

SIEMENS

WinCC

Communication Manual

Manual 2

This manual is part of the documentation package
with the order number:

6AV6392-1CA05-0AB0

C79000-G8276-C156-01

Release: September 1999

WinCC, SIMATIC, SINEC, STEP are trademarks of Siemens.

The other names used in this manual may be trademarks; their owners' rights may be violated if they are used by third parties for their own purposes.

(The transmission and reproduction of this document, and utilization and disclosure of its contents are not permitted unless expressly authorized.
Offenders will be liable for damages. All rights, including rights created by patent grant or registration of a utility model or design, are reserved.)

(We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvements are welcomed.)

© Siemens AG 1994 - 1999 All rights reserved

Technical data subject to change

C79000-G8276-C156-01
Printed in the Federal Republic of Germany

Siemens Aktiengesellschaft

Table of contents

1	Sample Projects	1-1
2	Communication to the SIMATIC S7 via Industrial Ethernet (Hardnet).....	2-1
2.1	Startup of the Communication Processor CP 1413	2-3
2.2	Creation of the STEP7 Project S7_IEH.....	2-13
2.3	Creation of the WinCC Project WinCC_S7_IEH	2-32
2.4	Diagnosis of the Communication Connection	2-45
3	Communication to the SIMATIC S7 via Industrial Ethernet (Softnet).....	3-1
3.1	Startup of the Communication Processor CP 1411	3-3
3.2	Creation of the STEP7 Project S7_IES.....	3-17
3.3	Creation of the WinCC Project WinCC_S7_IES	3-35
3.4	Diagnosis of the Communication Connection	3-48
4	Communication to the SIMATIC S7 via TCP/IP	4-1
4.1	Startup of the Communication Processor CP 1411	4-3
4.2	Creation of the STEP7 Project S7_IETCP.....	4-17
4.3	Creation of the WinCC Project WinCC_S7_IETCP.....	4-35
4.4	Diagnosis of the Communication Connection	4-48
5	Communication to the SIMATIC S7 via OPC	5-1
5.1	Startup of the Communication Processor CP 1413	5-3
5.2	Creation of the STEP7 Project S7_OPC.....	5-12
5.3	Configuration of the S7 OPC Server	5-29
5.4	Creation of the WinCC Project WinCC_S7_OPC	5-44
5.5	Diagnosis of the Communication Connection	5-57
6	Communication to the SIMATIC S7 via PROFIBUS.....	6-1
6.1	Startup of the Communication Processor CP 5412 A2.....	6-3
6.2	Creation of the STEP7 Project S7_PB.....	6-12
6.3	Creation of the WinCC Project WinCC_S7_PB	6-31
6.4	Diagnosis of the Communication Connection	6-45
7	Communication to the SIMATIC S5 via Industrial Ethernet ...	7-1
7.1	Startup of the Communication Processor CP 1413	7-3
7.2	Creation of the STEP5 Project S5_IEHst.....	7-12
7.3	Creation of the WinCC Project WinCC_S5_IEH	7-18
7.4	Diagnosis of the Communication Connection	7-31
8	Communication to the SIMATIC S5 via PROFIBUS FMS.....	8-1
8.1	Startup of the Communication Processor CP 5412 A2.....	8-3
8.2	Creation of the STEP5 Project S5_FMSst	8-20
8.3	Creation of the WinCC Project WinCC_S5_FMS.....	8-27

8.4	Diagnosis of the Communication Connection	8-38
9	Communication to the SIMATIC S5 via PROFIBUS FDL.....	9-1
9.1	Startup of the Communication Processor CP 5412 A2.....	9-3
9.2	Creation of the STEP5 Project S5_FDLst	9-13
9.3	Creation of the WinCC Project WinCC_S5_FDL	9-21
9.4	Diagnosis of the Communication Connection	9-33
10	Communication WinCC-WinCC via OPC	10-1
10.1	Configuration of the WinCC Stations.....	10-3
10.2	Creation of the WinCC Project WinCC_OPC_SERVER	10-11
10.3	Creation of the WinCC Project WinCC_OPC_CLIENT	10-19
10.4	Diagnosis of the Communication Connection	10-29

Preface

Purpose of this Manual

This manual contains various sample projects pertaining to the topic communication between WinCC and a PLC. It emphasizes the different communication options to the SIMATIC S5 and SIMATIC S7.

This manual is available in printed form as well as an electronic online document. The table of contents or the index will quickly point you to the information required. The online document also provides an expanded search function.

Additional Support

For technical questions, please contact your Siemens representative at your local Siemens branch.

In addition, you can contact our Hotline at the following number:

+49 (911) 895-7000 (Fax -7001)

Information about SIMATIC Products

Constantly updated information about SIMATIC products can be found in the CA01 catalog. This catalog can be accessed at the following Internet address:

<http://www.ad.siemens.de/ca01online/>

In addition, the SIEMENS Customer Support provides you with current information and downloads. A collection of frequently asked questions is listed at the following Internet address:

http://www.ad.siemens.de/support/html_00/index.shtml

1 Sample Projects

This chapter illustrates the configuration of the communication between a WinCC station and a PLC by means of sample projects. Each of the sample projects is based on the application of a certain communication option and hardware combination.

Content of the Examples

The sample projects described below can be copied directly from the online document to your hard drive.

The functionality of the sample projects is limited to the application and display of a few tag values. The emphasis is placed on the configuration of the communication.

Structure of the Samples

The steps necessary to successfully start up the communication connection are described in detail. In general, the individual descriptions are structured into the following sections:

- Overview of the sample project
- Installation of the necessary components in the PC
- Creation of the project for the PLC
- Creation of the WinCC project
- Diagnosis of the communication connection

Software

The samples have been created with the following software versions:

- WinCC Version 5.0
- STEP5 Version 4.6
- STEP7 Version 5.0
- SIMATIC NET 05/99

2 Communication to the SIMATIC S7 via Industrial Ethernet (Hardnet)

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder *C:\Communication_Manual*. You have the option to copy the following components to the hard drive:



S7_I EH

The STEP7 project we will create.

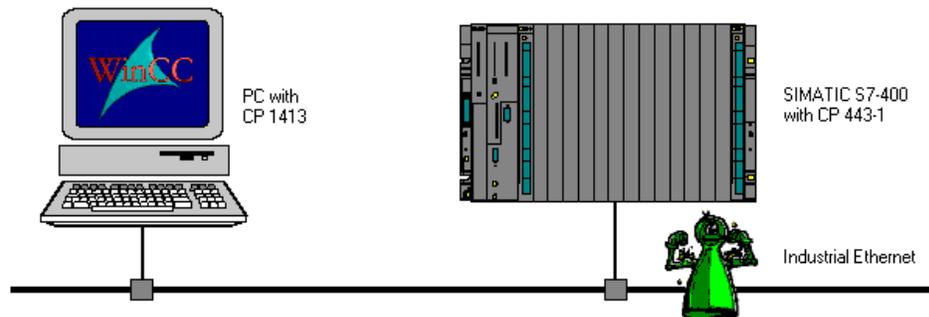


WinCC_S7_I EH

The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a SIMATIC S7 and WinCC. The communication connection is realized via the Industrial Ethernet. The communication card CP 1413 used in the computer has its own CPU onboard. This will free the CPU of the computer from communication tasks. Such a configuration is generally referred to as Hardnet.

Overview of the Structure of the Sample



On the computer side, the connection to the *Industrial Ethernet* network is established via the communication processor *CP 1413*. To install this communication processor in the computer, the driver *IE S7 1413*, located on the *SIMATIC NET* CD-ROM, is needed. In the WinCC project, the communication driver *SIMATIC S7 Protocol Suite* must be installed. Via its channel unit *Industrial Ethernet*, the connection to the *SIMATIC S7* is configured.

The PLC is equipped with a *CPU 416-1* module. The connection to the network is established via the communication processor *CP 443-1*. For the configuration of this communication processor with the STEP7 software, the option package *NCM S7 Industrial Ethernet* is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 1413
- Creation of the STEP7 Project S7_I EH
- Creation of the WinCC Project WinCC_S7_I EH
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>IE S7-1413</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 1413</i> .
STEP7	STEP7 software with option package <i>NCM for Industrial Ethernet</i> for the creation of the STEP7 project.
WinCC	WinCC with the communication driver <i>SIMATIC S7 Protocol Suite</i> for the creation of the WinCC project.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 1413</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>UR1</i>
Power Supply	Power supply <i>PS 407 10A</i> in slot 1 and 2.
CPU Module	CPU module <i>CPU 416-1</i> in slot 3.
Communication Processor	Communication processor <i>CP 443-1</i> in slot 4.

2.1 Startup of the Communication Processor CP 1413

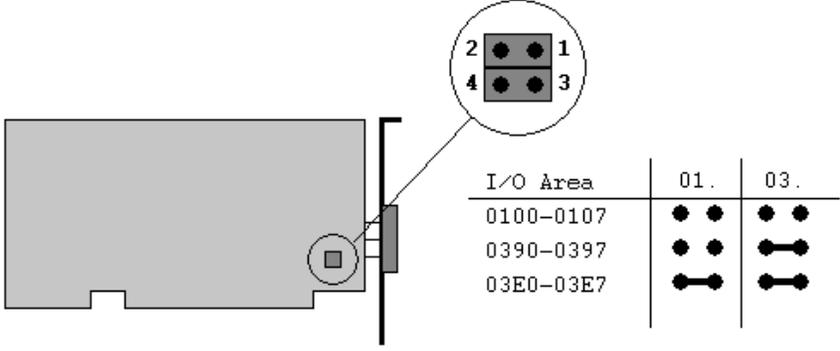
The following description details the configuration steps necessary to successfully start up the communication processor CP 1413.

Overview of the Configuration Steps

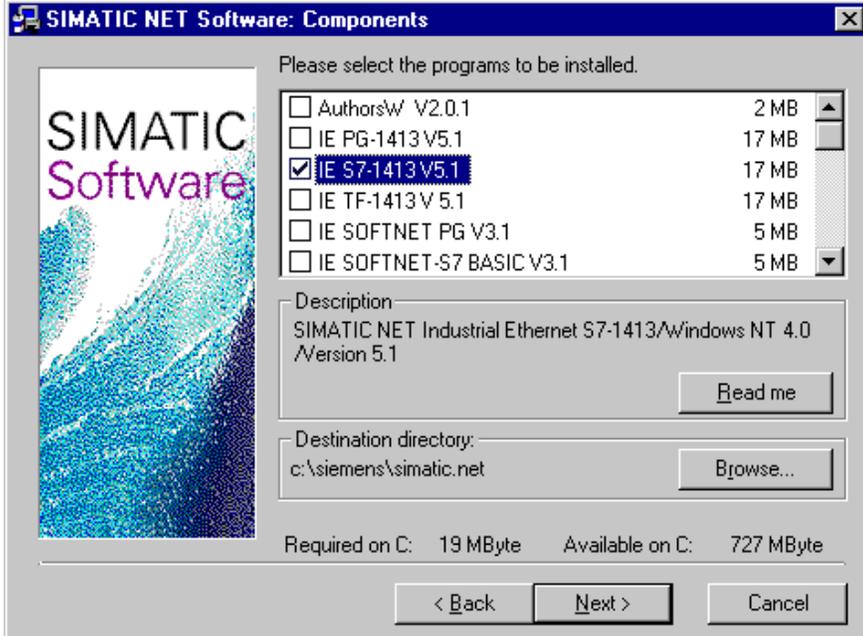
The following lists the configuration steps necessary to start up the communication processor *CP 1413*:

- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Installing the Communication Processor
- D: Assigning the Communication Processor
- E: Testing the Communication Processor

A: Mounting the Communication Processor in the Computer

Step	A: Mounting the Communication Processor in the Computer												
1	<p>Check the selected jumper settings at the CP 1413.</p> <p>During the installation of the <i>CP 1413</i>, the <i>I/O Range</i> must be specified. The <i>I/O Range</i> is set via <i>jumper</i>s.</p> <p>By default, the <i>I/O Range</i> is set to <i>03E0-03E7</i>. The settings <i>0100-0117</i> and <i>0390-0397</i> are also possible. The following graphic illustrates the jumper settings necessary for the various <i>I/O Ranges</i>.</p>  <table border="1"> <thead> <tr> <th>I/O Area</th> <th>01.</th> <th>03.</th> </tr> </thead> <tbody> <tr> <td>0100-0107</td> <td>● ●</td> <td>● ●</td> </tr> <tr> <td>0390-0397</td> <td>● ●</td> <td>— —</td> </tr> <tr> <td>03E0-03E7</td> <td>— —</td> <td>— —</td> </tr> </tbody> </table>	I/O Area	01.	03.	0100-0107	● ●	● ●	0390-0397	● ●	— —	03E0-03E7	— —	— —
I/O Area	01.	03.											
0100-0107	● ●	● ●											
0390-0397	● ●	— —											
03E0-03E7	— —	— —											
2	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>For the communication card <i>CP 1413</i>, a free ISA slot in the computer is required. After the installation of the <i>CP 1413</i>, close the computer's case and start the computer.</p>												

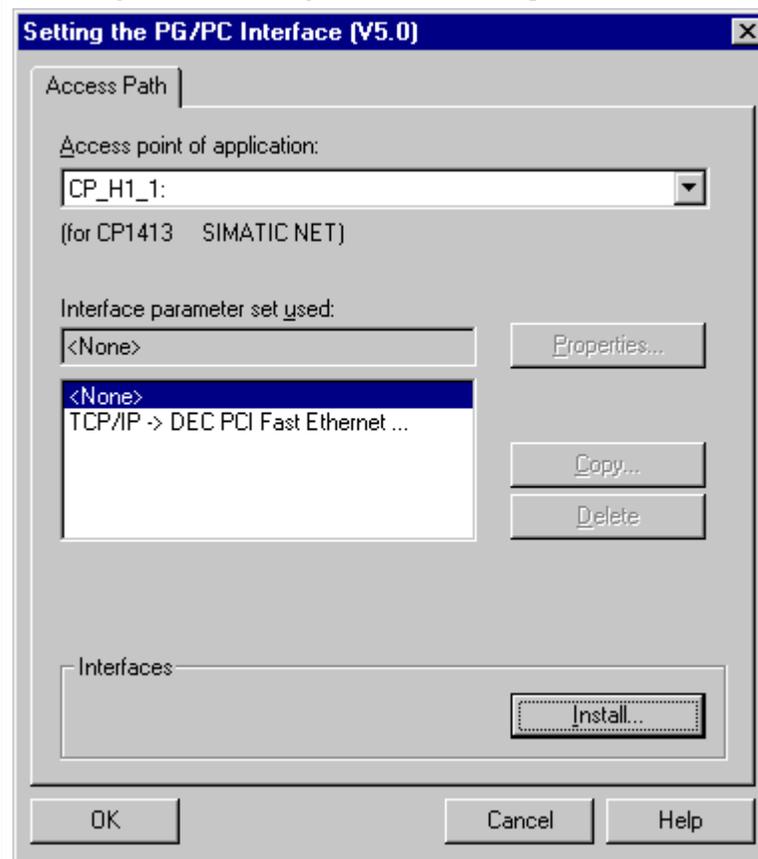
B: Installing the Communication Driver

Step	B: Installing the Communication Driver
1	<p>Install the communication driver <i>IE S7-1413</i> from the <i>SIMATIC NET</i> CD-ROM. After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">  </div> <p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>IE S7-1413</i> to be installed must be selected. Finish the installation.</p> <div>  </div>

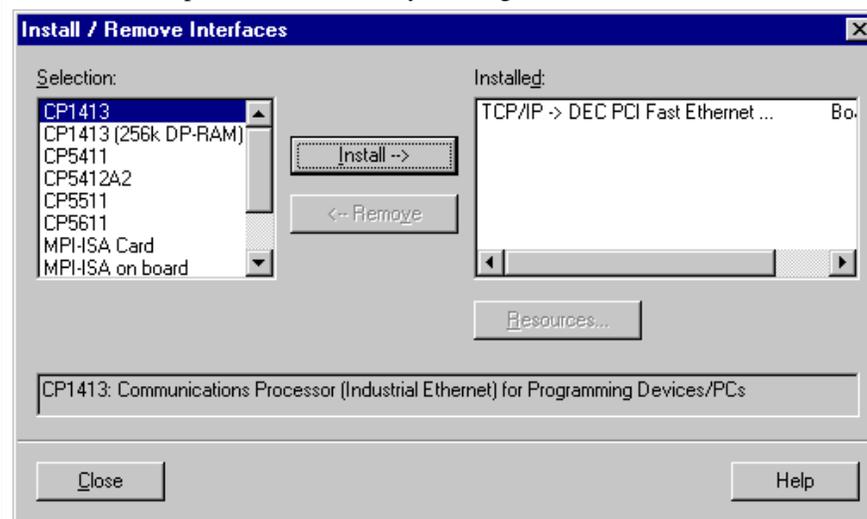
C: Installing the Communication Processor

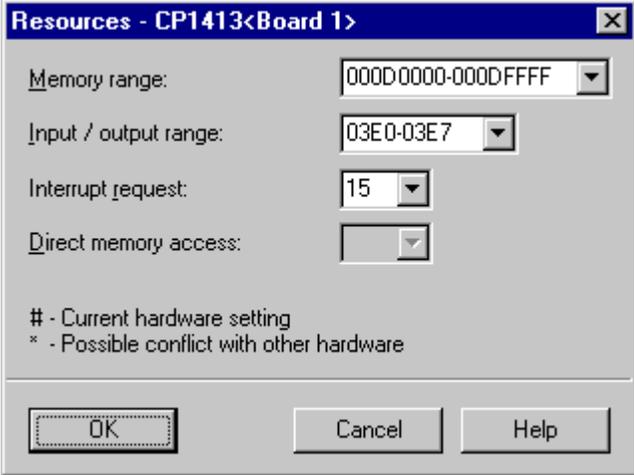
Step	C: Installing the Communication Processor
1	<p>Install the communication processor CP 1413 via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Setting the PG/PC Interface</p>

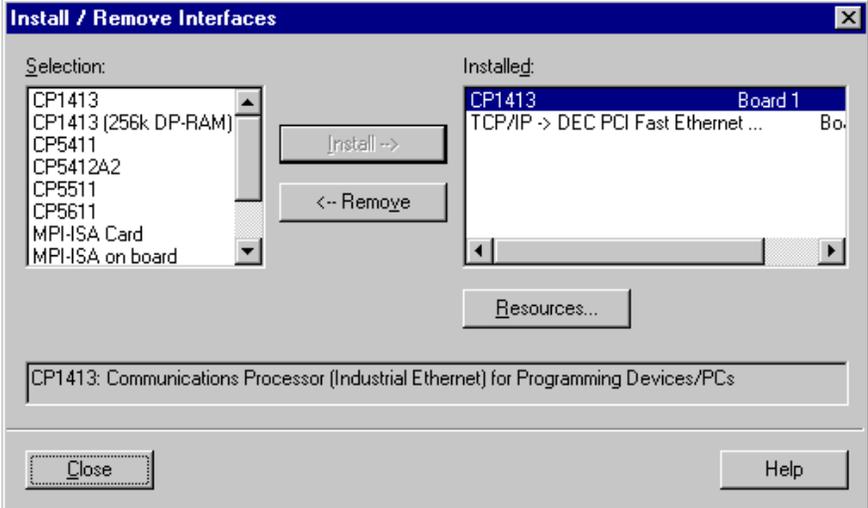
The program *Setting the PG/PC Interface* will be displayed.
The dialog box for installing a new interface is opened via the *Install* button.



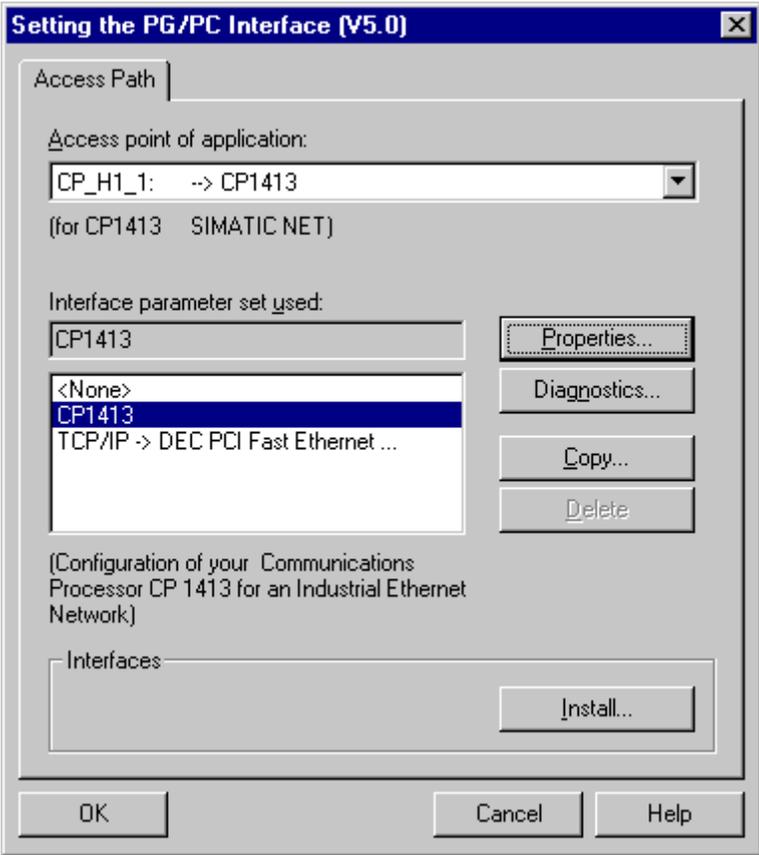
- 3 The dialog box *Install/Remove Modules* will be displayed. The *Selection* field lists all interfaces that can be installed. Among them will be the entry *CP 1413*, if the communication driver has been installed previously as outlined in step B. From the *Selection* field, select the entry *CP 1413*. The installation of the communication processor is started by clicking on the *Install ->* button.

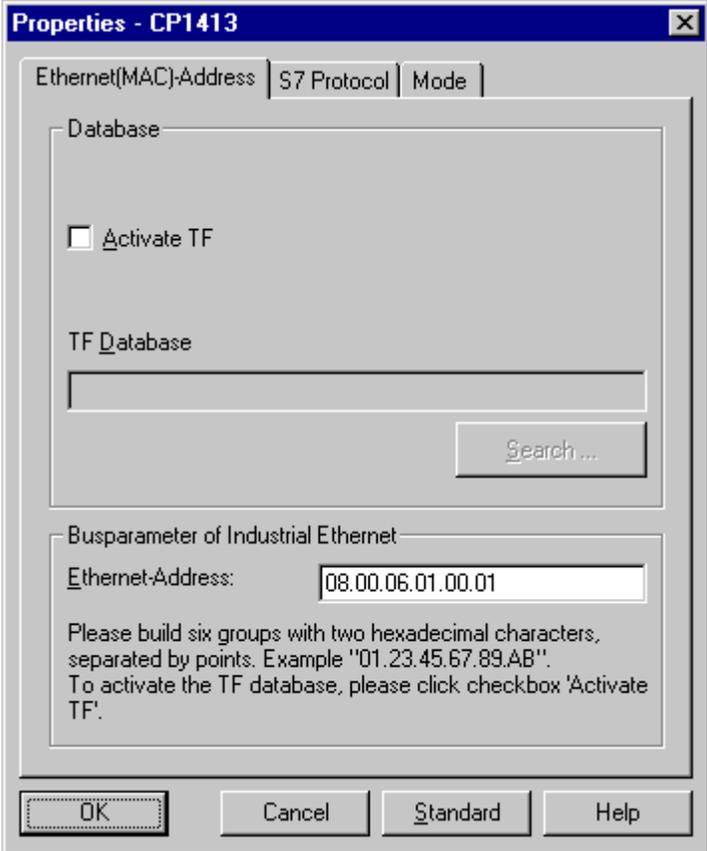


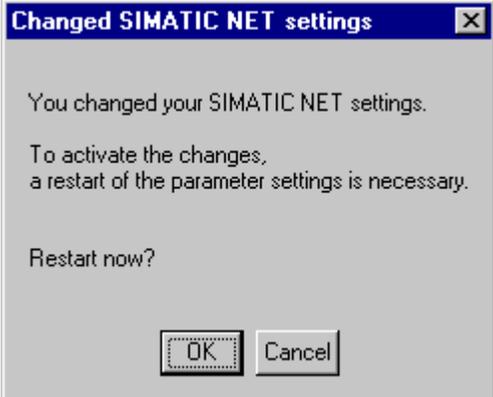
Step	C: Installing the Communication Processor
4	<p>The dialog box <i>Resources - CP 1413</i> will be displayed.</p> <p>The settings for the <i>Memory Range</i>, <i>I/O Range</i> and <i>Interrupt</i> have to be specified.</p> <p>The <i>I/O Range</i> has already been determined via the Jumper Settings at the <i>CP 1413</i>.</p> <p>Make sure that the assigned resources have not already been taken by other modules in the computer. Information about already taken system resources can be obtained from the <i>Resources</i> tab accessed via <i>Start</i> → <i>Programs</i> → <i>Administrative Tools (Common)</i> → <i>Windows NT Diagnostics</i>.</p> <p>Close the <i>Resources</i> tab by clicking on <i>OK</i>.</p> 

Step	C: Installing the Communication Processor
5	<p>In the dialog box <i>Install/Remove Modules</i>, the <i>Installed</i> field will now contain the entry for the <i>CP 1413</i>.</p> <p>Exit the dialog box <i>Install/Remove Modules</i> via the <i>Close</i> button.</p> 

D: Assigning the Communication Processor

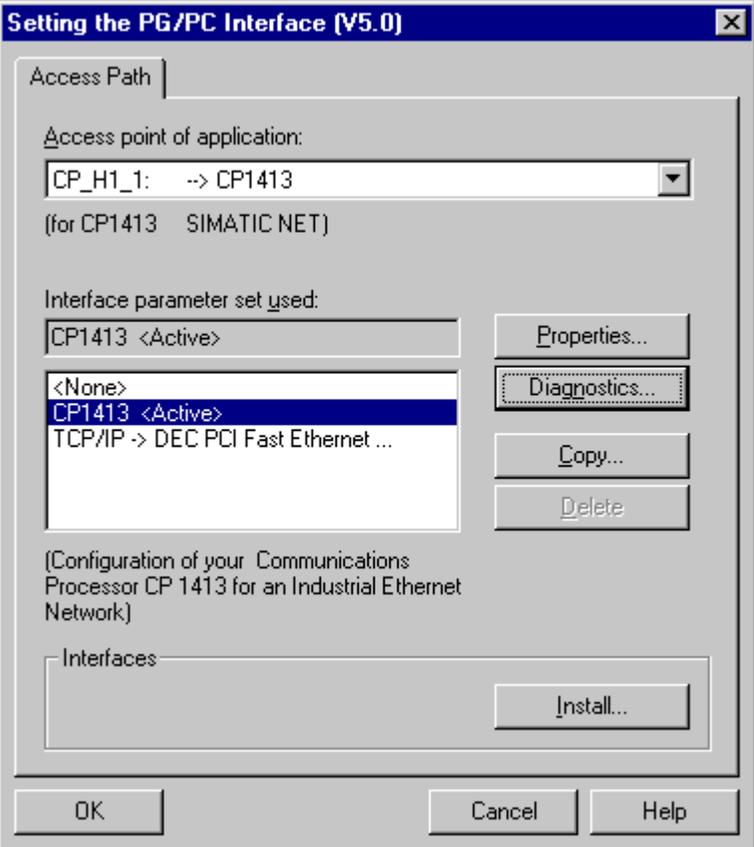
Step	D: Assigning the Communication Processor
1	<p>In the program <i>Setting the PG/PC Interface</i>, assign the access point <i>CP_H1_1</i>: to the just installed interface.</p> <p>The access point <i>CP_H1_1</i>: is the default access point used by WinCC for the communication via the Industrial Ethernet. It has been created automatically during the installation of the communication driver IE S7-1413.</p> <p>In the field <i>Access Point of the Application</i>, set the entry <i>CP_H1_1</i>:. In the field below, select the entry <i>CP1413</i>. This completes the assignment between the access point and the communication processor.</p> 

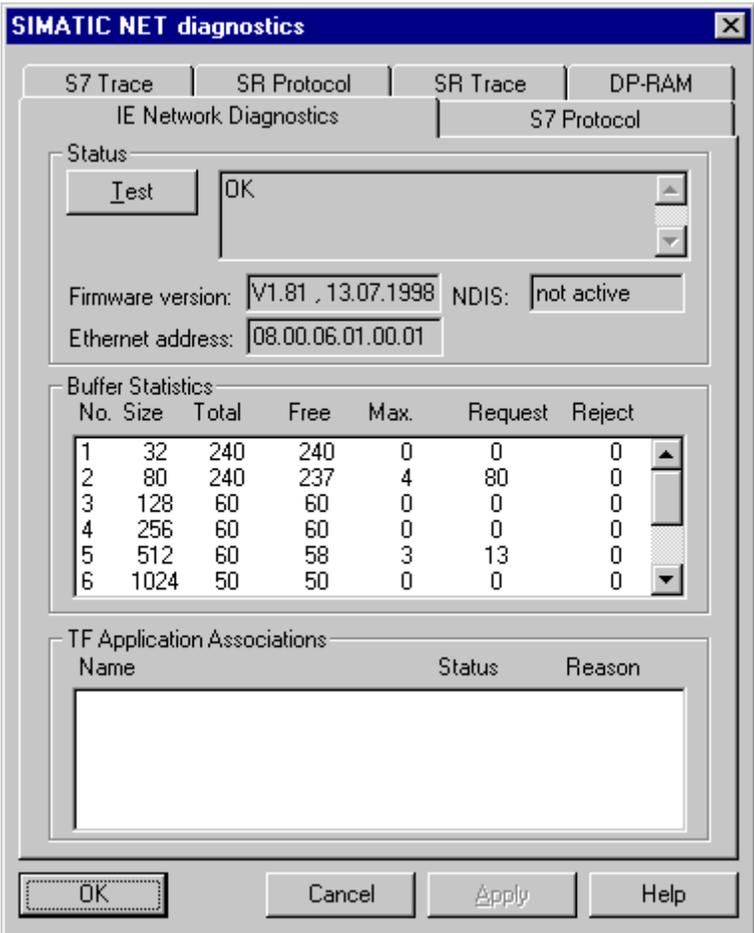
Step	D: Assigning the Communication Processor
2	<p>Setting the properties of the communication processor CP 1413.</p> <p>The dialog box for setting the properties is opened via the <i>Properties</i> button of the <i>Setting the PG/PC Interface</i> program.</p> <p>The dialog box <i>Properties - CP 1413</i> will be displayed.</p> <p>In the <i>Ethernet (MAC) Address</i> tab, enter the <i>Ethernet Address</i> of the <i>CP 1413</i>. In our sample, this is <i>08.00.06.01.00.01</i>.</p> <p>The <i>Ethernet Address</i> is six Bytes long and structured as follows for SIEMENS devices:</p> <ul style="list-style-type: none"> • <i>08.00.06</i>: The first six digits of the hexadecimal value correspond to the number for SIEMENS. • <i>01</i>: The next two digits specify the range for SIEMENS. • <i>0</i>: The next digit signifies the SIMATIC system. • <i>0.01</i>: The last three digits correspond to the significant station address of a SIEMENS device. 

Step	D: Assigning the Communication Processor
3	<p>Exit the program Setting the PG/PC Interface via the OK button.</p> <p>A dialog box will be displayed requesting the restart of the CP 1413.</p> <p>Acknowledge this dialog box by clicking on <i>OK</i>, which will result in the restart of the communication processor CP 1413.</p> <p>This completes the installation of the communication processor.</p> 

E: Testing the Communication Processor

Step	E: Testing the Communication Processor
1	<p>Check the proper installation of the communication processor CP 1413 via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>

Step	E: Testing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface to be checked. In this case, select the entry <i>CP 1413</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The check for a proper installation is activated by clicking on the <i>Diagnostics</i> button.</p> 

Step	E: Testing the Communication Processor
3	<p>The dialog box Simatic NET Diagnostics will be displayed.</p> <p>In the <i>IE Network Diagnostics</i> tab, the diagnosis is started via the <i>Test</i> button. The result of the diagnosis will be displayed after that.</p> <p>If the result of the diagnosis is positive (correct installation), the dialog box can be exited with <i>OK</i>. In this case, the program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>. The configuration of the communication to the S7 via the <i>Industrial Ethernet</i> is continued in the following section.</p> <p>However, if the result of the diagnosis is negative (incorrect installation), the error must be localized and corrected. Troubleshooting procedures are described in the section <i>Is the Communication Module in the Computer operational?</i>.</p> 

2.3 Creation of the STEP7 Project S7_I EH

The following description details the configuration steps necessary to create and start up the STEP7 project *S7_I EH*.

Overview of the Configuration Steps

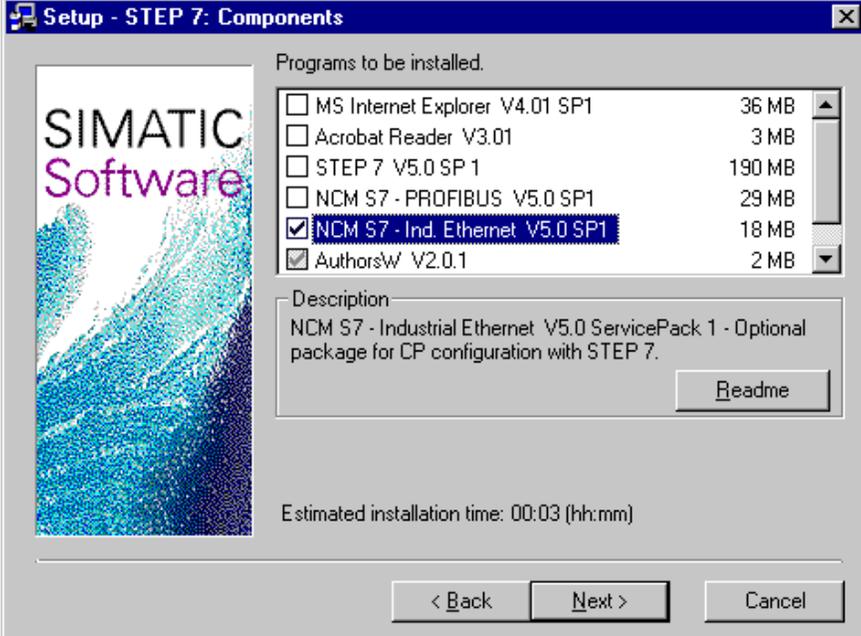
The following lists the configuration steps necessary to create the STEP7 project *S7_I EH*:

- A: Installing the Hardware
- B: Installing the Option Package
- C: Creating the STEP7 Project
- D: Configuring the Hardware
- E: Loading the Hardware Configuration
- F: Testing the Hardware Configuration
- G: Creating the STEP7 Program
- H: Testing the STEP7 Program

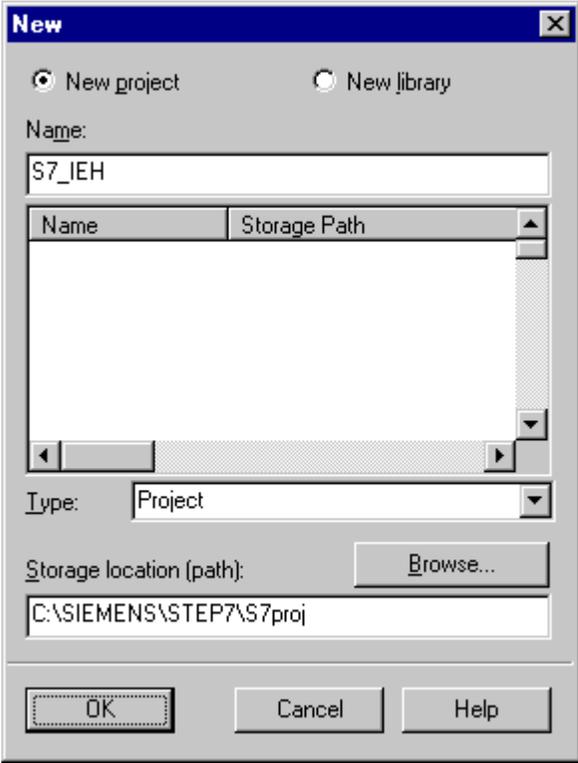
A: Installing the Hardware

Step	A: Installing the Hardware
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 407 10A</i>, the CPU module <i>CPU 416-1</i> and the communication processor <i>CP 443-1</i>.</p> <p>Establishing the connection from the programming device to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 1413</i> in the computer to the communication processor <i>CP 443-1</i> in the PLC.</p>

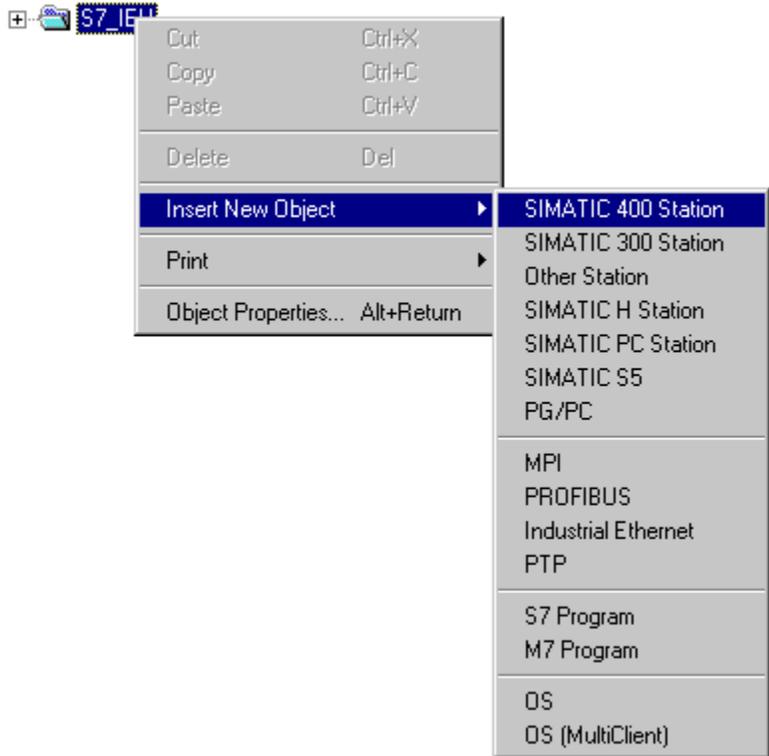
B: Installing the Option Package

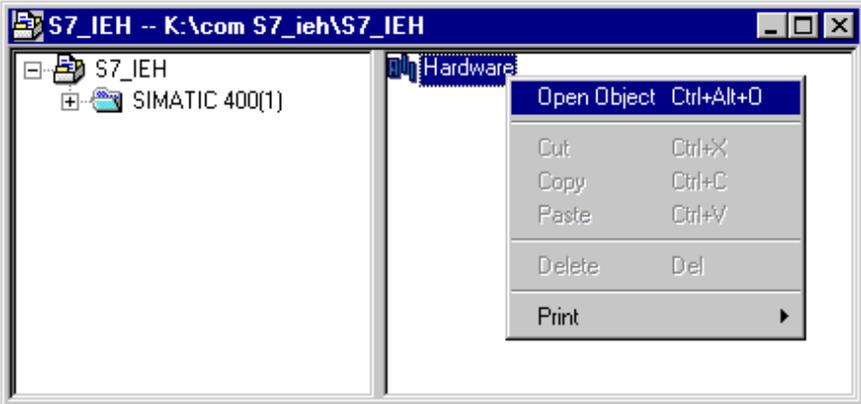
Step	B: Installing the Option Package
1	<p>If the option package NCM S7 Industrial Ethernet has not been installed during the installation of STEP7, install it now from the STEP7 CD-ROM. This option package is required for the configuration of the communication processor CP 443-1 via the STEP7 software.</p> <p>After inserting the <i>STEP7</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p>  <p>setup.exe</p>
2	<p>This starts the installation program.</p> <p>Follow the instructions of the installation program. On the <i>Components</i> page, select the check-box <i>NCM S7 Ind. Ethernet</i>. Finish the installation.</p> 

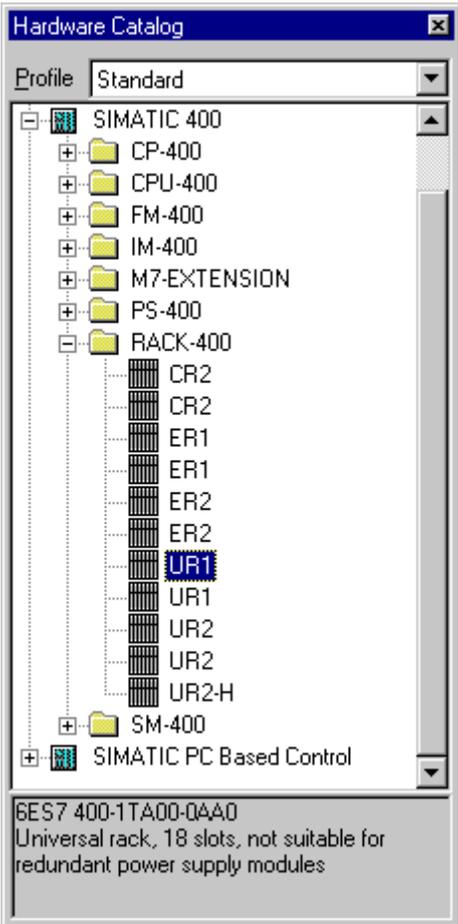
C: Creating the STEP7 Project

Step	C: Creating the STEP7 Project
1	<p>Create a new STEP7 project in the <i>SIMATIC Manager</i>.</p> <p>It is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC Manager</i>.</p>  <p>SIMATIC Manager</p>
2	<p>This displays the <i>SIMATIC Manager</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the parameters of a new STEP7 project will be opened.</p> <p>The <i>New</i> dialog box will be displayed.</p> <p>The radio-button <i>New Project</i> must be selected. In the <i>Name</i> field, the name of the new project to be created is entered. The names of the STEP7 projects created within the framework of this manual all start with <i>S7</i>. They also include a reference to the communication type used. The project of this sample has the name <i>S7_IEH</i>.</p> <p>By default, projects are stored in the <i>C:\SIEMENS\STEP7\S7proj</i> folder. This can be changed at any time via the <i>Browse</i> button.</p> <p>The <i>New</i> dialog box is closed via the <i>OK</i> button.</p> 

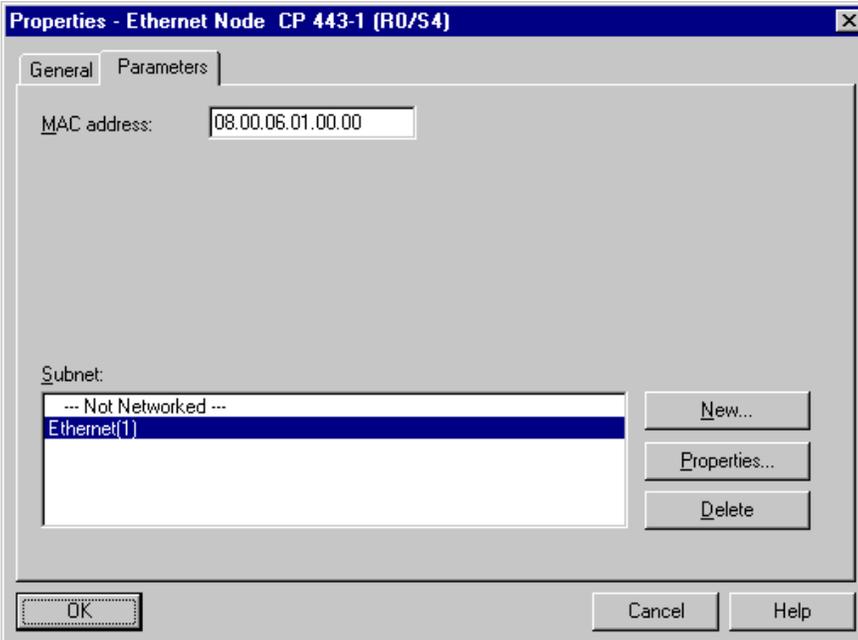
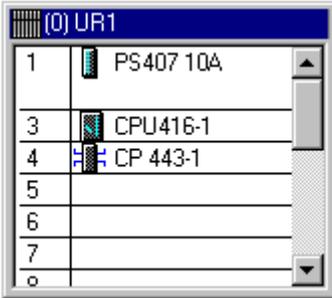
D: Configuring the Hardware

Step	D: Configuring the Hardware
1	<p>The new project will be displayed in the <i>SIMATIC Manager</i>.</p> <p>The hardware for this project must be configured. Two components are needed: One <i>SIMATIC 400-Station</i> and for its networking an <i>Industrial Ethernet</i>. These components are added to the <i>SIMATIC Manager</i> via a  on the project name <i>S7_IEH</i> and then selecting <i>Insert New Object</i> → <i>SIMATIC 400-Station</i> and <i>Insert New Object</i> → <i>Industrial Ethernet</i> from the pop-up menu.</p> 

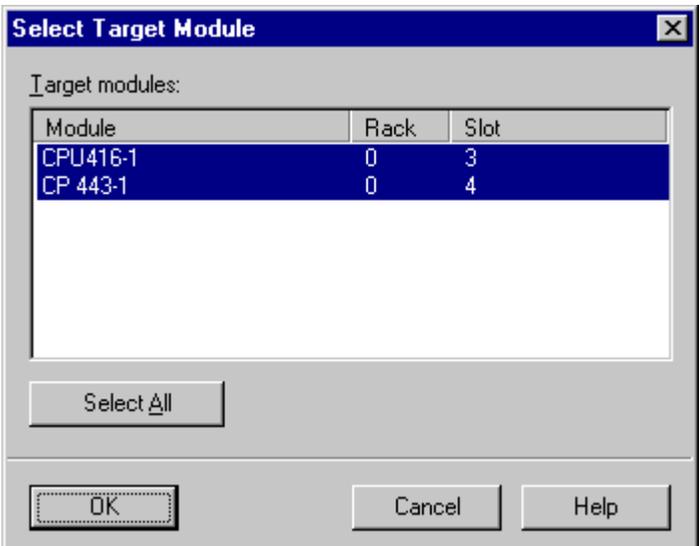
Step	D: Configuring the Hardware
2	<p>The just added components will be displayed in the right window of the <i>SIMATIC Manager</i>.</p> <p> SIMATIC 400(1)  MPI(1)  Ethernet(1)</p> <p>By clicking on the component <i>SIMATIC 400(1)</i> in the right window, the point <i>Hardware</i> will be displayed. By clicking on the point <i>Hardware</i> or right-clicking on it and then selecting <i>Open Object</i> from the pop-up menu, the program <i>HW Config</i> will be started.</p> 
3	<p>The program <i>HW Config</i> is displayed.</p> <p>This program is used to exactly define the hardware used in the PLC and to configure their properties.</p>  <p>HW Konfig</p>
4	<p>By clicking on the toolbar button of the program <i>HW Config</i> displayed below, the <i>Hardware Catalog</i> is opened. This catalog is used to select the required hardware components.</p> 

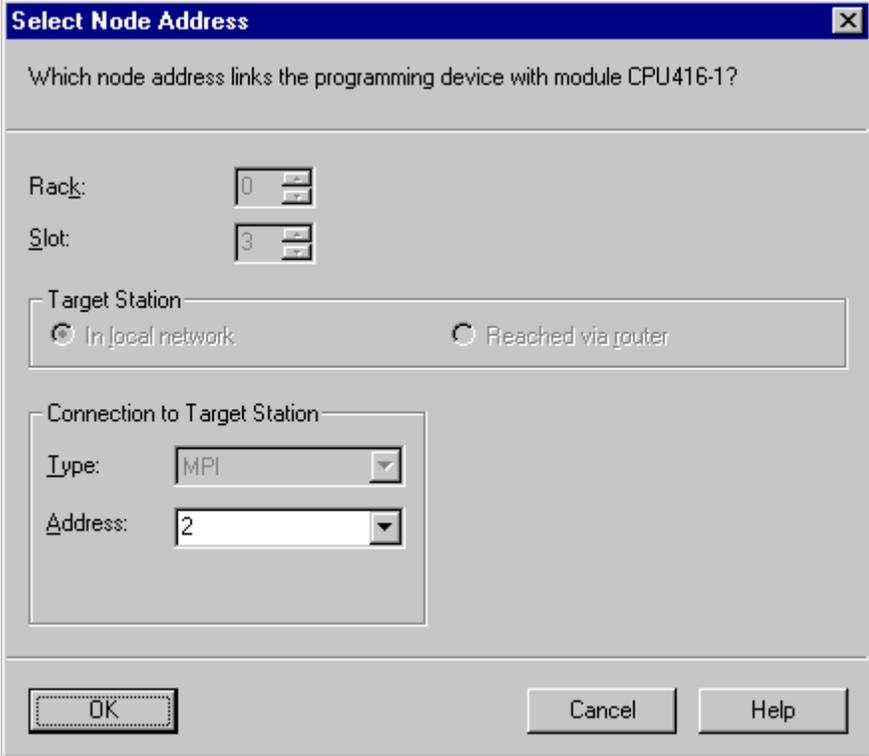
Step	D: Configuring the Hardware
5	<p>The Hardware Catalog is displayed.</p> <p>The first component selected is the rack. On this rack, all other components will be installed. The rack is inserted into the project via a  or by Dragging Dropping. In this sample, the rack type <i>UR1</i> is used.</p> 

Step	D: Configuring the Hardware
6	<p>The program HW Config displays the currently still empty rack. It received the Rack Number 0. During the configuration of the connection in the WinCC project, the Rack Number is one of the parameters that must be set.</p> 
7	<p>Arrange the other hardware components in the rack. This is done by Dragging Dropping the desired components from the Hardware Catalog to the corresponding slot in the rack.</p> <p>This sample uses the power supply <i>PS 407 10A</i>. It is inserted into slot <i>1</i>. A power supply of this type occupies two slots.</p> <p>As the CPU module, this sample uses a <i>CPU 416-1</i>. This module is inserted into slot <i>3</i>. Another parameter to be set during the configuration of the connection in the WinCC project is the slot number of the CPU module.</p> <p>We also require the communication processor <i>CP 443-1</i>. This CP is only available from the <i>Hardware Catalog</i> if the option package <i>NCM S7 Industrial Ethernet</i> has been installed. After the communication processor <i>CP 443-1</i> has been inserted in the rack, its properties dialog box will open.</p>

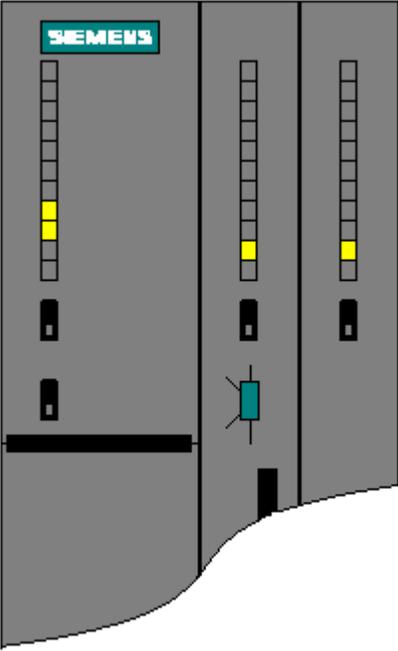
Step	D: Configuring the Hardware
8	<p>The Ethernet Interface properties dialog box of the CP 443-1 will be displayed.</p> <p>In the <i>MAC Address</i> field of the <i>Parameters</i> tab, enter the desired Ethernet address of the communication processor. In this sample, the address <i>08.00.06.01.00.00</i> is specified. Another parameter to be set during the configuration of the connection in the WinCC project is this Ethernet address.</p> <p>In the <i>Subnet</i> field below, assign the entry <i>Ethernet(1)</i> to the communication processor. Close the dialog box by clicking on <i>OK</i>.</p> 
9	<p>The following graphic shows the completed hardware arrangement of the sample.</p> 
10	<p>Save the settings made in the program <i>HW Config</i>. This is done via the toolbar button displayed below.</p> 

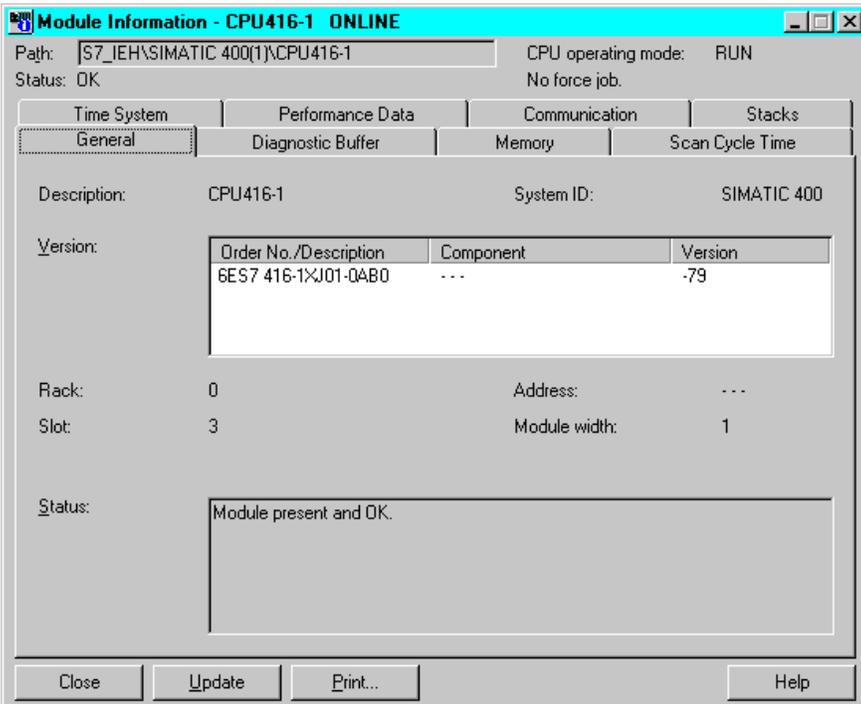
E: Loading the Hardware Configuration

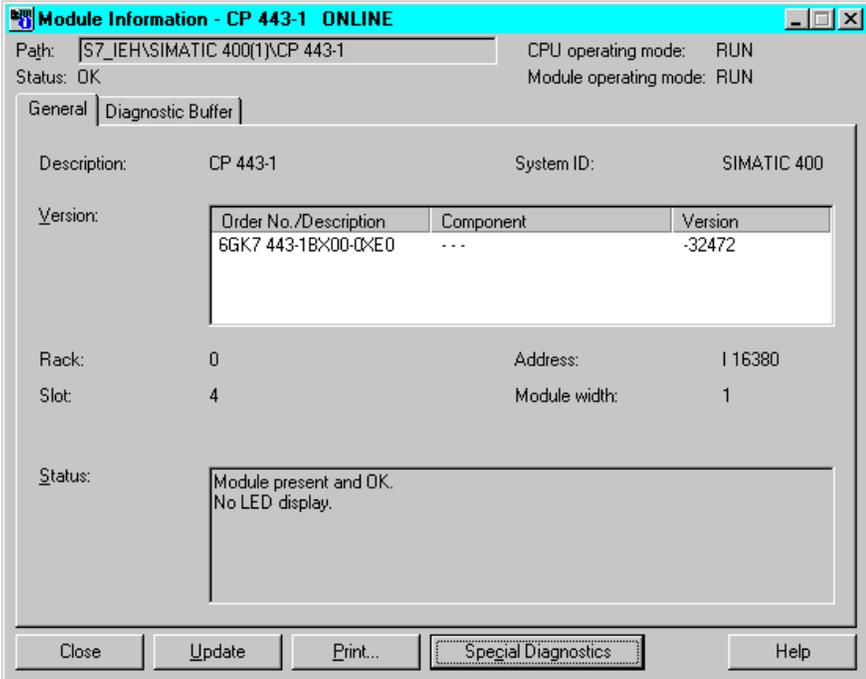
Step	E: Loading the Hardware Configuration									
1	<p>The hardware configuration created in the program <i>HW Config</i> must be transferred to the PLC.</p> <p>This is done via the toolbar button displayed below.</p> 									
2	<p>A dialog box will be displayed from which the components to be loaded can be selected.</p> <p>For this sample, all displayed components will be selected. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>. Close the dialog box by clicking on <i>OK</i>.</p>  <table border="1"> <thead> <tr> <th>Module</th> <th>Rack</th> <th>Slot</th> </tr> </thead> <tbody> <tr> <td>CPU416-1</td> <td>0</td> <td>3</td> </tr> <tr> <td>CP 443-1</td> <td>0</td> <td>4</td> </tr> </tbody> </table>	Module	Rack	Slot	CPU416-1	0	3	CP 443-1	0	4
Module	Rack	Slot								
CPU416-1	0	3								
CP 443-1	0	4								

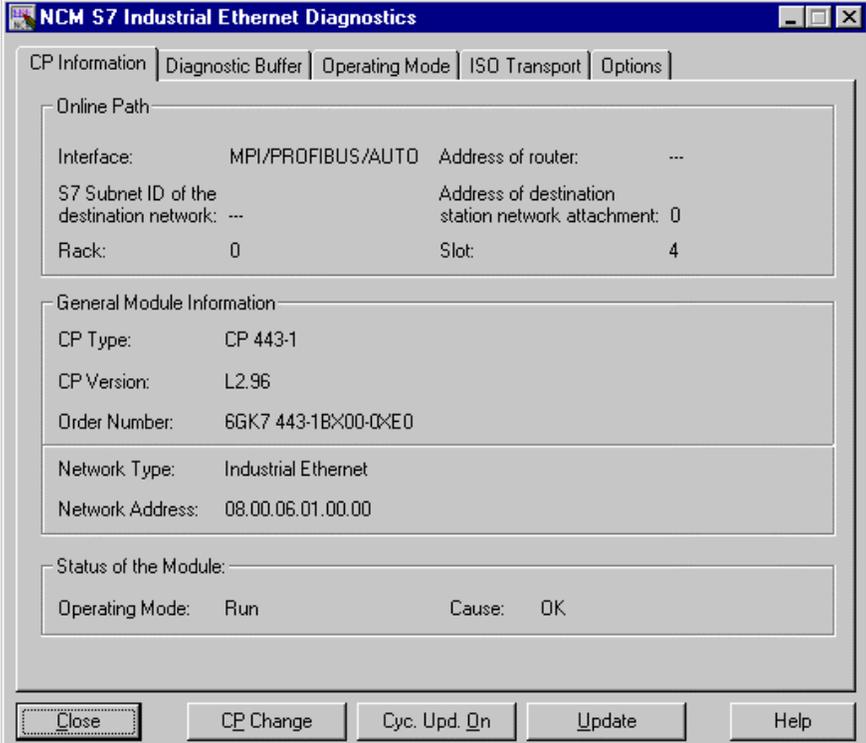
Step	E: Loading the Hardware Configuration
3	<p>Now the dialog box <i>Select Station Address</i> will be displayed.</p> <p>In this dialog box, specify which station address is used by the STEP7 software to communicate with the CPU module. In this sample, the communication is carried out via the MPI interface. The <i>Address</i> of the CPU module is 2.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>The configuration data will now be transferred to the PLC. If necessary, the individual modules will be set to the <i>STOP</i> status.</p> <p>The program <i>HW Config</i> can be exited.</p> <p>The newly added components will be displayed by the <i>SIMATIC Manager</i> for the station <i>SIMATIC 400(1)</i>.</p> 

F: Testing the Hardware Configuration

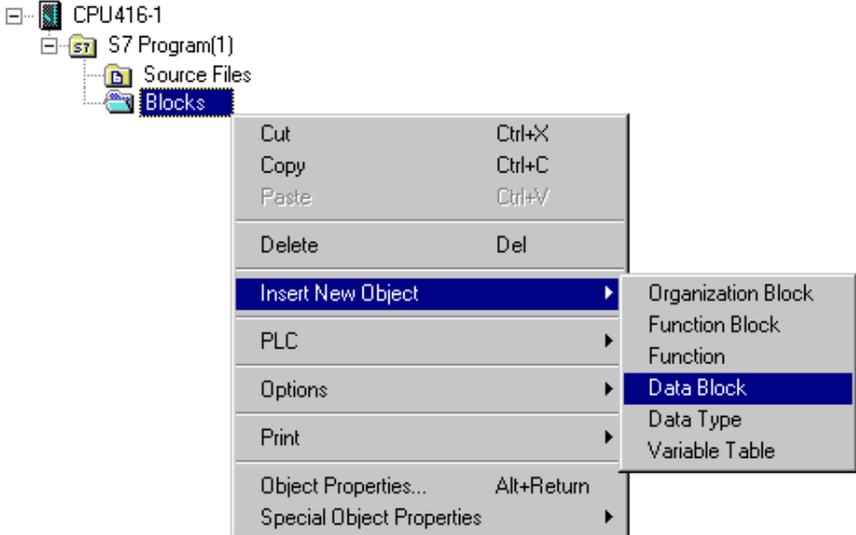
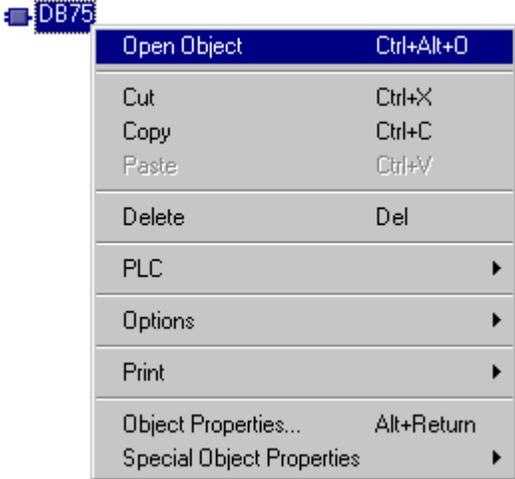
Step	F: Testing the Hardware Configuration
1	<p>Testing of the hardware configuration made.</p> <p>If the key switch of the CPU module is set to <i>RUN</i> or <i>RUN-P</i> and the operating mode switch of the communication processor is set to <i>RUN</i>, only the status LEDs signifying the <i>RUN</i> operating mode should be displayed.</p> <p>If this is not the case, there is an error. The following steps help you localize this error. However, these steps should still be performed even if the status LEDs show no error. This allows you to recognize uncritical errors and faulty configurations.</p> 

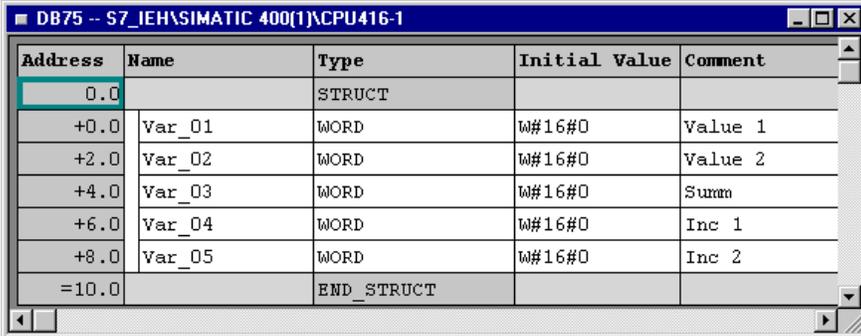
Step	F: Testing the Hardware Configuration
2	<p>Testing the configuration of the CPU module.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the CPU module in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the CPU module will be displayed.</p> <p>The <i>General</i> tab displays various general data of the CPU module. In the <i>Status</i> field, the current module status and any existing errors are displayed.</p> <p>The <i>Diagnosis Buffer</i> tab contains more detailed information about existing errors and how to correct them.</p> <p>The dialog box can be exited via the <i>Close</i> button.</p> 

Step	F: Testing the Hardware Configuration
3	<p>Testing the configuration of the communication processor.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the communication processor in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the communication processor will be displayed. The <i>General</i> tab displays various general data of the module.</p> <p>A dialog box for a more detailed diagnosis of the communication processor can be accessed via the <i>Special Diagnosis</i> button.</p> 

Step	F: Testing the Hardware Configuration
4	<p>The dialog box NCM S7 Industrial Ethernet Diagnosis will be displayed.</p> <p>The <i>CP Information</i> tab displays general information about the module. Among other things, the network address set can be checked.</p> <p>The dialog box can be exited via the <i>Close</i> button. The Module Status dialog box can also be exited via the <i>Close</i> button.</p> 

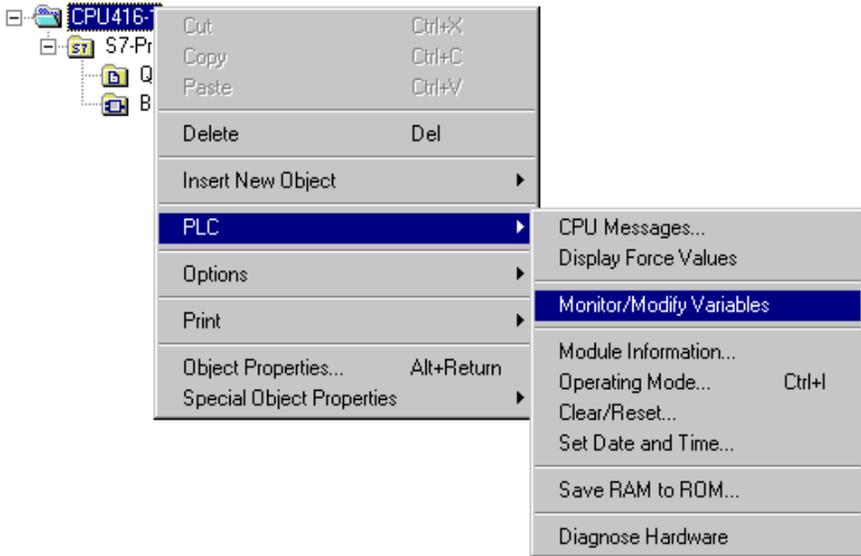
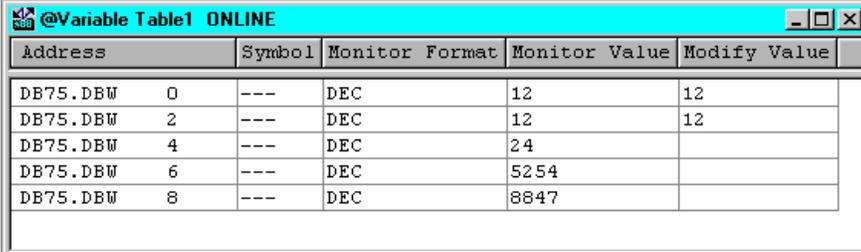
G: Creating the STEP7 Program

Step	G: Creating the STEP7 Program
1	<p>Creation of the <i>S7 Program</i>.</p> <p>This sample project requires the operation block OB1 and a data block. OB1 is available by default, the required data block must be created. This is done in the SIMATIC Manager via a  on the sub-entry Modules of the entry S7 Program(1) of the configured CPU module and then selecting <i>Insert New Object</i> → <i>Data Block</i> from the pop-up menu.</p> <p>The properties dialog box of the data block will be opened. As the block's <i>Name</i> enter <i>DB75</i> and close the dialog box with <i>OK</i>.</p> 
2	<p>The newly created data block <i>DB75</i> will be displayed in the right window of the project.</p> <p>Via a  on this data block or a  and then selecting <i>Open Object</i> from the pop-up menu, the content of the block can be programmed. This starts the program LAD/STL/SCF.</p> 

Step	G: Creating the STEP7 Program																																								
3	<p>The program <i>LAD/STL/SCF</i> is displayed. Acknowledge the dialog box <i>New Data Block</i> by clicking on <i>OK</i>.</p>  <p>KOP AWL FUP</p>																																								
4	<p>Programming the <i>DB75</i>.</p> <p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits. Two additional tags with a length of 16 Bits are created, whose values are cyclically incremented in <i>OBI</i>.</p> <p>The tags created in the data block <i>DB75</i> are visualized in the WinCC project. To do so, WinCC tags with corresponding addressing are created there.</p> <p>The following graphic displays the programmed data block <i>DB75</i>.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Name</th> <th>Type</th> <th>Initial Value</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>0.0</td> <td></td> <td>STRUCT</td> <td></td> <td></td> </tr> <tr> <td>+0.0</td> <td>Var_01</td> <td>WORD</td> <td>w#16#0</td> <td>Value 1</td> </tr> <tr> <td>+2.0</td> <td>Var_02</td> <td>WORD</td> <td>w#16#0</td> <td>Value 2</td> </tr> <tr> <td>+4.0</td> <td>Var_03</td> <td>WORD</td> <td>w#16#0</td> <td>Summ</td> </tr> <tr> <td>+6.0</td> <td>Var_04</td> <td>WORD</td> <td>w#16#0</td> <td>Inc 1</td> </tr> <tr> <td>+8.0</td> <td>Var_05</td> <td>WORD</td> <td>w#16#0</td> <td>Inc 2</td> </tr> <tr> <td>=10.0</td> <td></td> <td>END_STRUCT</td> <td></td> <td></td> </tr> </tbody> </table>	Address	Name	Type	Initial Value	Comment	0.0		STRUCT			+0.0	Var_01	WORD	w#16#0	Value 1	+2.0	Var_02	WORD	w#16#0	Value 2	+4.0	Var_03	WORD	w#16#0	Summ	+6.0	Var_04	WORD	w#16#0	Inc 1	+8.0	Var_05	WORD	w#16#0	Inc 2	=10.0		END_STRUCT		
Address	Name	Type	Initial Value	Comment																																					
0.0		STRUCT																																							
+0.0	Var_01	WORD	w#16#0	Value 1																																					
+2.0	Var_02	WORD	w#16#0	Value 2																																					
+4.0	Var_03	WORD	w#16#0	Summ																																					
+6.0	Var_04	WORD	w#16#0	Inc 1																																					
+8.0	Var_05	WORD	w#16#0	Inc 2																																					
=10.0		END_STRUCT																																							
5	<p>Save the block and load it into the PLC. This is done via the toolbar button displayed below. Note that loading to the CPU module is only possible while the operating mode switch is set to STOP or RUN-P.</p>  <p>Download</p>																																								
6	<p>Programming the <i>OBI</i>.</p> <p>Open the block in the program <i>LAD/STL/SCF</i>.</p> <p>First, two values in the <i>DB75</i> are added and then stored again in <i>DB75</i>.</p> <p>Netzwerk 1: Addition</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Adding two 16-Bit Values The result is stored in another 16-Bit Value</p> </div> <table border="1"> <tbody> <tr> <td>OPN</td> <td>DB</td> <td>75</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>0</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>2</td> </tr> <tr> <td>+I</td> <td></td> <td></td> </tr> <tr> <td>T</td> <td>DBW</td> <td>4</td> </tr> </tbody> </table> <p>Next, a value in the <i>DB75</i> is incremented every second.</p>	OPN	DB	75	L	DBW	0	L	DBW	2	+I			T	DBW	4																									
OPN	DB	75																																							
L	DBW	0																																							
L	DBW	2																																							
+I																																									
T	DBW	4																																							

Step	G: Creating the STEP7 Program
	<p>Network 2 : Second Cycle</p> <p>Generation of a second cycle at M 0.0</p> <pre> AN M 0.0 L S5T#1S SD T 1 A T 1 = M 0.0 </pre> <p>Network 3 : Counting in a second cycle</p> <p>Counting a value in a second cycle At 10000, reset to 0</p> <pre> AN M 0.0 JC M001 L DBW 6 L 1 +I T DBW 6 L 10000 <I JC M001 L 0 T DBW 6 M001: NOP 0 </pre> <p>Finally, a value in the <i>DB75</i> is incremented every time the <i>OB1</i> run.</p> <p>Network 4 : Counting in the cycle time</p> <p>Counting a value each time the OB is executed At 10000, reset to 0</p> <pre> L DBW 8 L 1 +I T DBW 8 L 10000 <I JC M002 L 0 T DBW 8 M002: NOP 0 </pre>
7	<p>Save the block <i>OB1</i> and load it into the PLC. This is done via the corresponding buttons on the toolbar.</p> <p>This completes the creation of the STEP7 project and it can now be run. Exit the program <i>LAD/STL/SCF</i>.</p>

H: Testing the STEP7 Program

Step	H: Testing the STEP7 Program																														
1	<p>Testing the program with the STEP7 software.</p> <p>For this purpose, a tag table is created. This is done in the SIMATIC Manager via a right-click on the entry of the configured CPU module and then selecting Target System → Monitor/Control Tag from the pop-up menu.</p> 																														
2	<p>An editor for creating and using a tag table will be displayed.</p> <p>The following shows a completed tag table. In this table, enter all tags created in the DB75.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Symbol</th> <th>Monitor Format</th> <th>Monitor Value</th> <th>Modify Value</th> </tr> </thead> <tbody> <tr> <td>DB75.DBW 0</td> <td>---</td> <td>DEC</td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 2</td> <td>---</td> <td>DEC</td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 4</td> <td>---</td> <td>DEC</td> <td>24</td> <td></td> </tr> <tr> <td>DB75.DBW 6</td> <td>---</td> <td>DEC</td> <td>5254</td> <td></td> </tr> <tr> <td>DB75.DBW 8</td> <td>---</td> <td>DEC</td> <td>8847</td> <td></td> </tr> </tbody> </table>	Address	Symbol	Monitor Format	Monitor Value	Modify Value	DB75.DBW 0	---	DEC	12	12	DB75.DBW 2	---	DEC	12	12	DB75.DBW 4	---	DEC	24		DB75.DBW 6	---	DEC	5254		DB75.DBW 8	---	DEC	8847	
Address	Symbol	Monitor Format	Monitor Value	Modify Value																											
DB75.DBW 0	---	DEC	12	12																											
DB75.DBW 2	---	DEC	12	12																											
DB75.DBW 4	---	DEC	24																												
DB75.DBW 6	---	DEC	5254																												
DB75.DBW 8	---	DEC	8847																												

Step	H: Testing the STEP7 Program
3	<p>Monitoring the current tag values.</p> <p>By clicking on the toolbar button displayed below, the current values of the corresponding tags in the PLC are displayed in the column Status Value.</p>  <p>Controlling the tag values.</p> <p>Values can be entered in the column Control Value. By clicking on the toolbar button displayed below, these values will be written to the corresponding tags in the PLC.</p> <p>Note that tags can only be controlled while the operating mode switch of the CPU module is set to <i>RUN-P</i>.</p> 
4	<p>The created tag table can now be saved.</p> <p>In this sample, the table is saved under the name <i>VAT1</i>. After checking the program in the PLC, the tag table can be closed. This concludes the configuration of the STEP7 project and the <i>SIMATIC Manager</i> can be exited.</p> 

2.4 Creation of the WinCC Project WinCC_S7_IEH

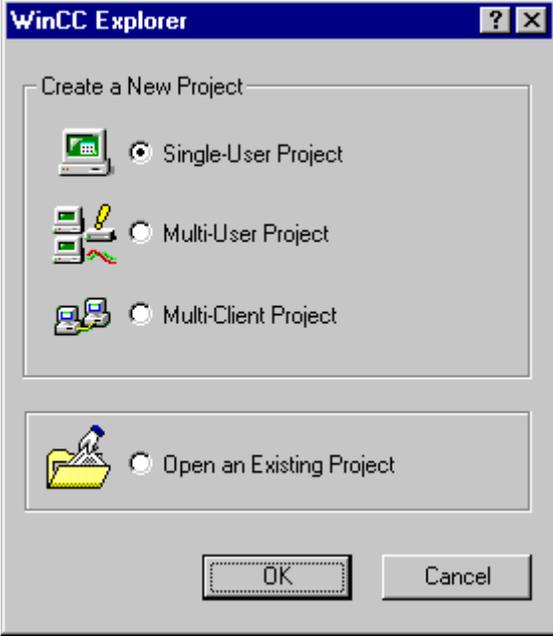
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S7_IEH*.

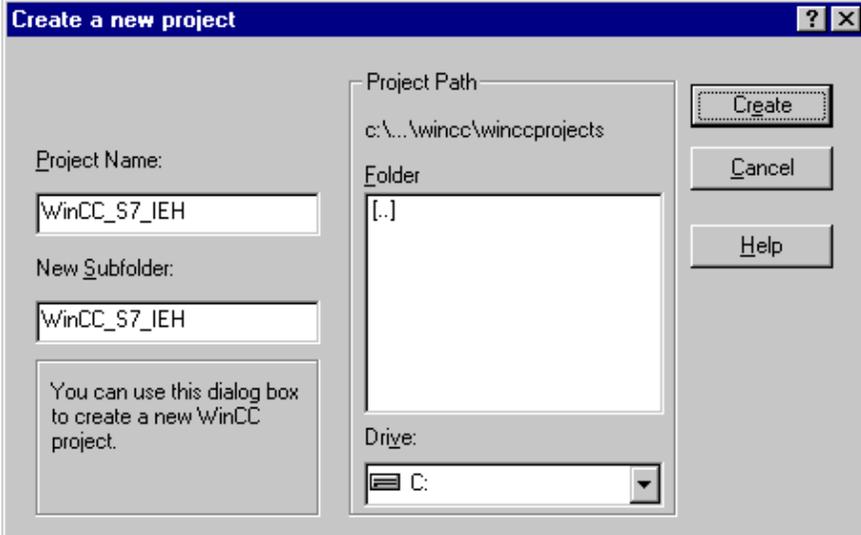
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_S7_IEH*:

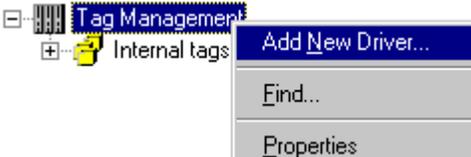
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Tags
- D: Creating the WinCC Screen

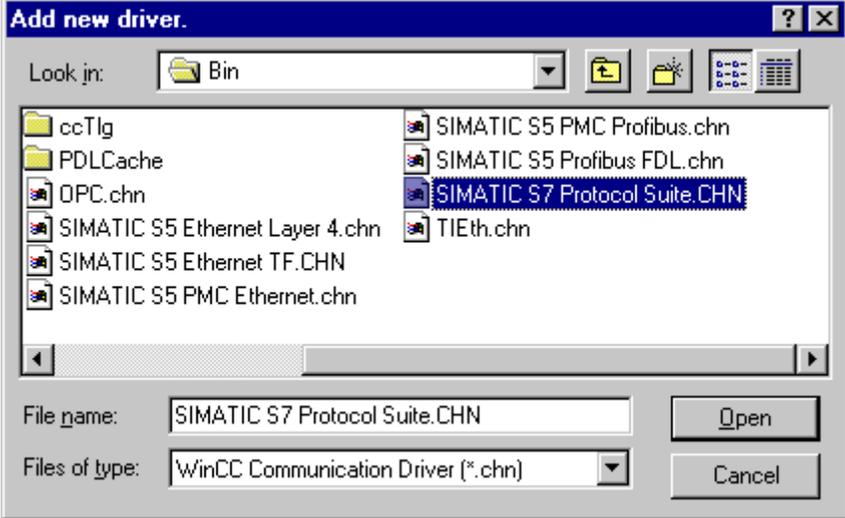
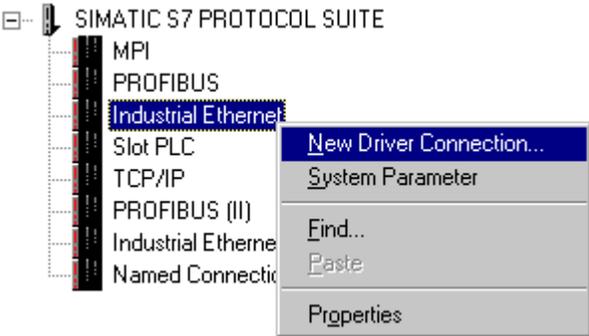
A: Creating the WinCC Project

Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the WinCC Explorer.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>The WinCC Explorer will be displayed.</p> <p>Via the menu <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

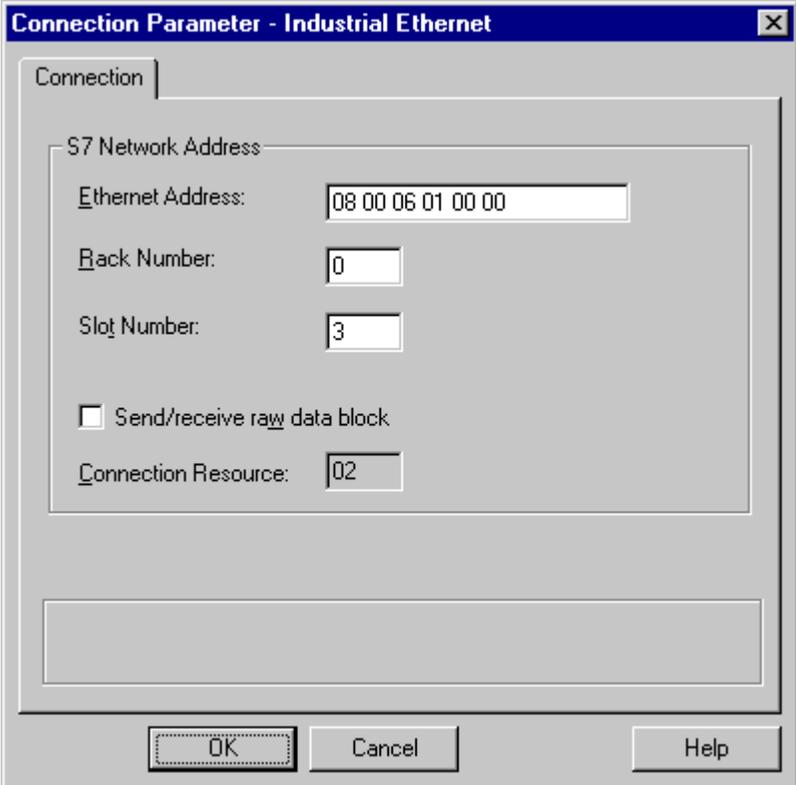
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S7_IEH</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

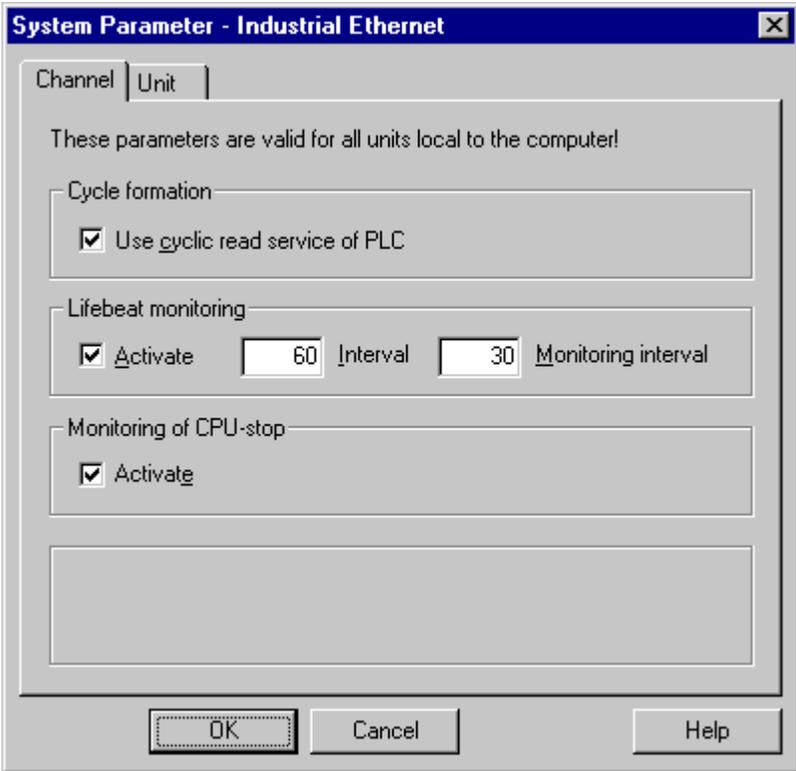
B: Creating the Connection

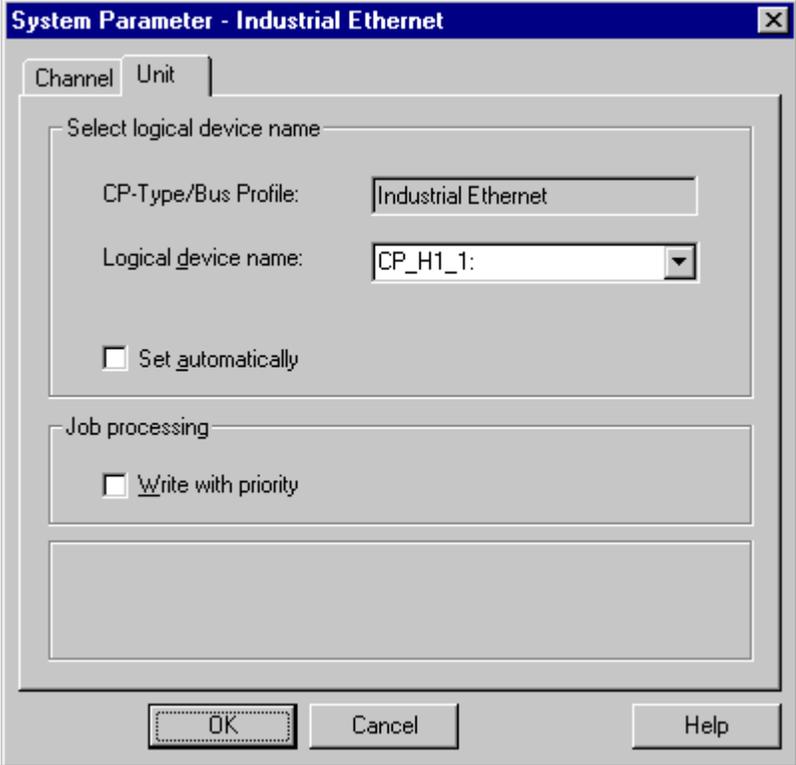
Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. For the communication to the <i>SIMATIC S7</i>, the driver <i>SIMATIC S7 Protocol Suite</i> is required. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added driver <i>SIMATIC S7 Protocol Suite</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The driver contains eight different channel units. To operate a computer with two <i>CP 1413</i> communication processors, two <i>Industrial Ethernet</i> channel units are available.</p> <p>In this sample, the channel unit <i>Industrial Ethernet</i> is used. Create a new connection for this channel unit by  on <i>Industrial Ethernet</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> 

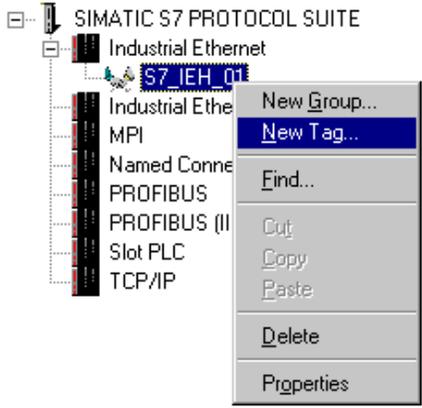
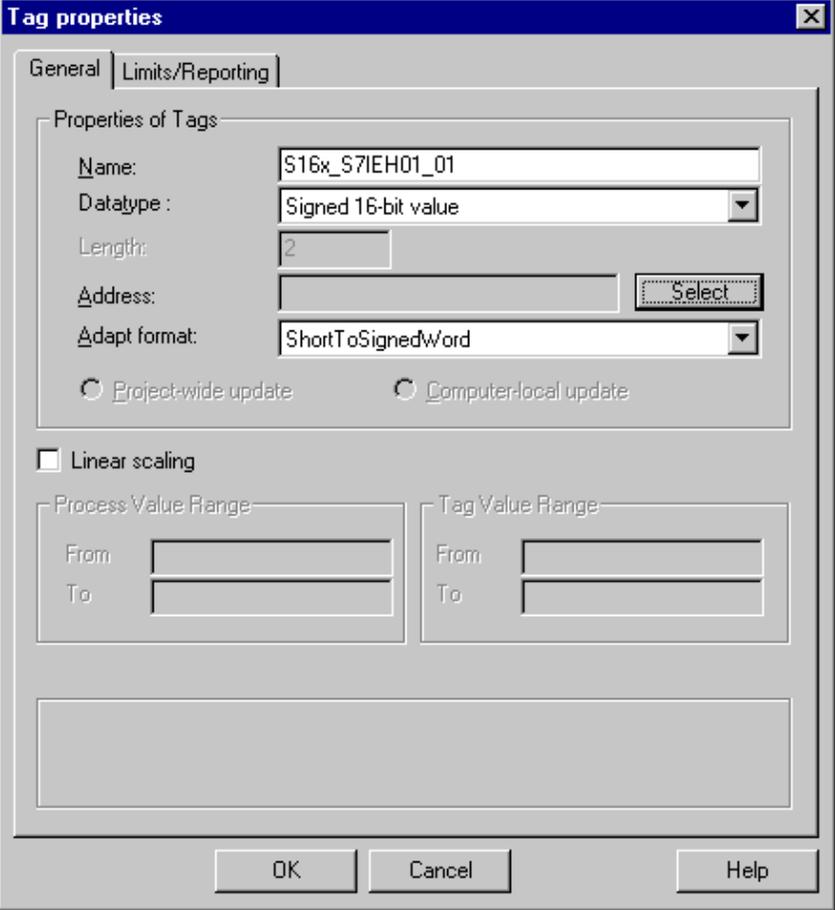
Step	B: Creating the Connection
4	<p>The properties dialog box of the connection will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered. In this sample, this is <i>S7_I EH_01</i>.</p> <p>Click on the <i>Properties</i> button to define the connection properties.</p> 

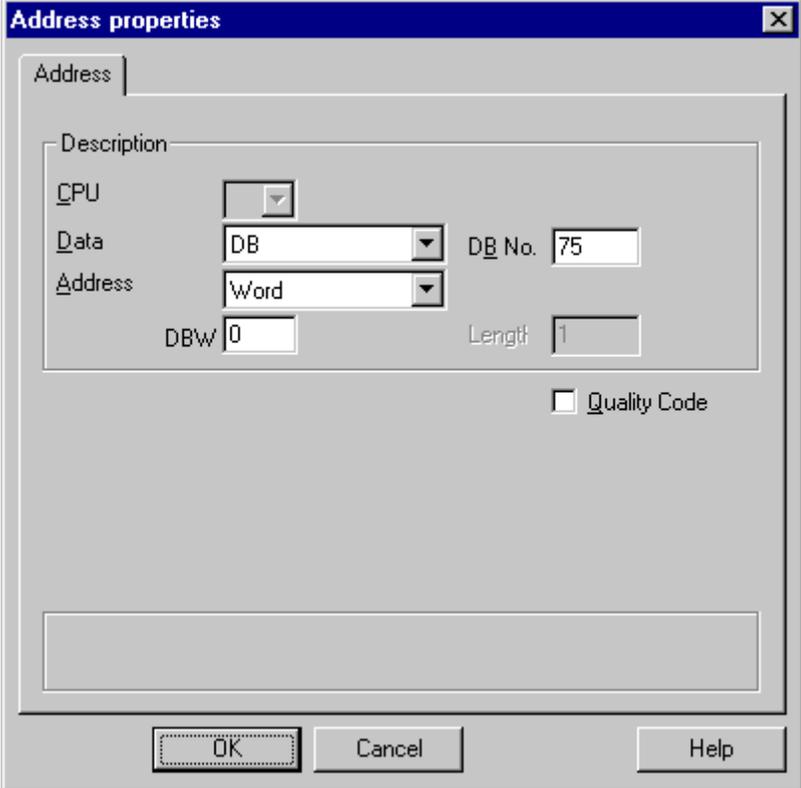
Step	B: Creating the Connection
5	<p>The dialog box Connection Properties will be displayed.</p> <p>In the <i>Ethernet Address</i> field, enter the address that has been set for the communication processor CP 443-1. In this sample, this is the Ethernet Address 08.00.06.01.00.00.</p> <p>Additionally, the Rack Number and Slot Number of the CPU module to be accessed must be entered. Make sure that the values of the CPU module are entered here and not the values of the communication processor.</p> <p>Close the dialog box by clicking on <i>OK</i>. Also close the <i>Connection Properties</i> dialog box by clicking on <i>OK</i>.</p> 

Step	B: Creating the Connection
6	<p>Setting the system parameters of the Industrial Ethernet channel unit.</p> <p>These settings are made in the <i>System Parameters</i> dialog box, which is accessed via a  on the <i>Industrial Ethernet</i> entry and then selecting <i>System Parameters</i> from the pop-up menu.</p> <p>In the <i>Channel</i> tab, various settings pertaining to the communication and monitoring a communication can be made. These settings will apply to all channel units of the communication driver.</p> 

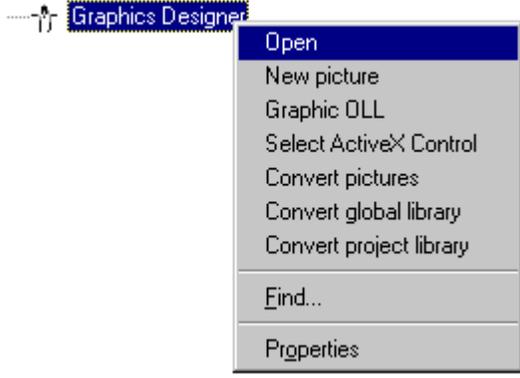
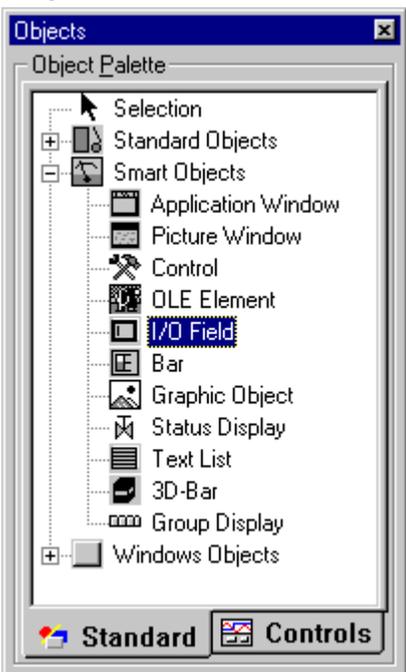
Step	B: Creating the Connection
7	<p>In the Device tab, the access point used by the connection to access the PLC is specified.</p> <p>By default, the access point <i>CP_H1_1</i>: is set. Previously, the communication processor <i>CP 1413</i> has been assigned to the access point <i>CP_H1_1</i>: in the program <i>Setting the PG/PC Interface</i>. If you want the access point to be set automatically, make sure that the correct one is being used, especially if multiple communication processors are used.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

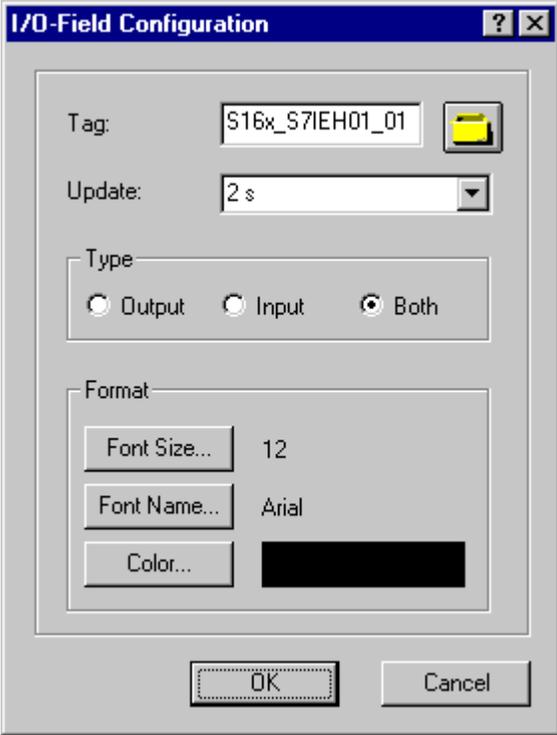
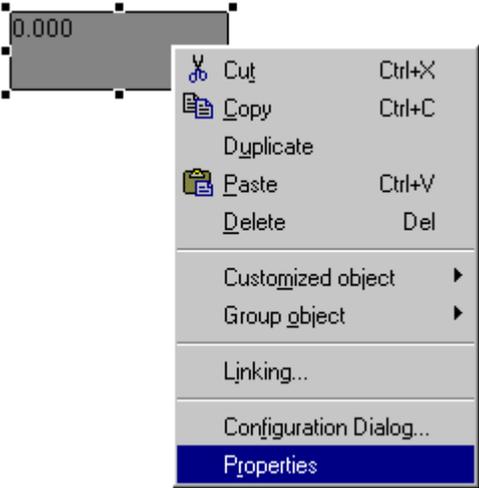
C: Creating the WinCC Tags

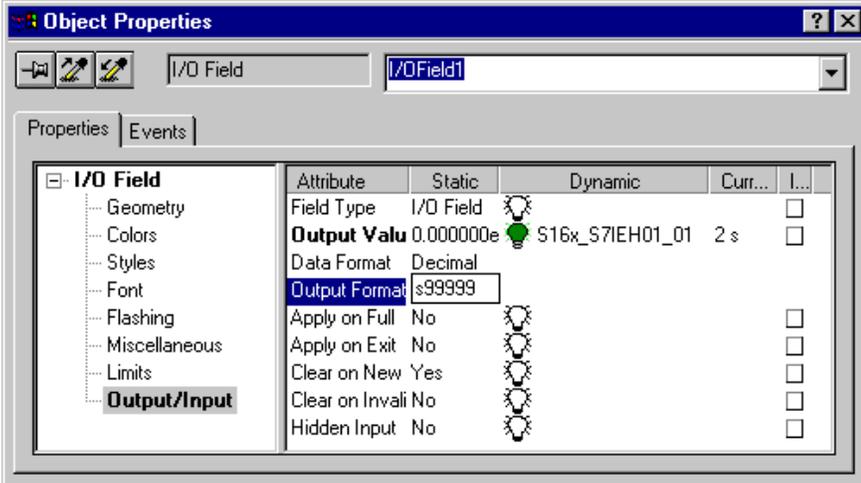
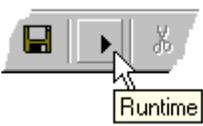
Step	C: Creating the WinCC Tags
1	<p>Creation of the WinCC tags required for the sample. This is done via a  on the newly created connection <i>S7_I EH_01</i> and then selecting <i>New Tag</i> from the pop-up menu.</p> 
2	<p>The properties dialog box of the tag will be displayed. In the sample, the <i>Name</i> of the first tag is <i>S16x_S7IEH01_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type. Click on the <i>Select</i> button to set the <i>Address</i> of the new tag.</p> 

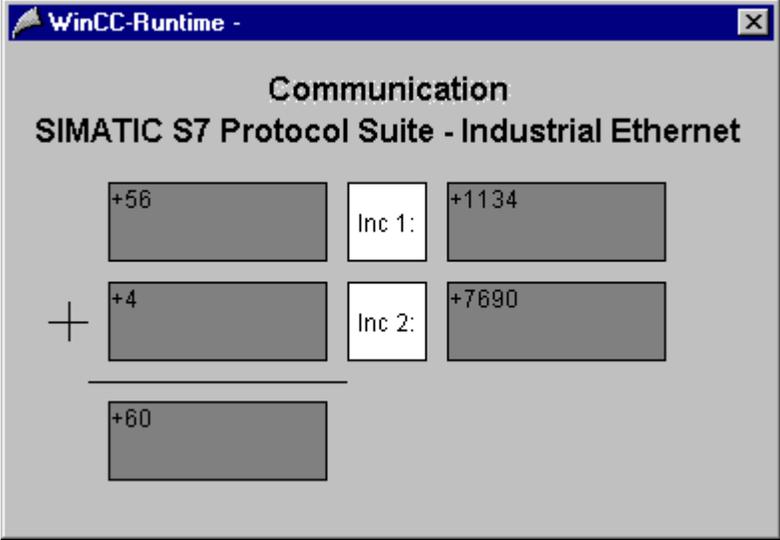
Step	C: Creating the WinCC Tags																		
3	<p>The dialog box Address Properties will be displayed.</p> <p>Set <i>DB</i> as the <i>Data Range</i> and the value <i>75</i> as the <i>DB No.</i>. Set <i>Word</i> in the Address field and the value <i>0</i> in the <i>DBW</i> field. Close the dialog box by clicking on <i>OK</i>. The properties dialog box of the tag is also closed by clicking on <i>OK</i>.</p> <p>The just created WinCC tag is addressed in the range of the DB75, where the first of the two values to be added is located.</p> 																		
4	<p>Creation of the remaining WinCC tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S7IEH01_01</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IEH01_02</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IEH01_03</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IEH01_04</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IEH01_05</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> </tbody> </table>	Name	Type	Parameters	 S16x_S7IEH01_01	Signed 16-bit value	DB75,DW0	 S16x_S7IEH01_02	Signed 16-bit value	DB75,DW0	 S16x_S7IEH01_03	Signed 16-bit value	DB75,DW0	 S16x_S7IEH01_04	Signed 16-bit value	DB75,DW0	 S16x_S7IEH01_05	Signed 16-bit value	DB75,DW0
Name	Type	Parameters																	
 S16x_S7IEH01_01	Signed 16-bit value	DB75,DW0																	
 S16x_S7IEH01_02	Signed 16-bit value	DB75,DW0																	
 S16x_S7IEH01_03	Signed 16-bit value	DB75,DW0																	
 S16x_S7IEH01_04	Signed 16-bit value	DB75,DW0																	
 S16x_S7IEH01_05	Signed 16-bit value	DB75,DW0																	

D: Creating the WinCC Screen

Step	D: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the Graphics Designer editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	D: Creating the WinCC Screen
3	<p>After placing the I/O Field on the screen, its Configuration dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S7IEH01_01</i> via the button displayed below.</p>  <p>Leave the Update of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on OK.</p>  <p>The dialog box titled "I/O-Field Configuration" has the following settings: Tag: S16x_S7IEH01_01 (with a folder icon button), Update: 2 s, Type: Both (selected), Format: Font Size: 12, Font Name: Arial, Color: Black. Buttons for Font Size, Font Name, and Color are visible. OK and Cancel buttons are at the bottom.</p>
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p>  <p>The image shows a context menu over a grey rectangular I/O field containing the text "0.000". The menu items are: Cut (Ctrl+X), Copy (Ctrl+C), Duplicate, Paste (Ctrl+V), Delete (Del), Customized object, Group object, Linking..., Configuration Dialog..., and Properties (highlighted in blue).</p>

Step	D: Creating the WinCC Screen
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p>  <p>The screenshot shows the 'Object Properties' dialog box with the 'I/O Field' selected. The 'Output Format' is set to 's99999'. The 'Output Value' is 0.000000e. The 'Data Format' is 'Decimal'. The 'Apply on Full' and 'Apply on Exit' options are 'No'. The 'Clear on New' option is 'Yes'. The 'Clear on Invalid' and 'Hidden Input' options are 'No'.</p>
6	<p>Creation of four additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_S7IEH_01.pdl</i>. The screen can be switched directly to runtime from the Graphics Designer via the button displayed below.</p>  <p>The screenshot shows a button labeled 'Runtime' with a lightbulb icon, which is used to switch the screen to runtime mode.</p>

Step	D: Creating the WinCC Screen
	<p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the I/O fields. They can be changed by entering values in the individual <i>I/O Fields</i>.</p>  <p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p> 

2.5 Diagnosis of the Communication Connection

The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S7_IEH* and the SIMATIC S7 station.

A diagnosis of the sample according to the following description makes only sense, if the checks listed below have been completed successfully.

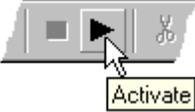
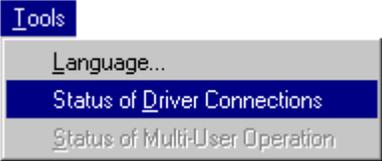
Startup of the Communication Processor CP 1413

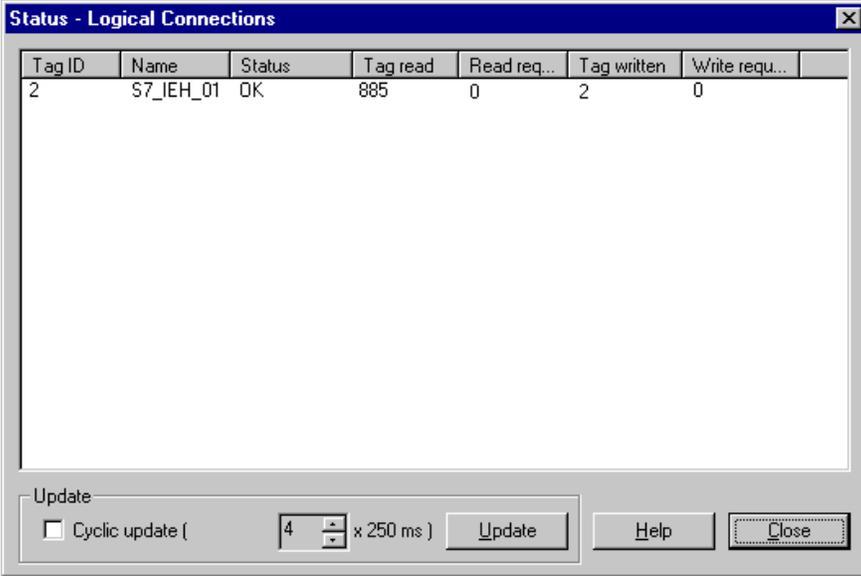
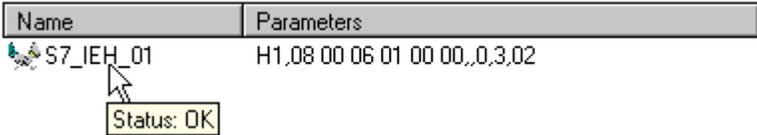
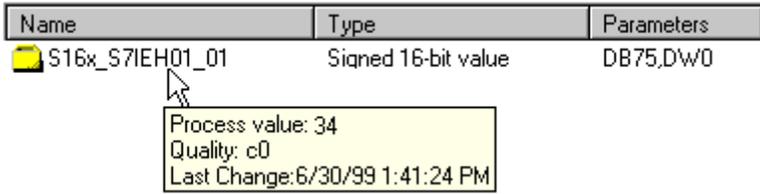
- E: Testing the Communication Processor

Creation of the STEP7 Project *S7_IEH*

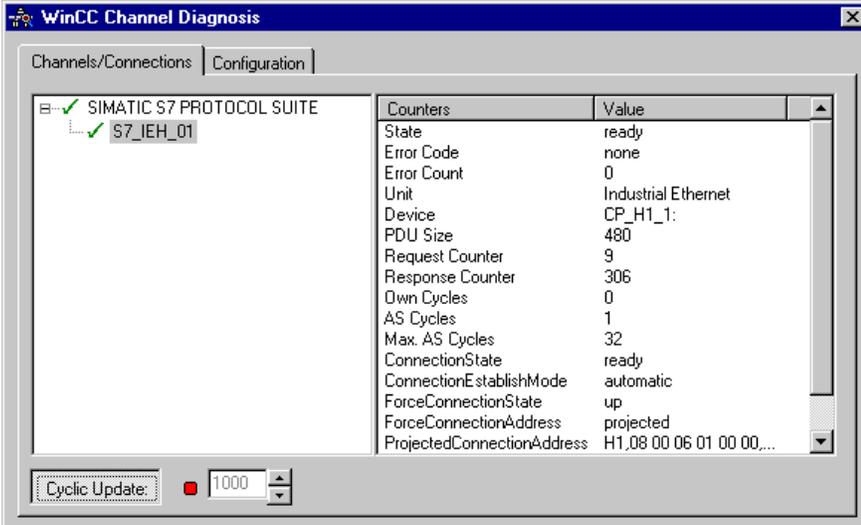
- F: Testing the Hardware Configuration
- I: Testing the STEP7 Program

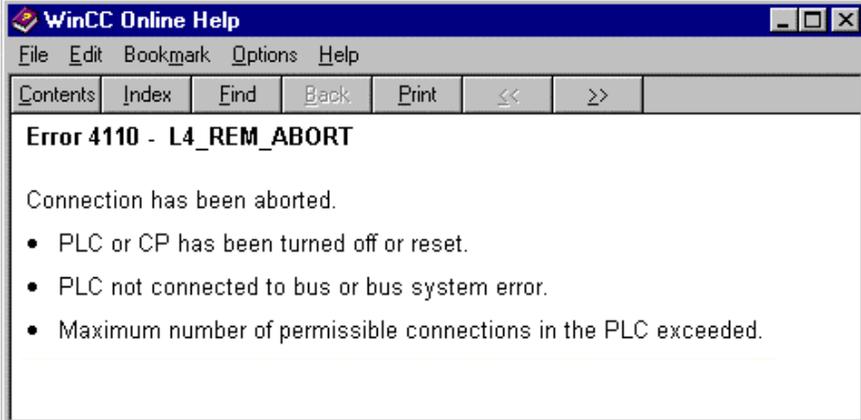
WinCC Explorer

Step	WinCC Explorer
1	<p>Diagnosis of the communication connection in the <i>WinCC Explorer</i>.</p> <p>Switch the project <i>WinCC_S7_IEH</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below.</p>  <p>The created WinCC screen <i>com_3_S7IEH_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 

Step	WinCC Explorer
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>S7_I EH_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p> 
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>.</p> <p>The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p>  <p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> 

Channel Diagnosis

Step	Channel Diagnosis
1	<p>Diagnosis of the communication connection via the program <i>WinCC Channel Diagnosis</i>.</p> <p>Start this program via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Channel Diagnosis</i>.</p>  <p>Channel Diagnosis</p>
2	<p>The program <i>WinCC Channel Diagnosis</i> will be displayed.</p> <p>The <i>Channels/Connections</i> tab displays detailed information about the status of each configured connection. By default, the display is updated every second. The update cycle can be changed in the input field located at the bottom.</p> 
3	<p>If a connection error is detected, the <i>Error Code</i> line in the right window half will display a value specifying the error cause. Detailed information about this error code is displayed by  on the <i>Error Code</i> entry and then selecting <i>Help</i> from the pop-up menu.</p> 

Step	Channel Diagnosis
4	<p>This opens the Online Help to WinCC containing a description of the corresponding error code. Additionally, possible error causes are also listed.</p>  <p>The screenshot shows a window titled "WinCC Online Help" with a menu bar (File, Edit, Bookmark, Options, Help) and a toolbar (Contents, Index, Find, Back, Print, <<, >>). The main content area displays the following text:</p> <p>Error 4110 - L4_REM_ABORT</p> <p>Connection has been aborted.</p> <ul style="list-style-type: none">• PLC or CP has been turned off or reset.• PLC not connected to bus or bus system error.• Maximum number of permissible connections in the PLC exceeded.

3 Communication to the SIMATIC S7 via Industrial Ethernet (Softnet)

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder *C:\Communication_Manual*. You have the option to copy the following components to the hard drive:



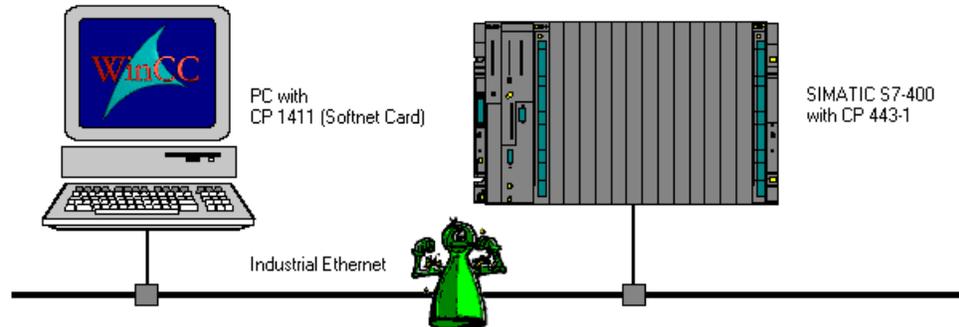
The STEP7 project we will create.



The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a SIMATIC S7 and WinCC. The communication connection is realized via the Industrial Ethernet. The CP 1411 communication processor used in the computer has no separate CPU, the computer's CPU handles all communication tasks. Such a configuration is generally referred to as Softnet.

Overview of the Structure of the Sample



On the computer side, the connection to the *Industrial Ethernet* network is established via the communication processor *CP 1411*. To install this communication processor in the computer, the driver *IE SOFTNET-S7 BASIC*, located on the *SIMATIC NET* CD-ROM, is needed.

In the WinCC project, the communication driver *SIMATIC S7 Protocol Suite* must be installed. Via its channel unit *Industrial Ethernet*, the connection to the *SIMATIC S7* is configured.

The PLC is equipped with a *CPU 416-1* module. The connection to the network is established via the communication processor *CP 443-1*. For the configuration of this communication processor with the STEP7 software, the option package *NCM S7 Industrial Ethernet* is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 1411
- Creation of the STEP7 Project S7_IES
- Creation of the WinCC Project WinCC_S7_IES
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>IE SOFTNET S7 BASIC</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 1411</i> .
Windows NT	Windows NT installation software for the installation of the communication processor <i>CP 1411</i> .
STEP7	STEP7 software with option package <i>NCM for Industrial Ethernet</i> for the creation of the STEP7 project.
WinCC	WinCC with the communication driver <i>SIMATIC S7 Protocol Suite</i> for the creation of the WinCC project.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 1411</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>UR1</i>
Power Supply	Power supply <i>PS 407 10A</i> in slot 1 and 2.
CPU Module	CPU module <i>CPU 416-1</i> in slot 3.
Communication Processor	Communication processor <i>CP 443-1</i> in slot 4.

3.1 Startup of the Communication Processor CP 1411

The following description details the configuration steps necessary to successfully start up the communication processor CP 1411. The communication is handled by the SIEMENS Industrial Ethernet protocol.

Overview of the Configuration Steps

The following lists the configuration steps necessary to start up the communication processor *CP 1411*:

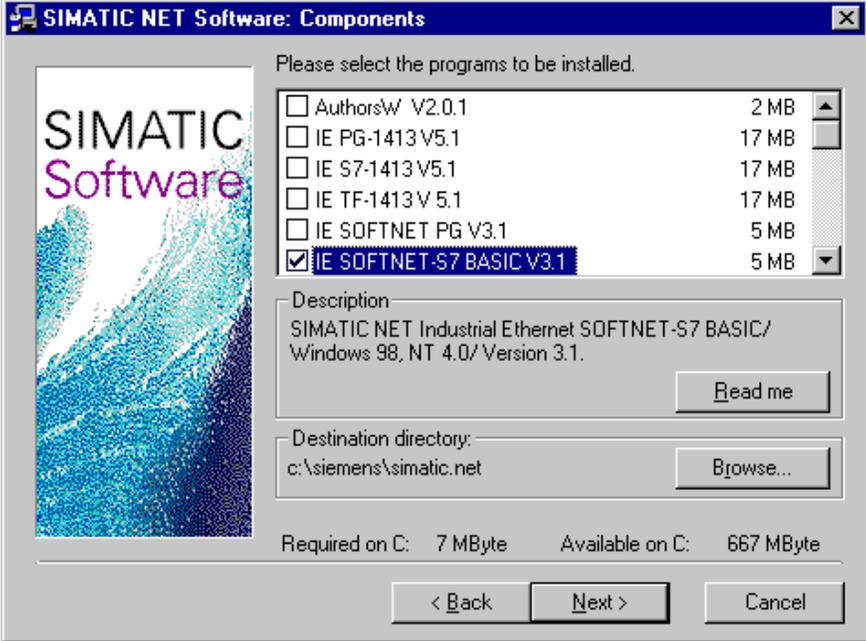
- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Installing the Communication Processor
- D: Installing the Communication Protocol
- E: Configuring the Bindings
- F: Creating an Access Point
- G: Testing the Communication Processor

A: Mounting the Communication Processor in the Computer

Step	A: Mounting the Communication Processor in the Computer
1	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>The communication card <i>CP 1411</i> requires a free ISA slot in the computer. After the installation of the <i>CP 1411</i>, close the computer's case and start the computer.</p>

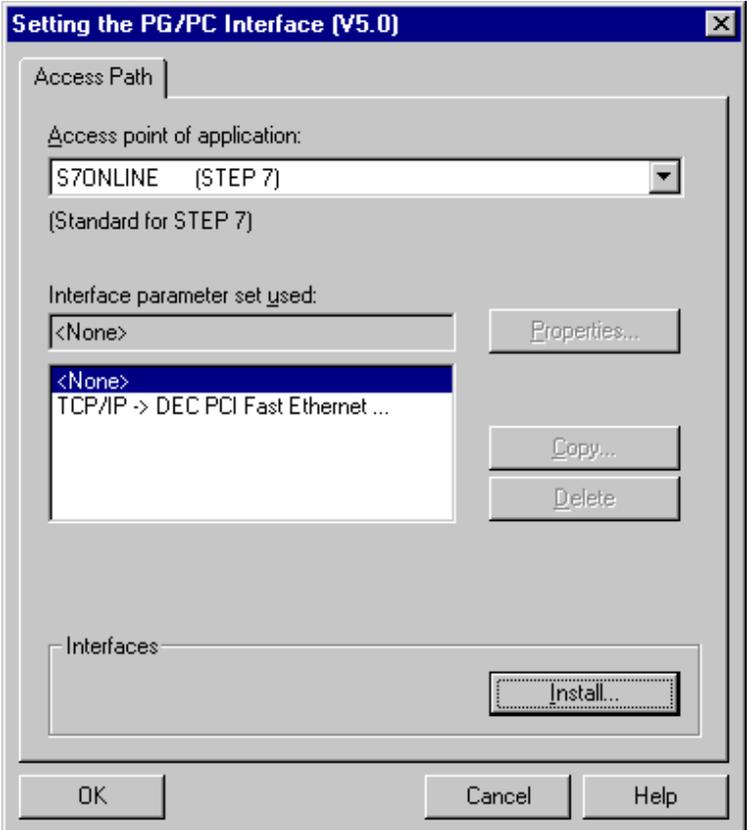
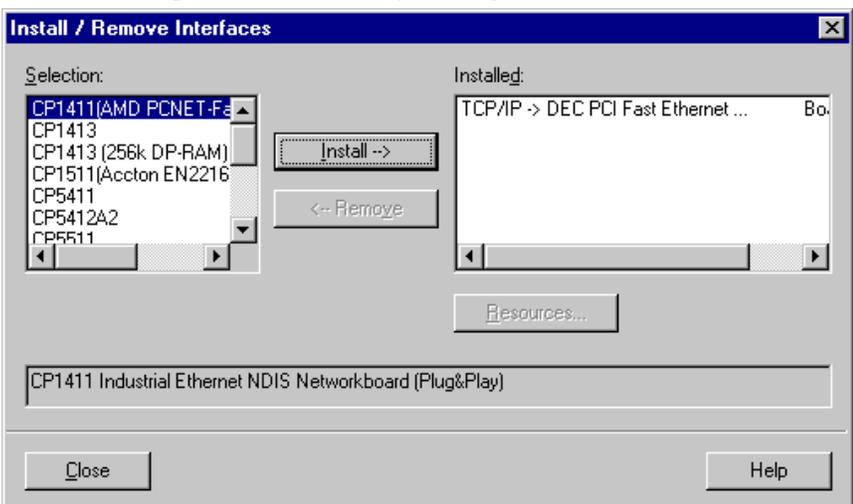
B: Installing the Communication Driver

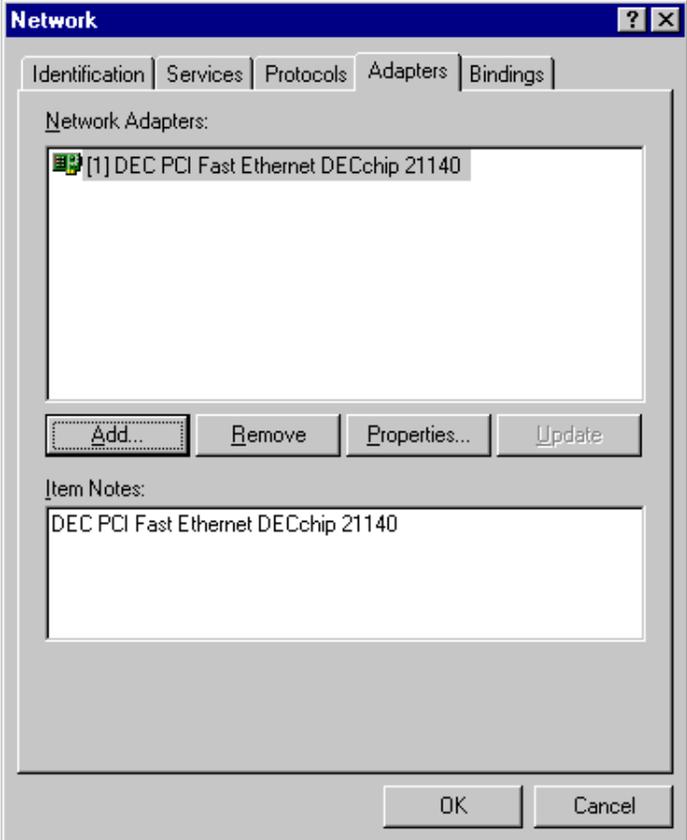
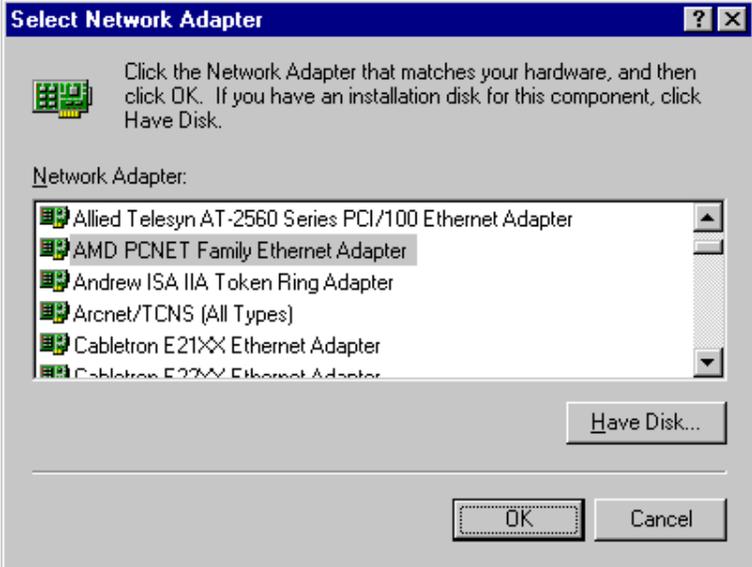
Step	B: Installing the Communication Driver
1	<p>Install the communication driver <i>IE SOFTNET S7 BASIC</i> from the <i>SIMATIC NET</i> CD-ROM.</p> <p>After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="text-align: center;">  </div>

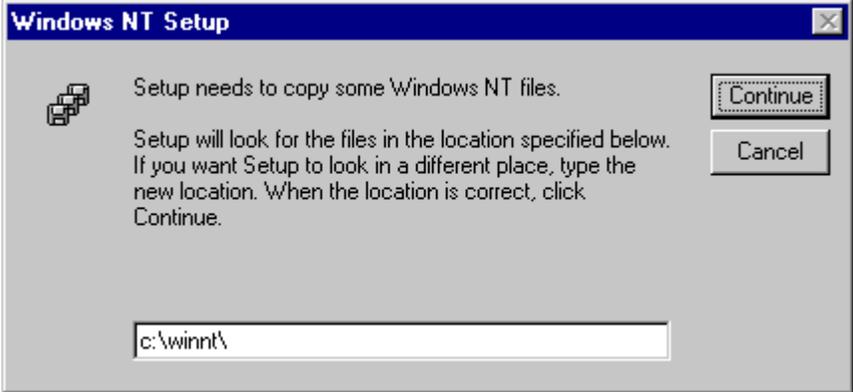
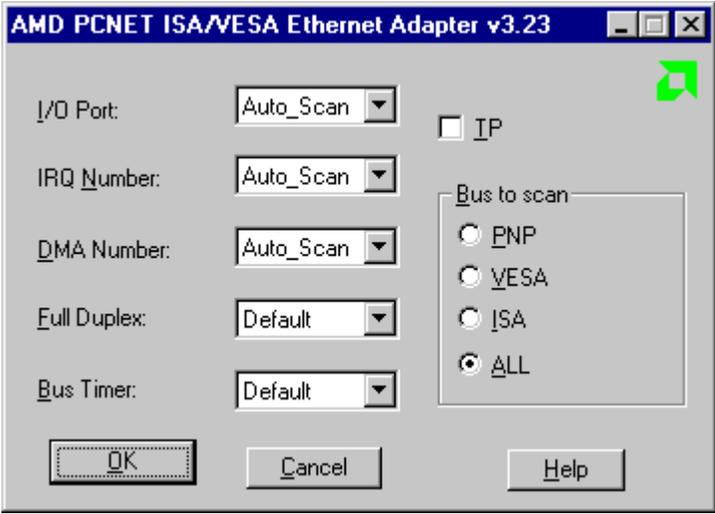
Step	B: Installing the Communication Driver
	<p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>IE SOFTNET-S7 BASIC</i> to be installed must be selected. Finish the installation.</p> 

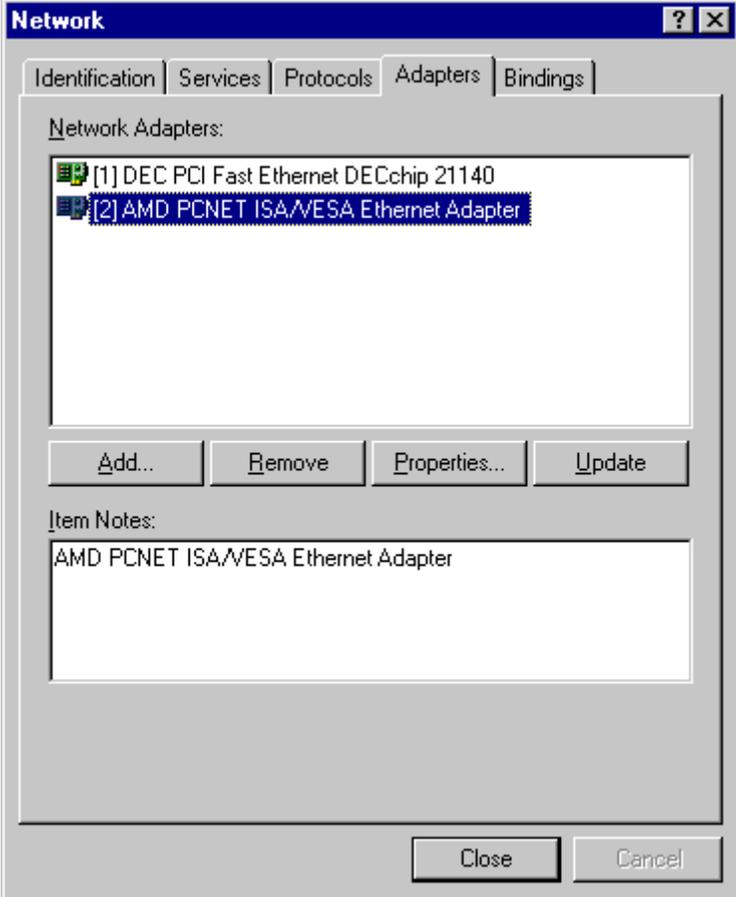
C: Installing the Communication Processor

Step	C: Installing the Communication Processor
1	<p>Install the communication processor <i>CP 1411</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>

Step	C: Installing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed. The dialog box for installing a new interface is opened via the <i>Install</i> button.</p> 
3	<p>The dialog box <i>Install/Remove Modules</i> will be displayed. The <i>Selection</i> field lists all interfaces that can be installed. Among them will be the entry <i>CP 1411</i>, if the communication driver has been installed previously as outlined in step B. Select the entry <i>CP 1411 (AMD PCNET-Family)</i>. The installation of the communication processor is started by clicking on the <i>Install -></i> button.</p> 

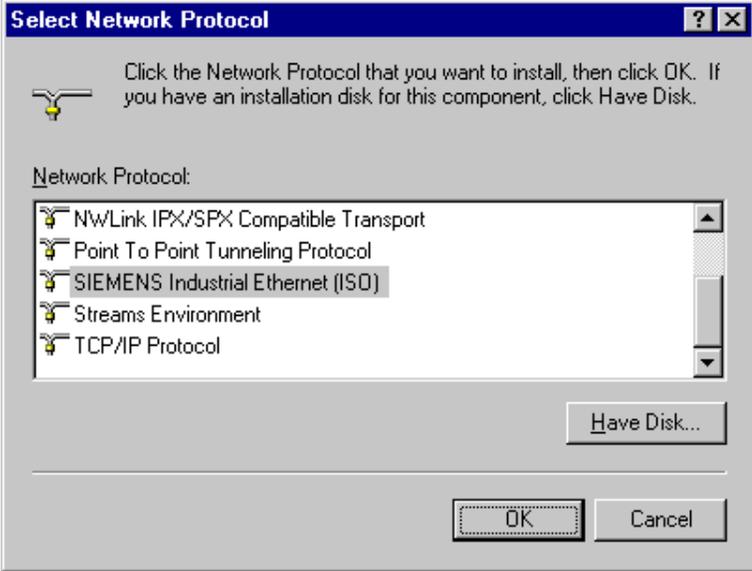
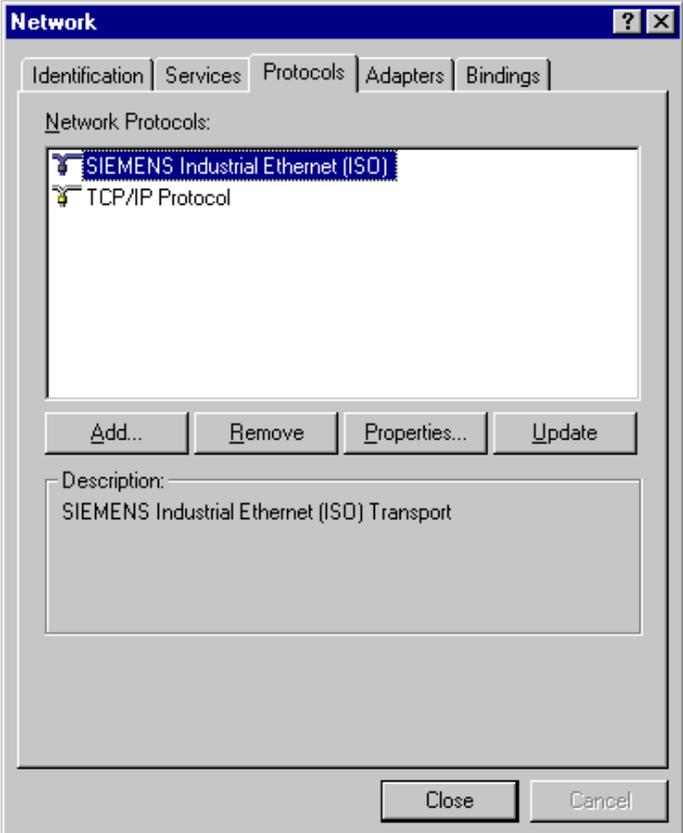
Step	C: Installing the Communication Processor
4	<p>This opens the <i>Network</i> dialog box. In the <i>Adapters</i> tab, install the communication card <i>CP 1411</i> by clicking on the <i>Add</i> button.</p>  <p>The screenshot shows a dialog box titled "Network" with tabs for Identification, Services, Protocols, Adapters, and Bindings. The "Adapters" tab is active, showing a list of "Network Adapters" with one entry: "[1] DEC PCI Fast Ethernet DECchip 21140". Below the list are buttons for "Add...", "Remove", "Properties...", and "Update". The "Add..." button is highlighted with a dashed border. Below the list is an "Item Notes:" section with the text "DEC PCI Fast Ethernet DECchip 21140". At the bottom are "OK" and "Cancel" buttons.</p>
5	<p>The <i>Select Network Adapter</i> dialog box will be displayed. From the <i>Network Adapter</i> list, select the entry <i>AMD PCNET-Family Ethernet-Adapter</i>. Close the <i>Select Network Adapter</i> dialog box by clicking on <i>OK</i>.</p>  <p>The screenshot shows a dialog box titled "Select Network Adapter" with a question mark icon. It contains a small icon of a network card and the text: "Click the Network Adapter that matches your hardware, and then click OK. If you have an installation disk for this component, click Have Disk." Below this is a list of "Network Adapter" entries: "Allied Telesyn AT-2560 Series PCI/100 Ethernet Adapter", "AMD PCNET Family Ethernet Adapter" (which is highlighted), "Andrew ISA IIA Token Ring Adapter", "Arcnet/TCNS (All Types)", "Cabletron E21XX Ethernet Adapter", and "Cabletron E2XX Ethernet Adapter". There is a "Have Disk..." button and "OK" and "Cancel" buttons at the bottom.</p>

Step	C: Installing the Communication Processor
6	<p>The <i>Windows NT Setup</i> dialog box will be displayed. This dialog box informs you that some Windows NT files must be copied for the installation of the <i>CP 1411</i>.</p> <p>In the input field at the bottom, specify the path in which the appropriate files can be found. Normally, this is the path to the CD-ROM drive (if the files are copied from a Windows NT Installation CD-ROM).</p> <p>Conclude the <i>Windows NT Setup</i> by clicking on the <i>Continue</i> button.</p> 
7	<p>The setup dialog box for the <i>CP 1411</i> will be displayed.</p> <p>Keep the default settings for the various options. Close the setup dialog box by clicking on <i>OK</i>.</p> 

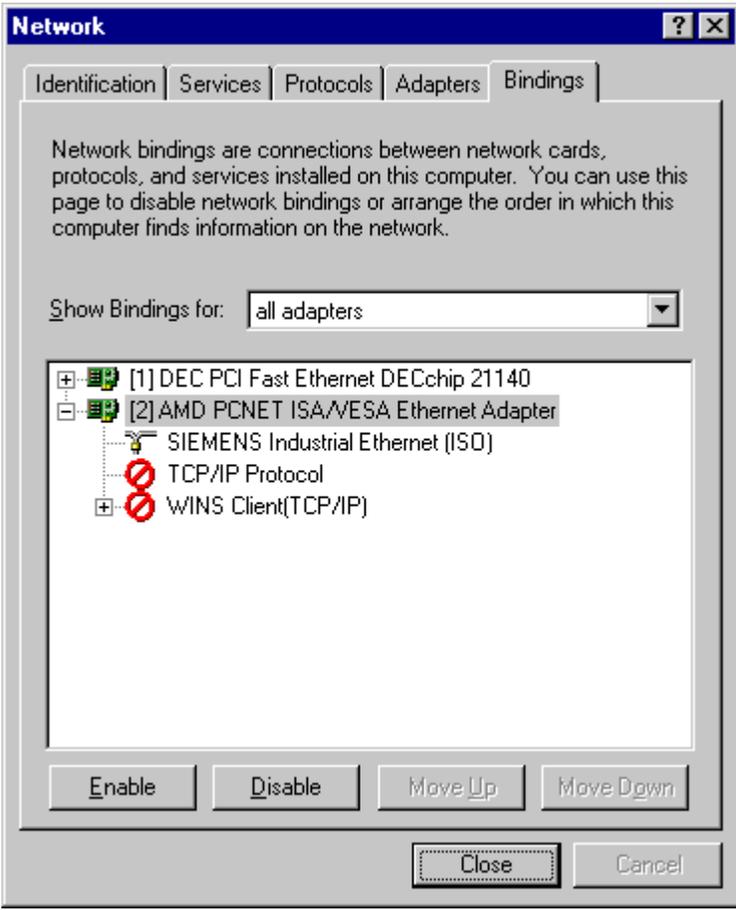
Step	C: Installing the Communication Processor
8	<p>After the installation of the <i>CP 1411</i> is complete, the entry <i>AMD PCNET ISA/VESA Ethernet-Adapter</i> will be displayed in the <i>Network Adapters</i> list of the <i>Adapters</i> tab.</p>  <p>The screenshot shows a window titled "Network" with a tabbed interface. The "Adapters" tab is selected. The "Network Adapters:" list contains two entries: "[1] DEC PCI Fast Ethernet DECchip 21140" and "[2] AMD PCNET ISA/VESA Ethernet Adapter". The second entry is highlighted. Below the list are buttons for "Add...", "Remove", "Properties...", and "Update". The "Item Notes:" field contains the text "AMD PCNET ISA/VESA Ethernet Adapter". At the bottom right are "Close" and "Cancel" buttons.</p>

D: Installing the Communication Protocol

Step	D: Installing the Communication Protocol
1	<p>Installation of the SIEMENS Industrial Ethernet protocol. This is done in the <i>Protocols</i> tab of the <i>Network</i> dialog box via the <i>Add</i> button.</p>  <p>The screenshot shows the 'Network' dialog box with the 'Protocols' tab selected. The 'Network Protocols' list contains one entry: 'TCP/IP Protocol'. Below the list are four buttons: 'Add...', 'Remove', 'Properties...', and 'Update'. Below these buttons is a 'Description:' field containing the text: 'Transport Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.' At the bottom of the dialog box are 'Close' and 'Cancel' buttons.</p>

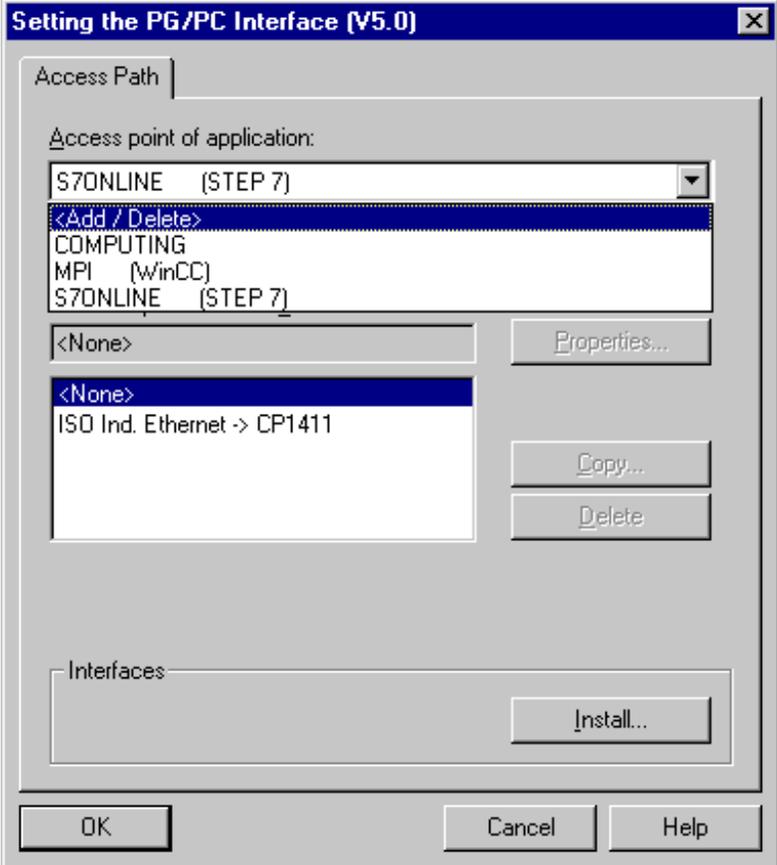
Step	D: Installing the Communication Protocol
2	<p>This opens the <i>Select Network Protocol</i> dialog box.</p> <p>From the <i>Network Protocol</i> list, select the entry <i>SIEMENS Industrial Ethernet (ISO)</i>. Close the <i>Select Network Protocol</i> dialog box by clicking on <i>OK</i>.</p> 
3	<p>After the installation of the <i>SIEMENS Industrial Ethernet</i> protocol is complete, it will be displayed in the <i>Network Protocols</i> field of the <i>Protocols</i> tab.</p> 

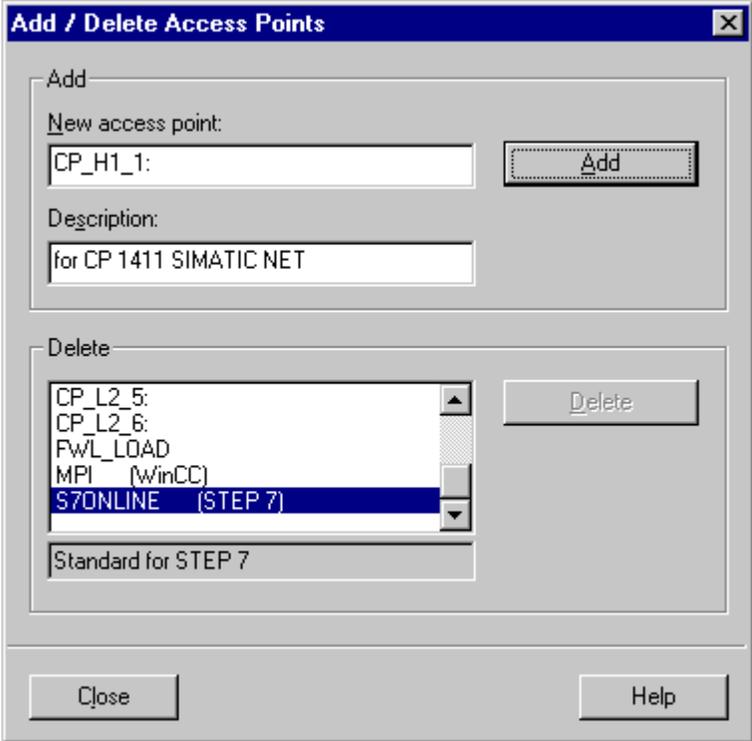
E: Configuring the Bindings

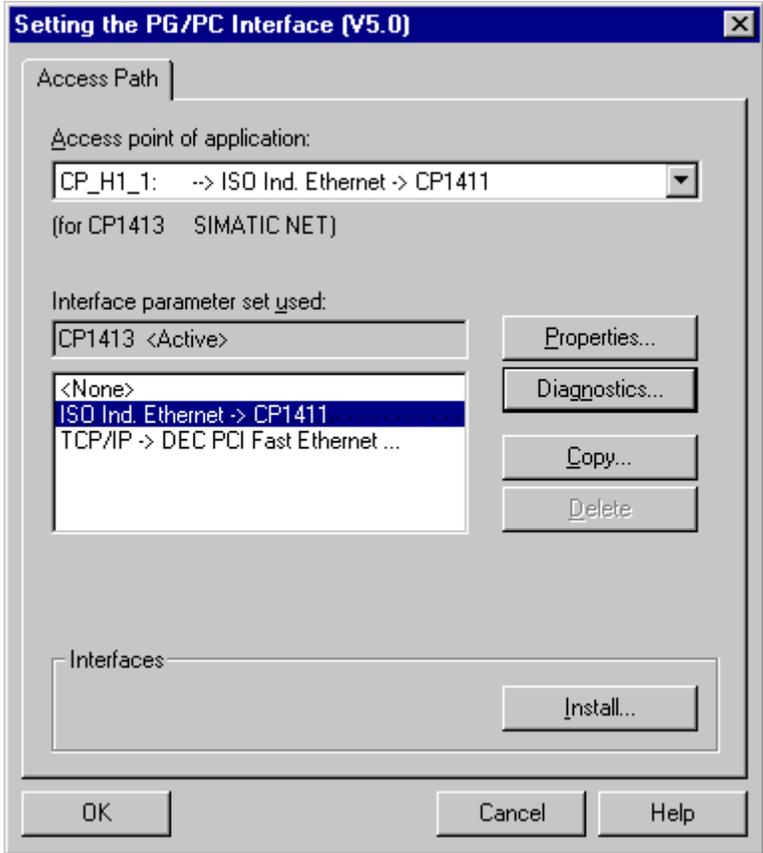
Step	E: Configuring the Bindings
1	<p>The bindings of the communication processor CP 1411 must be configured. This is done in the Bindings tab of the Network dialog box.</p> <p>In the <i>Show Bindings for:</i> field, select the entry <i>all adapters</i>.</p> <p>Select all protocols to be used by the communication processor <i>CP 1411</i>. In this sample, the communication processor only communicates via the <i>SIEMENS Industrial Ethernet (ISO)</i> protocol. For this purpose, all available protocols except for the <i>SIEMENS Industrial Ethernet (ISO)</i> must be disabled for the <i>AMD PCNET-Family Ethernet-Adapter</i> entry.</p> <p>A protocol is disabled via the <i>Disable</i> button. Disabled protocols are marked as follows:</p>  <p>Close the <i>Network</i> dialog box by clicking on the <i>OK</i> button.</p> 

Step	E: Configuring the Bindings
2	<p>The installation and settings made require a restart of the computer. Acknowledge the dialog box displayed by clicking on <i>Yes</i>.</p> 

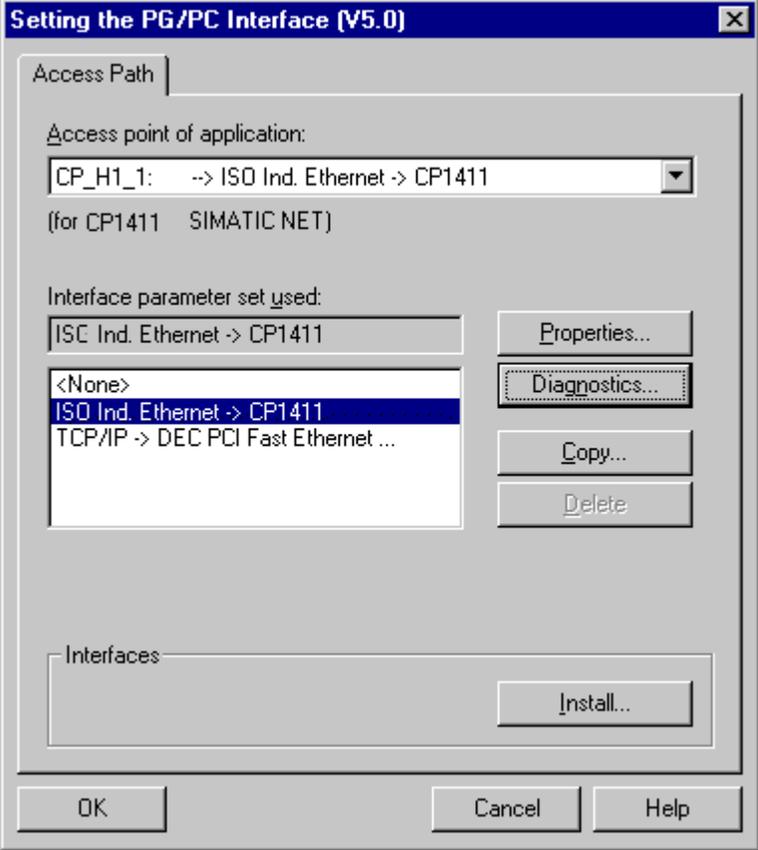
F: Creating an Access Point

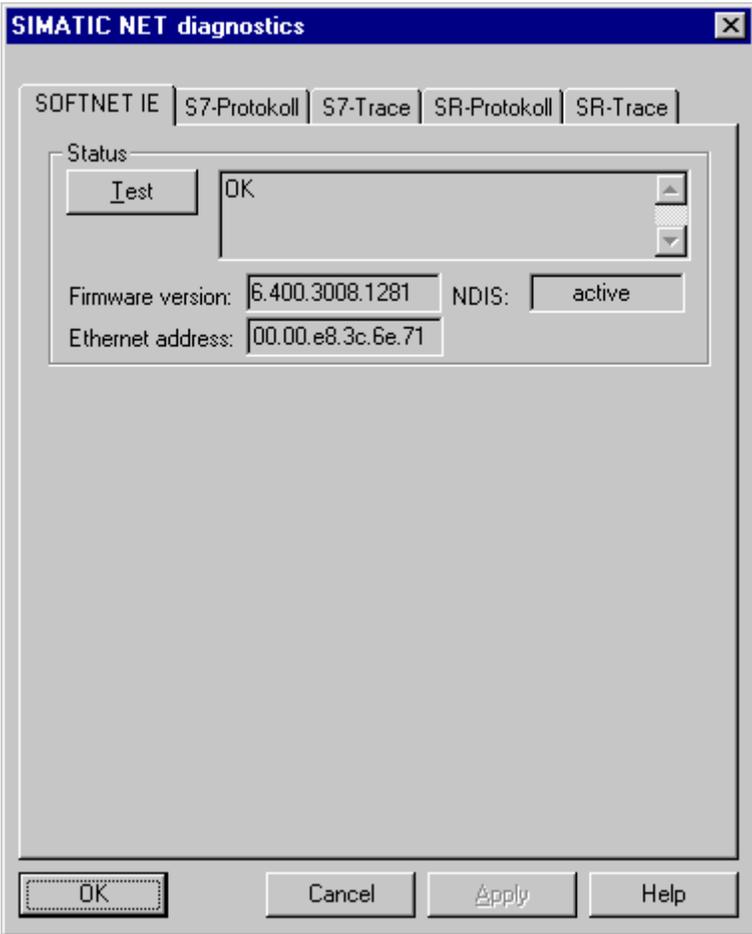
Step	F: Creating an Access Point
1	<p>Creation of an access point for the communication processor <i>CP 1411</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed. The dialog box for adding a new access point is opened via the <i>Add/Delete</i> entry from the <i>Access Point of the Application</i> list-box.</p> 

Step	F: Creating an Access Point
3	<p>The dialog box <i>Add/Delete Access Points</i> will be displayed.</p> <p>In the <i>New Access Point</i> field, enter the name of the new access point. For this sample, the name <i>CP_H1_1:</i> is entered. The access point <i>CP_H1_1:</i> is the default access point used by WinCC for the communication via the <i>Industrial Ethernet</i>. In the <i>Description</i> field, additional information about the access point can be entered.</p> <p>The access point is created via the <i>Add</i> button. The access point will then be displayed in the list of available access points.</p> <p>Exit the dialog box <i>Add/Delete Access Points</i> by clicking on the <i>Close</i> button.</p> 

Step	F: Creating an Access Point
4	<p>In the program <i>Setting the PG/PC Interface</i>, assign the communication processor <i>CP 1411</i> to the new access point.</p> <p>To do so, set the <i>CP-H1_1</i>: entry in the <i>Access Point of the Application</i> field. In the field below, select the entry <i>ISO Ind. Ethernet -> CP1411</i>. This completes the assignment between the access point and the communication processor.</p> <p>Close the program <i>Setting the PG/PC Interface</i> by clicking on the <i>OK</i> button. This concludes the installations and settings required for the operation of the <i>CP 1411</i>.</p> 

G: Testing the Communication Processor

Step	G: Testing the Communication Processor
1	<p>Check the proper installation of the communication processor <i>CP 1411</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface to be checked. In this case, select the entry <i>ISO Ind. Ethernet</i> -> <i>CP 1411</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The check for a proper installation is activated by clicking on the <i>Diagnostics</i> button.</p> 
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>In the <i>SOFTNET IE</i> tab, the diagnosis is started via the <i>Test</i> button. The result of the diagnosis will be displayed immediately following.</p> <p>If the result of the diagnosis is positive (correct installation), the dialog box can be exited with <i>OK</i>.</p>

Step	G: Testing the Communication Processor
	<p>In this case, the program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>. The configuration of the communication to the S7 via the <i>Industrial Ethernet</i> is continued in the following section.</p> <p>However, if the result of the diagnosis is negative (incorrect installation), the error must be localized and corrected. Troubleshooting procedures are described in the section <i>Is the Communication Module in the Computer operational?</i>.</p> 

3.2 Creation of the STEP7 Project S7_IES

The following description details the configuration steps necessary to create and start up the STEP7 project *S7_IES*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to create the STEP7 project *S7_IES*:

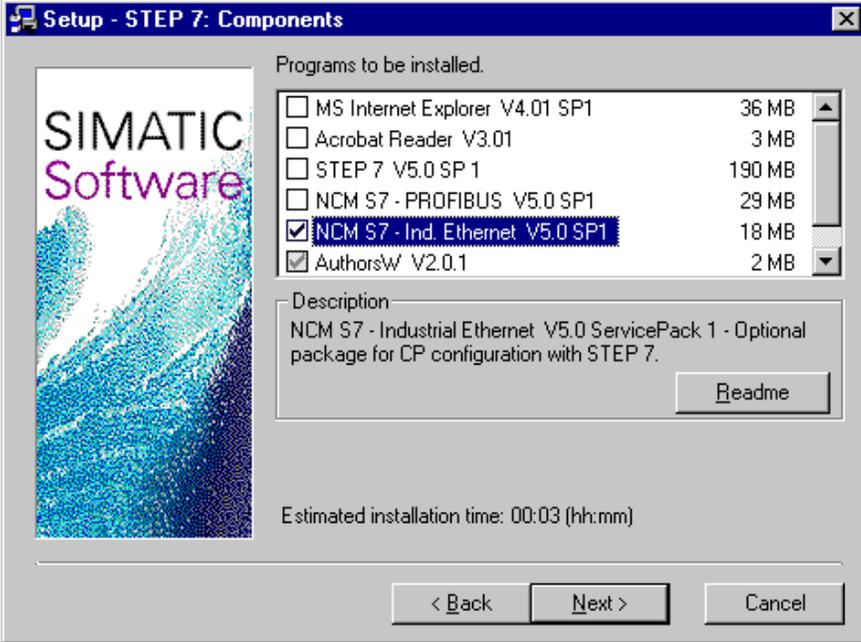
- A: Installing the Hardware
- B: Installing the Option Package
- C: Creating the STEP7 Project
- D: Configuring the Hardware
- E: Loading the Hardware Configuration
- F: Testing the Hardware Configuration
- G: Creating the STEP7 Program
- H: Testing the STEP7 Program

A: Installing the Hardware

Step	A: Installing the Hardware
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 407 10A</i>, the CPU module <i>CPU 416-1</i> and the communication processor <i>CP 443-1</i>.</p> <p>Establishing the connection from the computer to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 1411</i> in the computer to the communication processor <i>CP 443-1</i> in the PLC.</p>

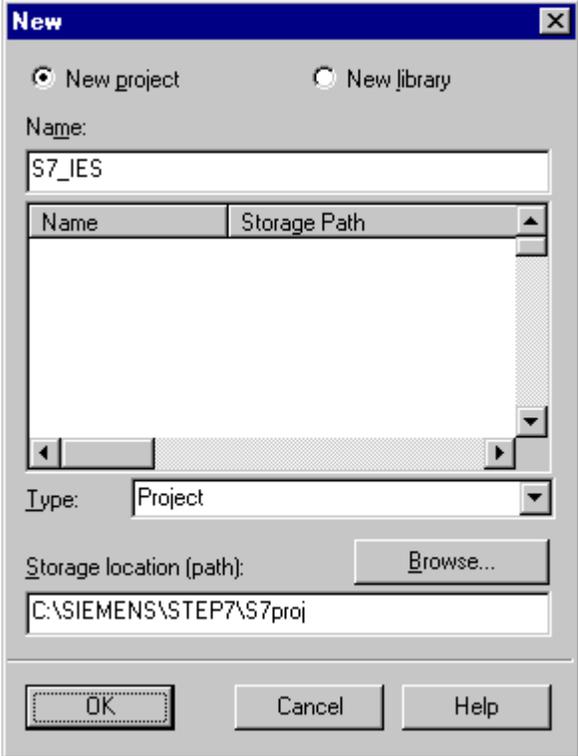
B: Installing the Option Package

Step	B: Installing the Option Package
1	<p>If the option package <i>NCM S7 Industrial Ethernet</i> has not been installed during the installation of <i>STEP7</i>, install it now from the <i>STEP7</i> CD-ROM. This option package is required for the configuration of the communication processor <i>CP 443-1</i> via the <i>STEP7</i> software.</p> <p>After inserting the <i>STEP7</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <div style="text-align: center;">  setup.exe </div>

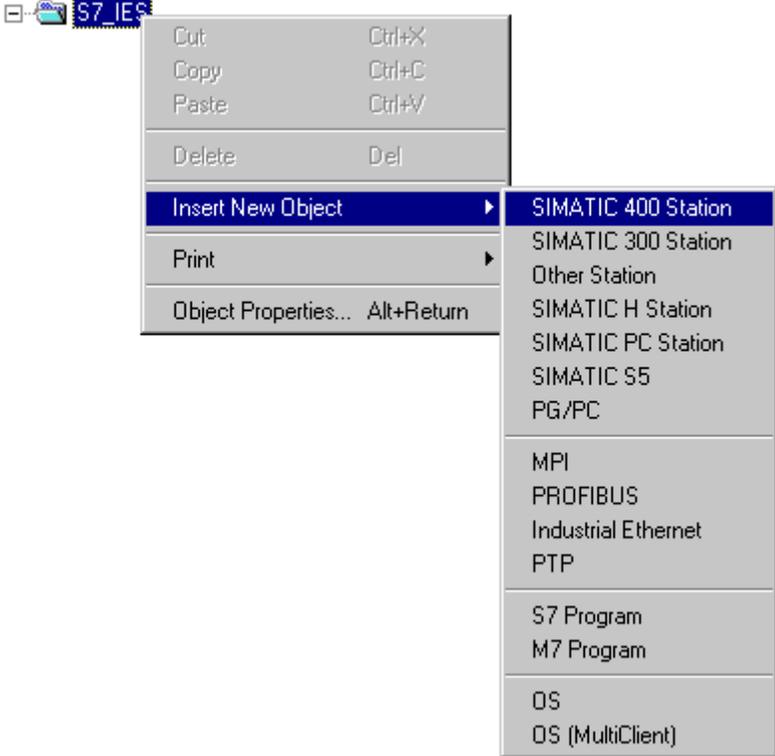
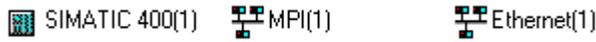
Step	B: Installing the Option Package
2	<p>This starts the installation program.</p> <p>Follow the instructions of the installation program. On the <i>Components</i> page, select the check-box <i>NCM S7 Ind. Ethernet</i>. Finish the installation.</p> 

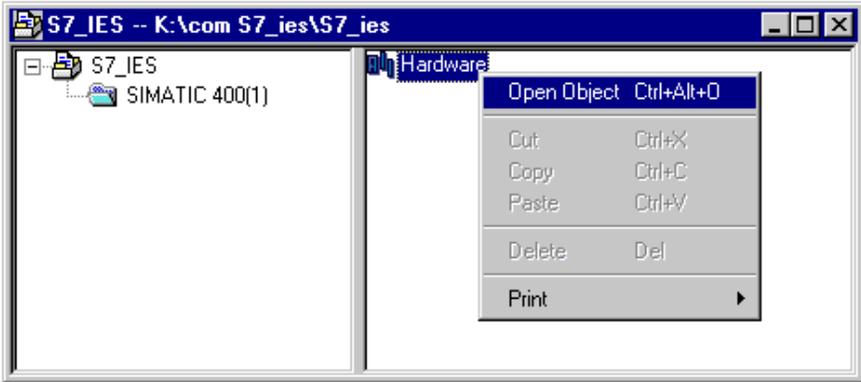
C: Creating the STEP7 Project

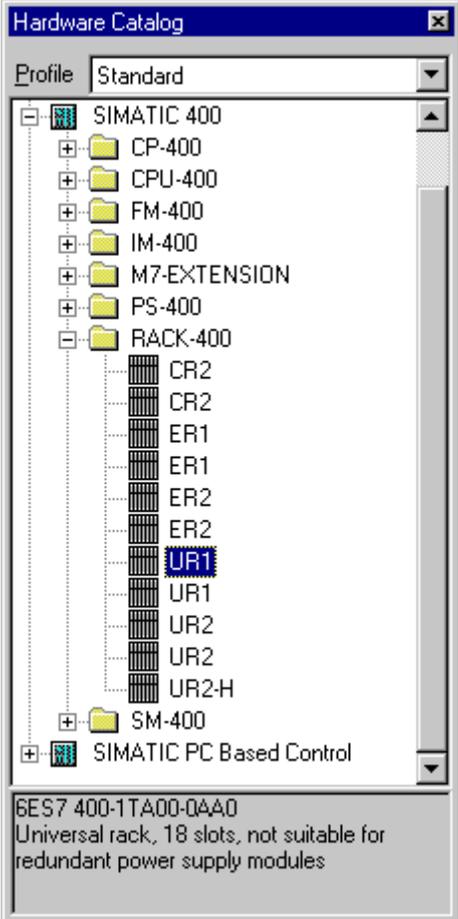
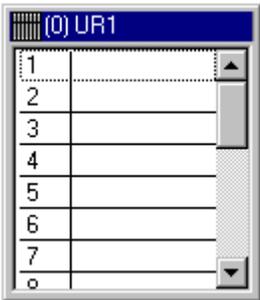
Step	C: Creating the STEP7 Project
1	<p>Create a new STEP7 project in the SIMATIC Manager.</p> <p>It is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC Manager</i>.</p>  <p>SIMATIC Manager</p>
2	<p>This displays the <i>SIMATIC Manager</i>.</p> <p>Via the menu <i>File</i> → <i>New</i>, the dialog box for specifying the parameters of a new STEP7 project will be opened.</p> <p>The <i>New</i> dialog box will be displayed.</p> <p>The radio-button <i>New Project</i> must be selected. In the <i>Name</i> field, the name of the new project to be created is entered. The names of the STEP7 projects created within the framework of this manual all start with <i>S7</i>. They also include a reference to the communication type used. The project of this sample has the name <i>S7_IES</i>.</p>

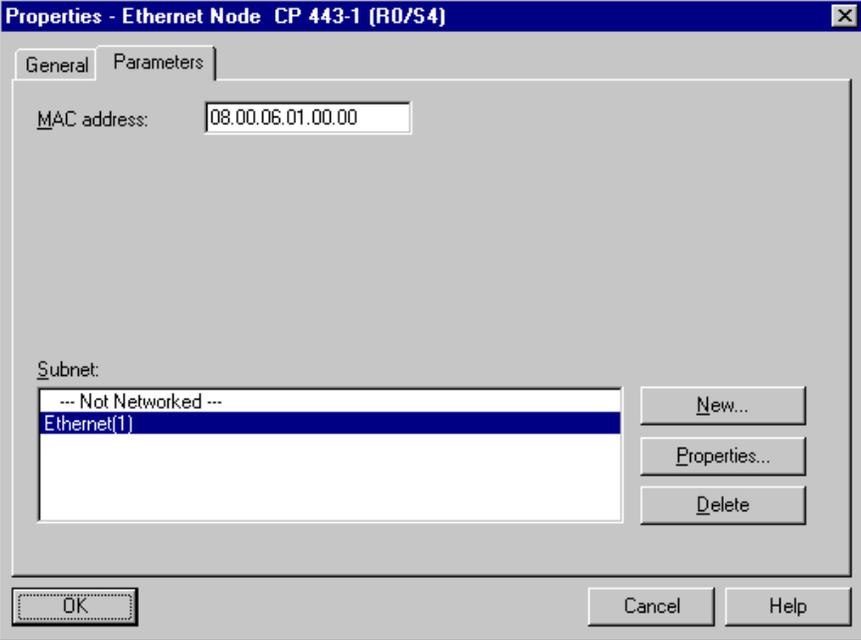
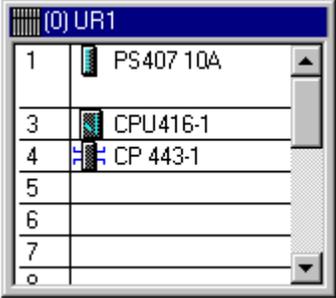
Step	C: Creating the STEP7 Project
	<p>By default, projects are stored in the C:\SIEMENS\STEP7\S7proj folder. This can be changed at any time via the <i>Browse</i> button.</p> <p>The <i>New</i> dialog box is closed via the <i>OK</i> button.</p> 

D: Configuring the Hardware

Step	D: Configuring the Hardware
1	<p>The new project will be displayed in the <i>SIMATIC Manager</i>.</p> <p>The hardware for this project must be configured. Two components are needed: One <i>SIMATIC 400-Station</i> and for its networking an <i>Industrial Ethernet</i>.</p> <p>These components are added to the <i>SIMATIC Manager</i> via a  on the project name <i>S7_IES</i> and then selecting <i>Insert New Object</i> → <i>SIMATIC 400-Station</i> and <i>Insert New Object</i> → <i>Industrial Ethernet</i> from the pop-up menu.</p> 
2	<p>The just added components will be displayed in the right window of the <i>SIMATIC Manager</i>.</p> 

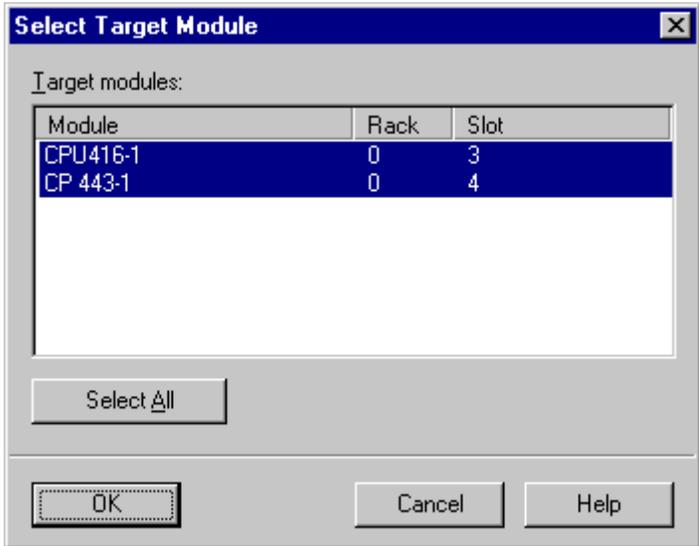
Step	D: Configuring the Hardware
	<p>By  on the component <i>SIMATIC 400(1)</i> in the right window, the point <i>Hardware</i> will be displayed. By  on the point <i>Hardware</i> or  on it and then selecting <i>Open Object</i> from the pop-up menu, the program <i>HW Config</i> will be started.</p> 
3	<p>The program <i>HW Config</i> will be displayed.</p> <p>This program is used to exactly define the hardware used in the PLC and to configure their properties.</p>  <p>HW Konfig</p>
4	<p>By clicking on the toolbar button of the program <i>HW Config</i> displayed below, the <i>Hardware Catalog</i> is opened. This catalog is used to select the required hardware components.</p>  <p>Catalog</p>

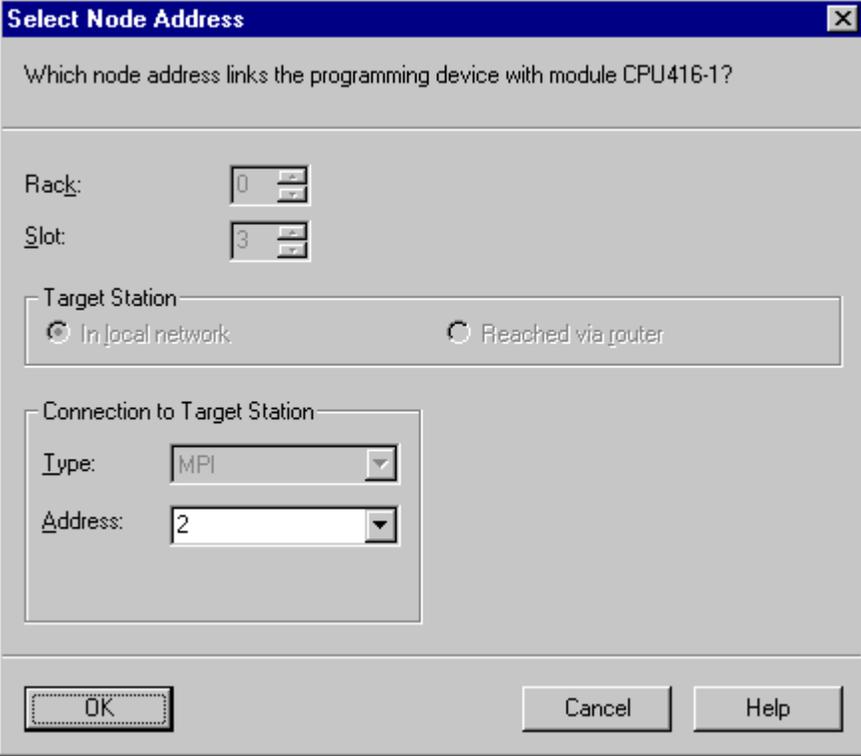
Step	D: Configuring the Hardware
5	<p>The <i>Hardware Catalog</i> will be displayed.</p> <p>The first component selected is the rack. On this rack, all other components will be installed. The rack is inserted into the project via a  or by Dragging Dropping. In this sample, the rack type UR1 is used.</p> 
6	<p>The program <i>HW Config</i> will display the currently still empty rack. It received the Rack Number 0. During the configuration of the connection in the WinCC project, the Rack Number is one of the parameters that must be set.</p> 
7	<p>Arrange the other hardware components in the rack. This is done by Dragging Dropping the desired components from the <i>Hardware Catalog</i> to the corresponding slot in the rack.</p>

Step	D: Configuring the Hardware
	<p>This sample uses the power supply PS 407 10A. It is inserted into slot 1. A power supply of this type occupies two slots.</p> <p>As the CPU module, this sample uses a CPU 416-1. This module is inserted into slot 3. Another parameter to be set during the configuration of the connection in the WinCC project is the slot number of the CPU module.</p> <p>We also require the communication processor CP 443-1. This CP is only available from the <i>Hardware Catalog</i> if the option package <i>NCM S7 Industrial Ethernet</i> has been installed. After the communication processor CP 443-1 has been inserted in the rack, its properties dialog box will open.</p>
8	<p>The properties dialog box of the communication processor CP 443-1 will be displayed.</p> <p>In the <i>MAC Address</i> field of the <i>Parameters</i> tab, enter the desired Ethernet address of the communication processor. In this sample, the address 08.00.06.01.00.00 is specified. Another parameter to be set during the configuration of the connection in the WinCC project is this Ethernet address.</p> <p>In the <i>Subnet</i> field below, assign the entry Ethernet(1) to the communication processor. Close the dialog box by clicking on OK.</p> 
9	<p>The following graphic shows the completed hardware arrangement of the sample.</p> 

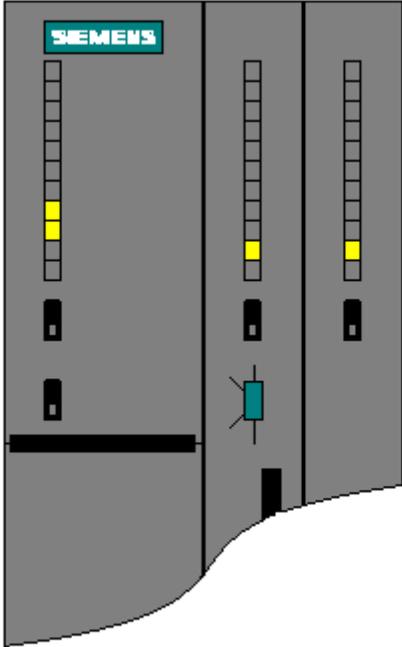
Step	D: Configuring the Hardware
10	<p>Save the settings made in the program <i>HW Config</i>. This is done via the toolbar button displayed below.</p> 

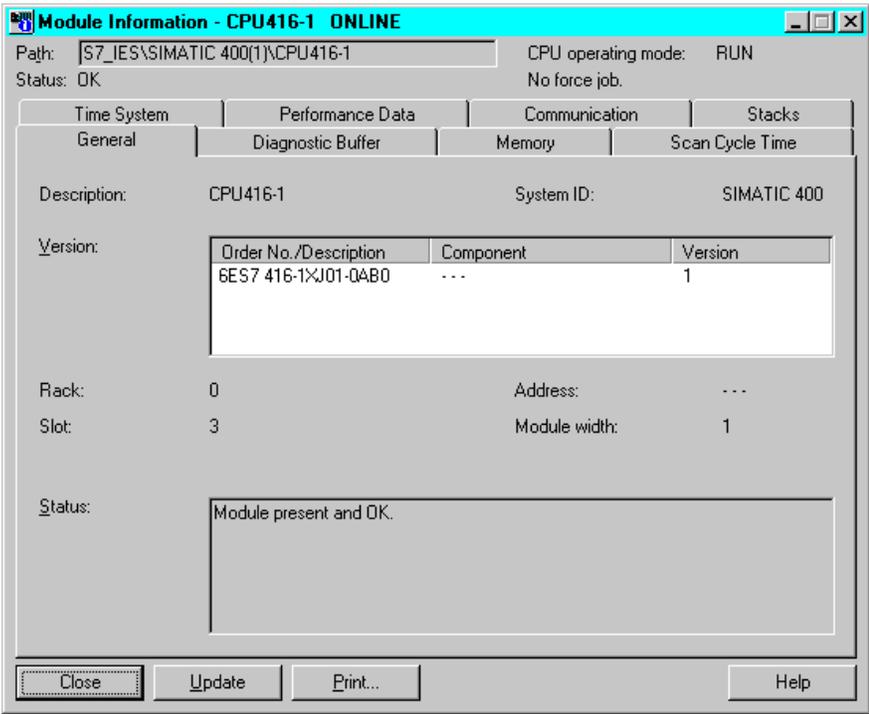
E: Loading the Hardware Configuration

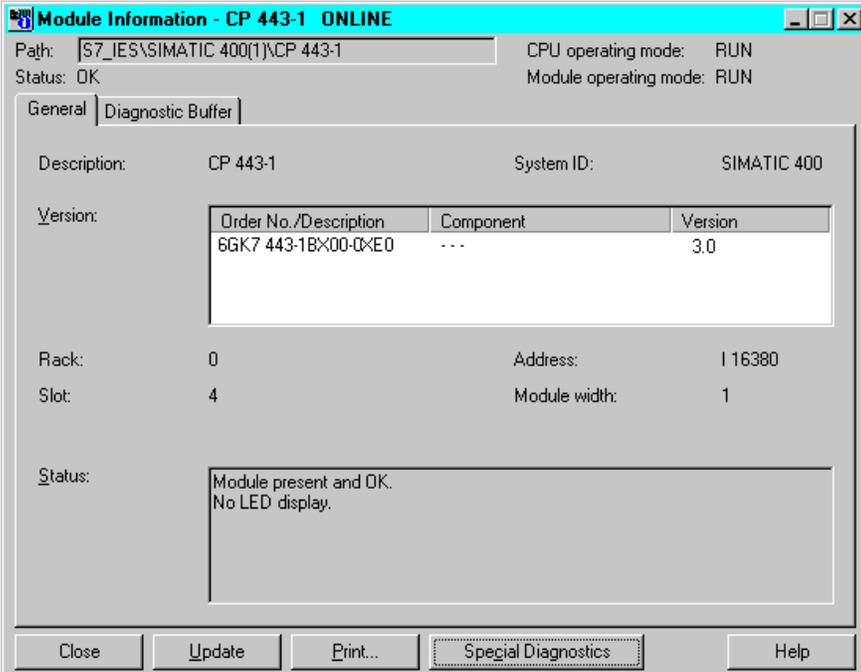
Step	E: Loading the Hardware Configuration									
1	<p>The hardware configuration created in the program <i>HW Config</i> must be transferred to the PLC.</p> <p>This is done via the toolbar button displayed below.</p> 									
2	<p>A dialog box will be displayed from which the components to be loaded can be selected.</p> <p>For this sample, all displayed components will be selected. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>. Close the dialog box by clicking on <i>OK</i>.</p>  <table border="1"> <thead> <tr> <th>Module</th> <th>Rack</th> <th>Slot</th> </tr> </thead> <tbody> <tr> <td>CPU416-1</td> <td>0</td> <td>3</td> </tr> <tr> <td>CP 443-1</td> <td>0</td> <td>4</td> </tr> </tbody> </table>	Module	Rack	Slot	CPU416-1	0	3	CP 443-1	0	4
Module	Rack	Slot								
CPU416-1	0	3								
CP 443-1	0	4								

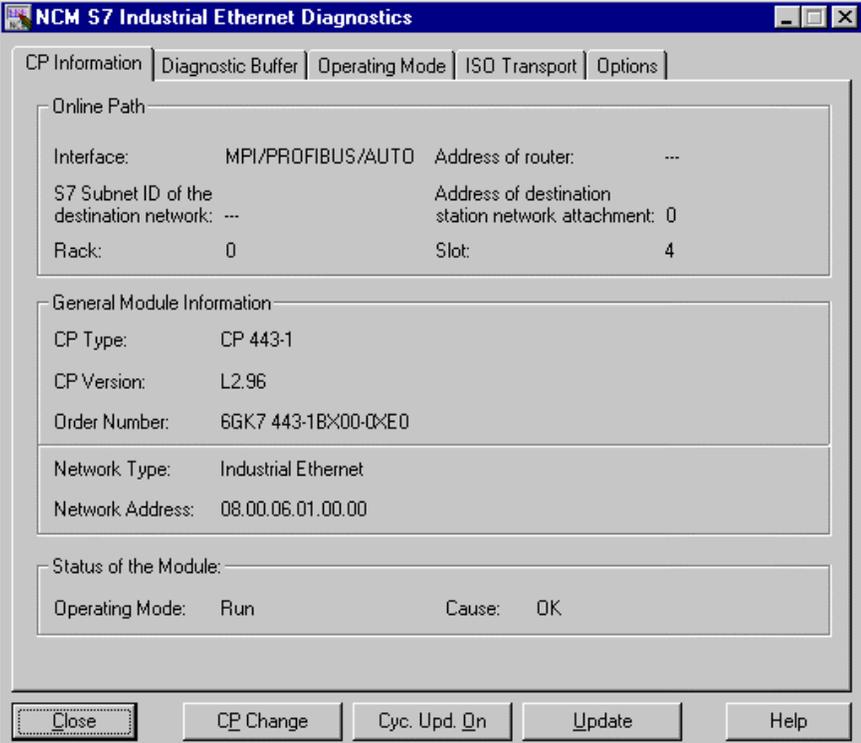
Step	E: Loading the Hardware Configuration
3	<p>Now the dialog box <i>Select Station Address</i> will be displayed.</p> <p>In this dialog box, specify which station address is used by the STEP7 software to communicate with the CPU module. In this sample, the communication is carried out via the MPI interface. The <i>Address</i> of the CPU module is 2.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>The configuration data will now be transferred to the PLC. If necessary, the individual modules will be set to the STOP status.</p> <p>The program <i>HW Config</i> can be exited.</p> <p>The newly added components will be displayed by the <i>SIMATIC Manager</i> for the station <i>SIMATIC 400(1)</i>.</p> 

F: Testing the Hardware Configuration

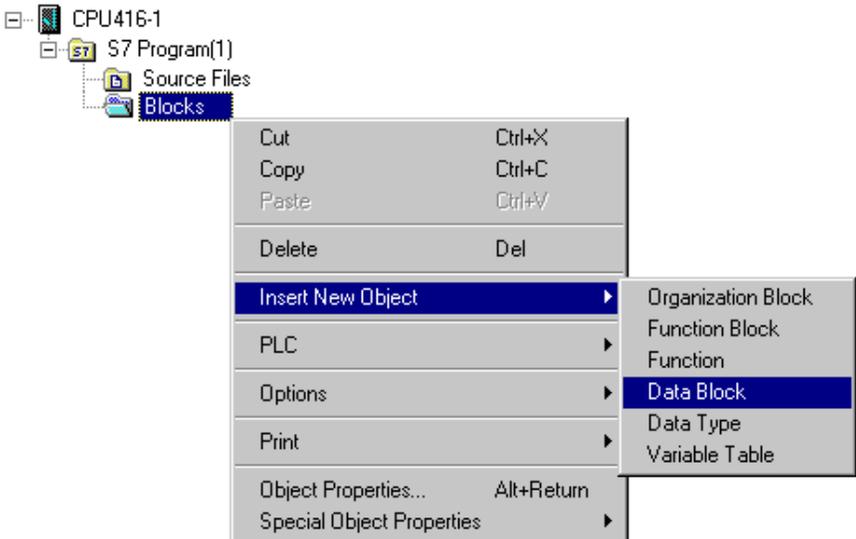
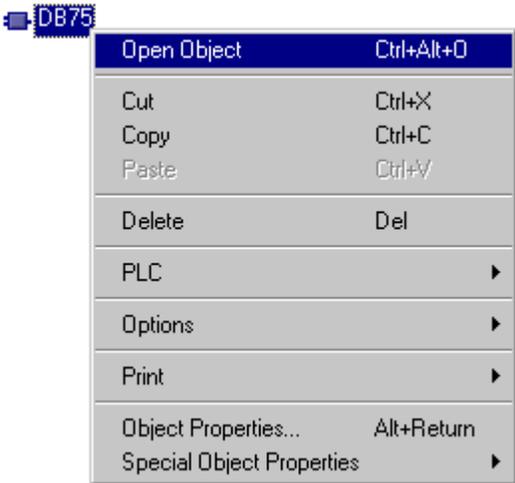
Step	F: Testing the Hardware Configuration
1	<p>Testing of the hardware configuration made.</p> <p>If the key switch of the CPU module is set to <i>RUN</i> or <i>RUN-P</i> and the operating mode switch of the communication processor is set to <i>RUN</i>, only the status LEDs signifying the <i>RUN</i> operating mode should be displayed.</p> <p>If this is not the case, there is an error. The following steps help you localize this error. However, these steps should still be performed even if the status LEDs show no error. This allows you to recognize uncritical errors and faulty configurations.</p> 

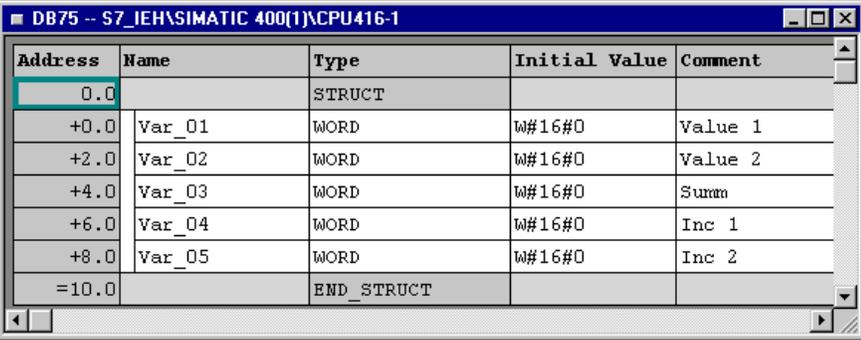
Step	F: Testing the Hardware Configuration
2	<p>Testing the configuration of the CPU module.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the CPU module in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the CPU module will be displayed.</p> <p>The <i>General</i> tab displays various general data of the CPU module. In the <i>Status</i> field, the current module status and any existing errors are displayed.</p> <p>The <i>Diagnosis Buffer</i> tab contains more detailed information about existing errors and how to correct them.</p> <p>The dialog box can be exited via the <i>Close</i> button.</p> 

Step	F: Testing the Hardware Configuration
3	<p>Testing the configuration of the communication processor.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the communication processor in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the communication processor will be displayed. The <i>General</i> tab displays various general data of the module.</p> <p>A dialog box for a more detailed diagnosis of the communication processor can be accessed via the <i>Special Diagnosis</i> button.</p> 

Step	F: Testing the Hardware Configuration
4	<p>The dialog box <i>NCM S7 Industrial Ethernet Diagnosis</i> will be displayed.</p> <p>The <i>CP Information</i> tab displays general information about the module. Among other things, the network address set can be checked.</p> <p>The dialog box can be exited via the <i>Close</i> button. The Module Status dialog box can also be exited via the <i>Close</i> button.</p> 

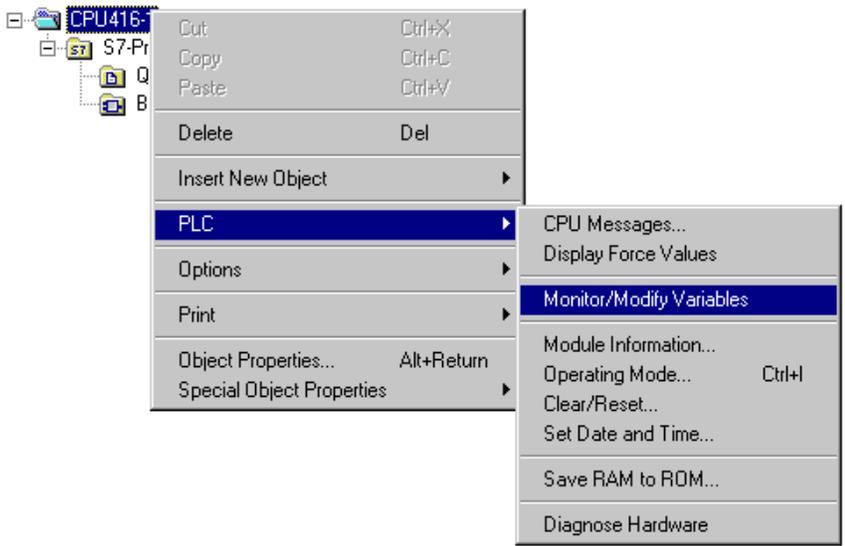
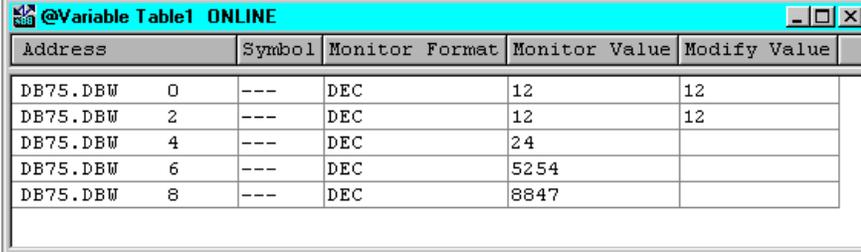
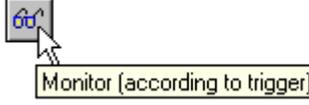
G: Creating the STEP7 Program

Step	G: Creating the STEP7 Program
1	<p>Creation of the <i>S7 Program</i>.</p> <p>This sample project requires the operation block <i>OBI</i> and a data block. <i>OBI</i> is available by default, the required data block must be created. This is done in the <i>SIMATIC Manager</i> via a  on the sub-entry <i>Modules</i> of the entry <i>S7 Program(1)</i> of the configured CPU module and then selecting <i>Insert New Object</i> → <i>Data Block</i> from the pop-up menu.</p> <p>The properties dialog box of the data block will be opened. As the block's <i>Name</i> enter <i>DB75</i> and close the dialog box with <i>OK</i>.</p> 
2	<p>The newly created data block <i>DB75</i> will be displayed in the right window of the project.</p> <p>Via a  on this data block or a  and then selecting <i>Open Object</i> from the pop-up menu, the content of the block can be programmed. This starts the program <i>LAD/STL/SCF</i>.</p> 

Step	G: Creating the STEP7 Program																																								
3	<p>The program <i>LAD/STL/SCF</i> is displayed.</p> <p>Acknowledge the dialog box <i>New Data Block</i> by clicking on <i>OK</i>.</p>  <p>KOP AWL FUP</p>																																								
4	<p>Programming the <i>DB75</i>.</p> <p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits.</p> <p>Two additional tags with a length of 16 Bits are created, whose values are cyclically incremented in <i>OBI</i>.</p> <p>The tags created in the data block <i>DB75</i> are visualized in the WinCC project. To do so, WinCC tags with corresponding addresses are created there.</p> <p>The following graphic displays the programmed data block <i>DB75</i>.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Name</th> <th>Type</th> <th>Initial Value</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>0.0</td> <td></td> <td>STRUCT</td> <td></td> <td></td> </tr> <tr> <td>+0.0</td> <td>Var_01</td> <td>WORD</td> <td>W#16#0</td> <td>Value 1</td> </tr> <tr> <td>+2.0</td> <td>Var_02</td> <td>WORD</td> <td>W#16#0</td> <td>Value 2</td> </tr> <tr> <td>+4.0</td> <td>Var_03</td> <td>WORD</td> <td>W#16#0</td> <td>Summ</td> </tr> <tr> <td>+6.0</td> <td>Var_04</td> <td>WORD</td> <td>W#16#0</td> <td>Inc 1</td> </tr> <tr> <td>+8.0</td> <td>Var_05</td> <td>WORD</td> <td>W#16#0</td> <td>Inc 2</td> </tr> <tr> <td>=10.0</td> <td></td> <td>END_STRUCT</td> <td></td> <td></td> </tr> </tbody> </table>	Address	Name	Type	Initial Value	Comment	0.0		STRUCT			+0.0	Var_01	WORD	W#16#0	Value 1	+2.0	Var_02	WORD	W#16#0	Value 2	+4.0	Var_03	WORD	W#16#0	Summ	+6.0	Var_04	WORD	W#16#0	Inc 1	+8.0	Var_05	WORD	W#16#0	Inc 2	=10.0		END_STRUCT		
Address	Name	Type	Initial Value	Comment																																					
0.0		STRUCT																																							
+0.0	Var_01	WORD	W#16#0	Value 1																																					
+2.0	Var_02	WORD	W#16#0	Value 2																																					
+4.0	Var_03	WORD	W#16#0	Summ																																					
+6.0	Var_04	WORD	W#16#0	Inc 1																																					
+8.0	Var_05	WORD	W#16#0	Inc 2																																					
=10.0		END_STRUCT																																							
5	<p>Save the block and load it into the PLC. This is done via the toolbar button displayed below. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>.</p> 																																								
6	<p>Programming the <i>OBI</i>.</p> <p>Open the block in the program <i>LAD/STL/SCF</i>.</p> <p>First, two values in the <i>DB75</i> are added and then stored again in <i>DB75</i>.</p> <p>Netzwerk 1: Addition</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Adding two 16-Bit Values The result is stored in another 16-Bit Value</p> </div> <table border="1"> <tbody> <tr> <td>OPN</td> <td>DB</td> <td>75</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>0</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>2</td> </tr> <tr> <td>+I</td> <td></td> <td></td> </tr> <tr> <td>T</td> <td>DBW</td> <td>4</td> </tr> </tbody> </table> <p>Next, a value in the <i>DB75</i> is incremented every second.</p>	OPN	DB	75	L	DBW	0	L	DBW	2	+I			T	DBW	4																									
OPN	DB	75																																							
L	DBW	0																																							
L	DBW	2																																							
+I																																									
T	DBW	4																																							

Step	G: Creating the STEP7 Program
	<p>Network 2: Second Cycle</p> <p>Generation of a second cycle at M 0.0</p> <pre> AN M 0.0 L S5T#1S SD T 1 A T 1 = M 0.0 </pre> <p>Network 3: Counting in a second cycle</p> <p>Counting a value in a second cycle At 10000, reset to 0</p> <pre> AN M 0.0 JC M001 L DBW 6 L 1 +I T DBW 6 L 10000 <I JC M001 L 0 T DBW 6 M001: NOP 0 </pre> <p>Finally, a value in the <i>DB75</i> is incremented every time the <i>OBI</i> run.</p> <p>Network 4: Counting in the cycle time</p> <p>Counting a value each time the OB is executed At 10000, reset to 0</p> <pre> L DBW 8 L 1 +I T DBW 8 L 10000 <I JC M002 L 0 T DBW 8 M002: NOP 0 </pre>
7	<p>Save the block <i>OBI</i> and load it into the PLC. This is done via the corresponding buttons on the toolbar.</p> <p>This completes the creation of the STEP7 project and it can now be run. Exit the program <i>LAD/STL/SCF</i>.</p>

H: Testing the STEP7 Program

Step	H: Testing the STEP7 Program																														
1	<p>Testing the program with the STEP7 software.</p> <p>For this purpose, a tag table is created. This is done in the <i>SIMATIC Manager</i> via a  on the entry of the configured CPU module and then selecting <i>Target System</i> → <i>Monitor/Control Tag</i> from the pop-up menu.</p> 																														
2	<p>An editor for creating and using a tag table will be displayed.</p> <p>The following shows a completed tag table. In this table, enter all tags created in the <i>DB75</i>.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Symbol</th> <th>Monitor Format</th> <th>Monitor Value</th> <th>Modify Value</th> </tr> </thead> <tbody> <tr> <td>DB75.DBW 0</td> <td>---</td> <td>DEC</td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 2</td> <td>---</td> <td>DEC</td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 4</td> <td>---</td> <td>DEC</td> <td>24</td> <td></td> </tr> <tr> <td>DB75.DBW 6</td> <td>---</td> <td>DEC</td> <td>5254</td> <td></td> </tr> <tr> <td>DB75.DBW 8</td> <td>---</td> <td>DEC</td> <td>8847</td> <td></td> </tr> </tbody> </table>	Address	Symbol	Monitor Format	Monitor Value	Modify Value	DB75.DBW 0	---	DEC	12	12	DB75.DBW 2	---	DEC	12	12	DB75.DBW 4	---	DEC	24		DB75.DBW 6	---	DEC	5254		DB75.DBW 8	---	DEC	8847	
Address	Symbol	Monitor Format	Monitor Value	Modify Value																											
DB75.DBW 0	---	DEC	12	12																											
DB75.DBW 2	---	DEC	12	12																											
DB75.DBW 4	---	DEC	24																												
DB75.DBW 6	---	DEC	5254																												
DB75.DBW 8	---	DEC	8847																												
3	<p>Monitoring the current tag values.</p> <p>By clicking on the toolbar button displayed below, the current values of the corresponding tags in the PLC are displayed in the column <i>Status Value</i>.</p>  <p>Controlling the tag values. Values can be entered in the column <i>Control Value</i>. By clicking on the toolbar button displayed below, these values will be written to the corresponding tags in the PLC. Note that tags can only be controlled while the operating mode switch of the CPU module is set to <i>RUN-P</i>.</p> 																														

Step	H: Testing the STEP7 Program
4	<p>The created tag table can now be saved.</p> <p>In this sample, the table is saved under the name <i>VAT1</i>. After checking the program in the PLC, the tag table can be closed. This concludes the configuration of the STEP7 project and the <i>SIMATIC Manager</i> can be exited.</p> <p> VAT1</p>

3.3 Creation of the WinCC Project WinCC_S7_IES

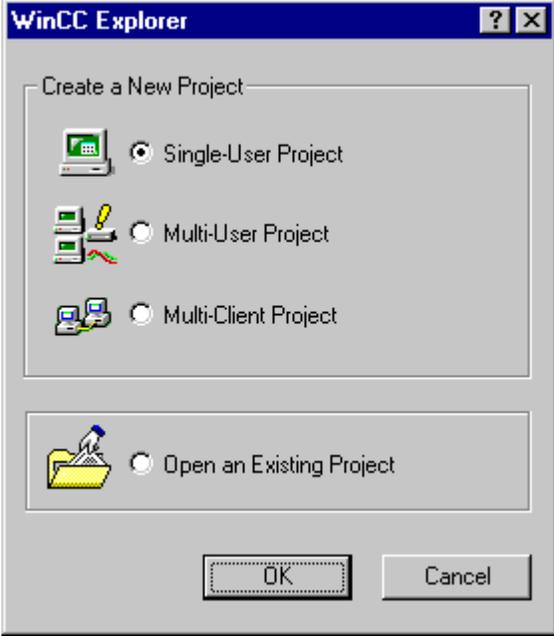
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S7_IES*.

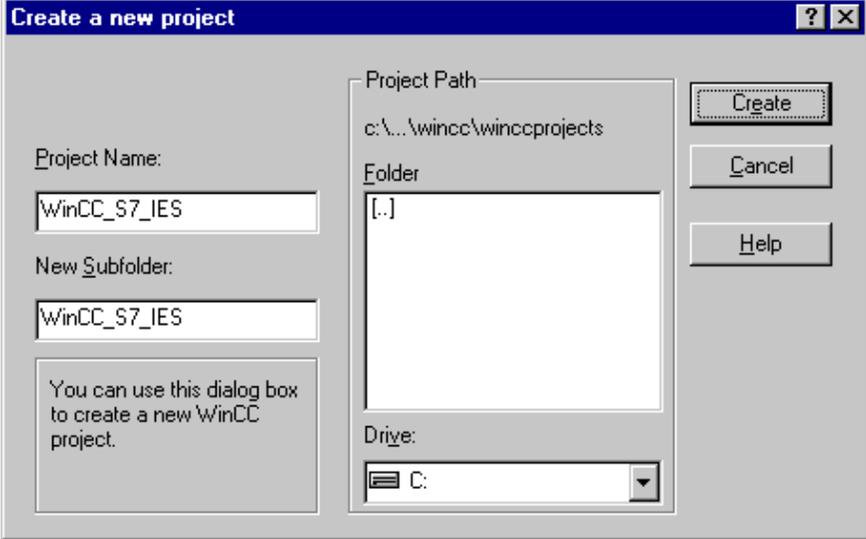
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_S7_IES*:

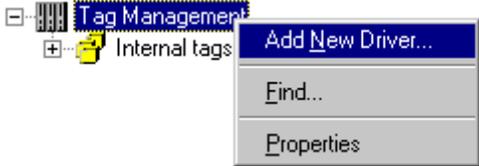
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Tags
- D: Creating the WinCC Screen

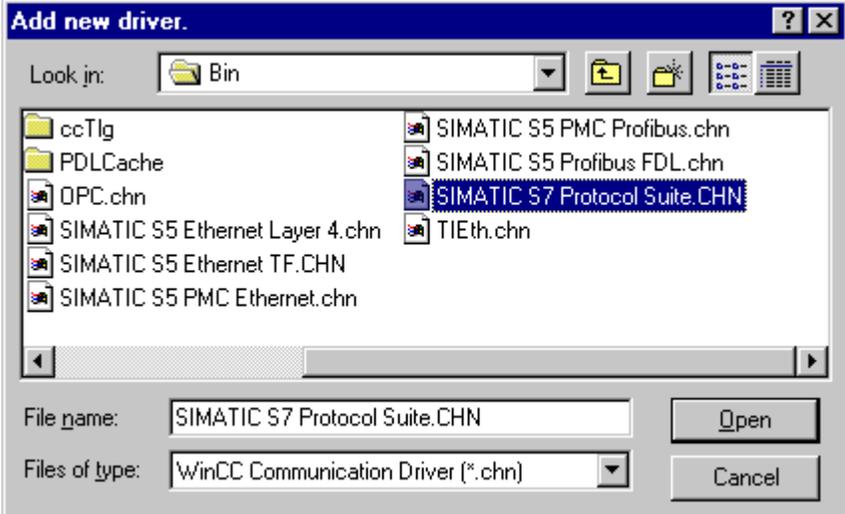
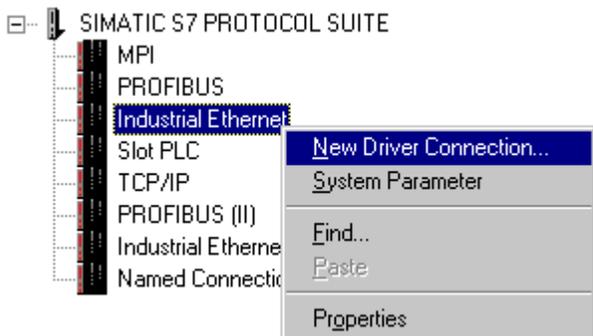
A: Creating the WinCC Project

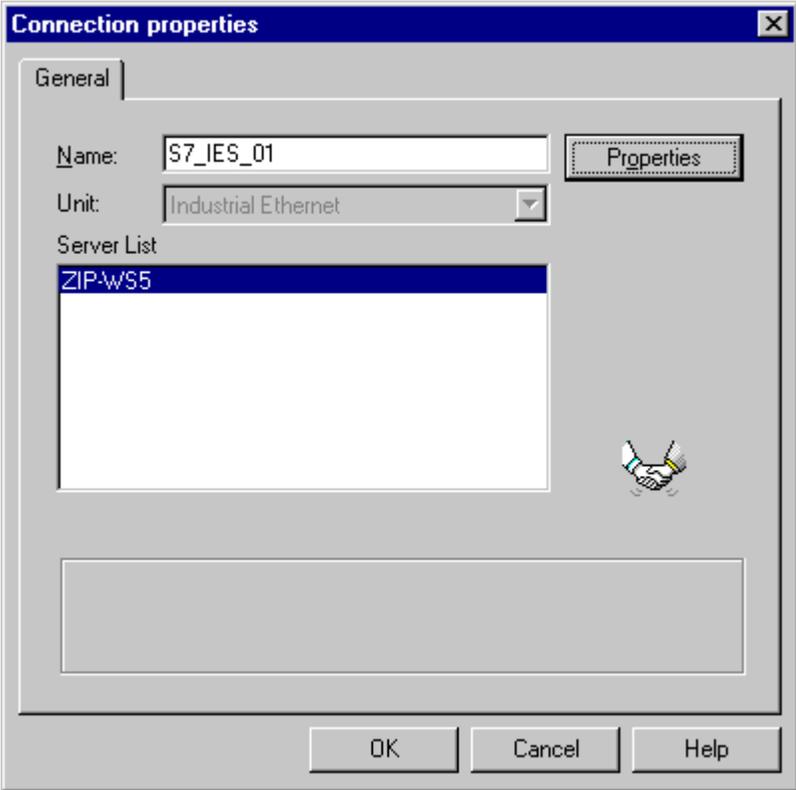
Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>This will display the <i>WinCC Explorer</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

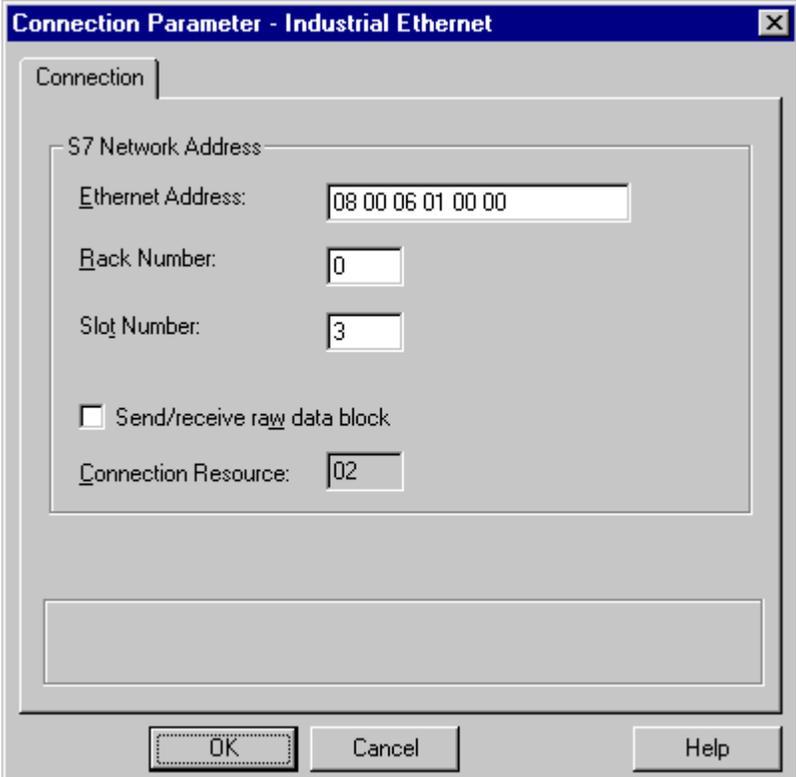
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S7_IES</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

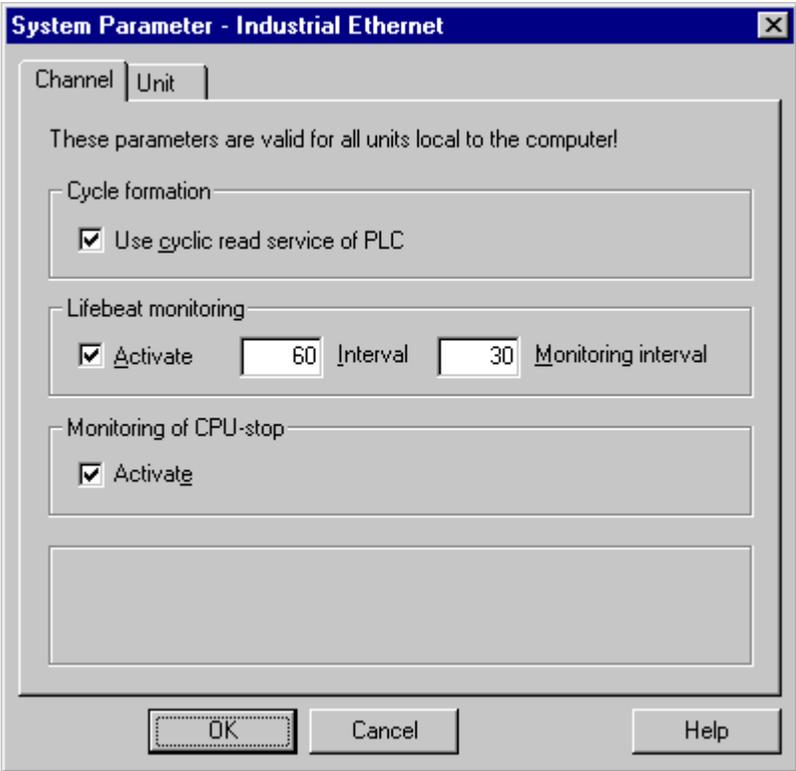
B: Creating the Connection

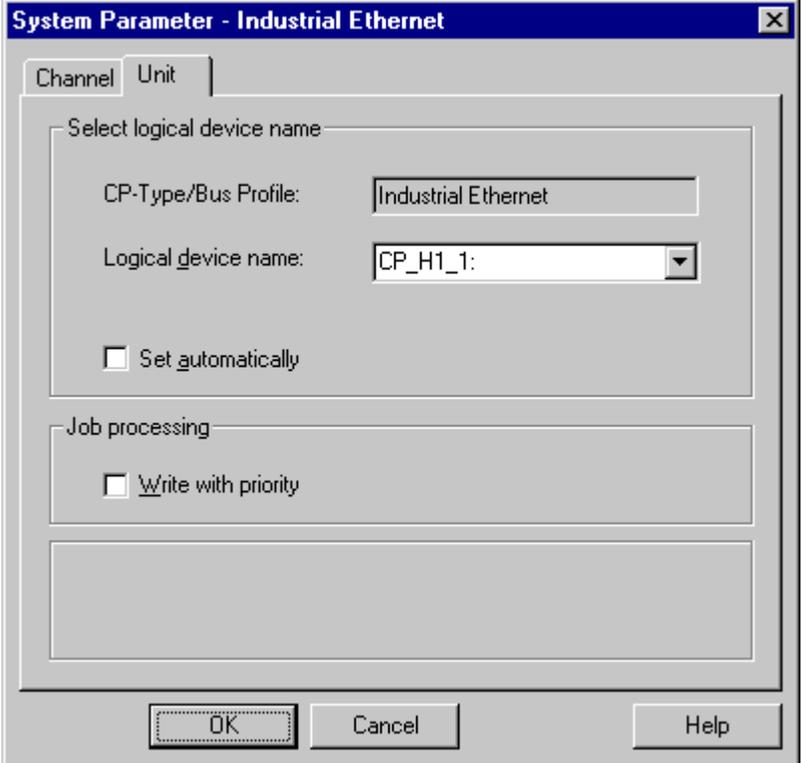
Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. For the communication to the <i>SIMATIC S7</i>, the driver <i>SIMATIC S7 Protocol Suite</i> is required. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added driver <i>SIMATIC S7 Protocol Suite</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The driver contains eight different channel units. To operate a computer with two <i>CP 1413</i> communication processors, two <i>Industrial Ethernet</i> channel units are available.</p> <p>In this sample, the channel unit <i>Industrial Ethernet</i> is used. Create a new connection for this channel unit by  on <i>Industrial Ethernet</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> 

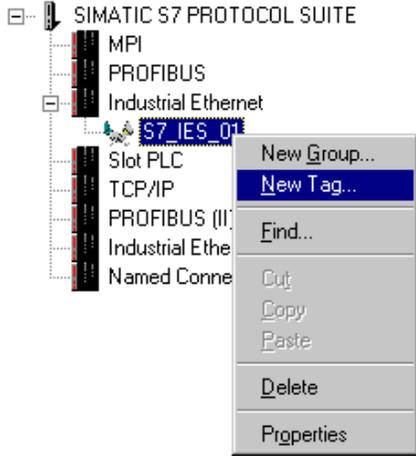
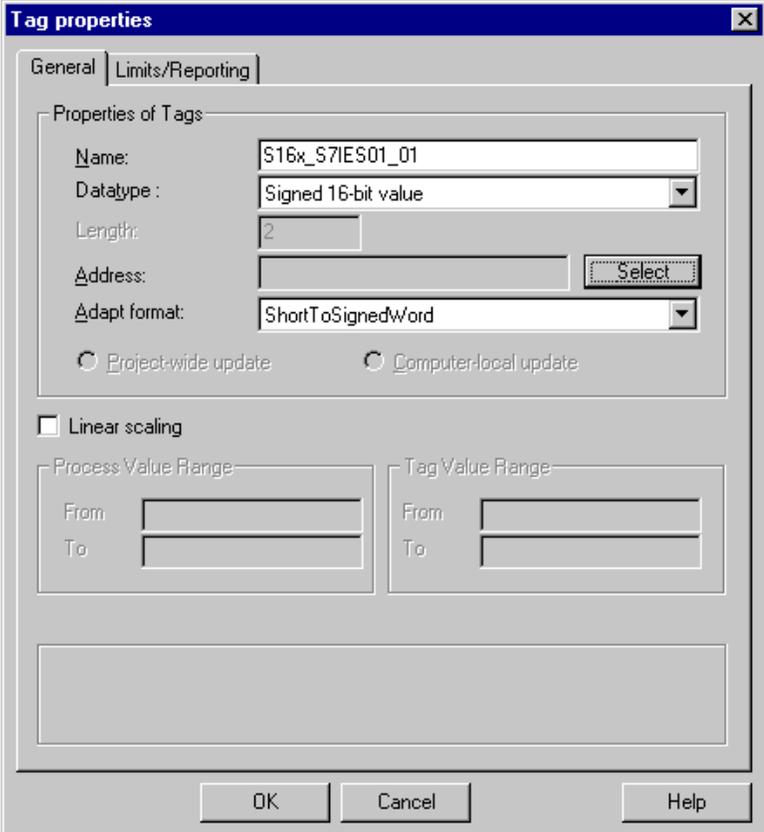
Step	B: Creating the Connection
4	<p>The properties dialog box of the connection will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered. In this sample, this is <i>S7_IES_01</i>.</p> <p>Click on the <i>Properties</i> button to define the connection properties.</p> 

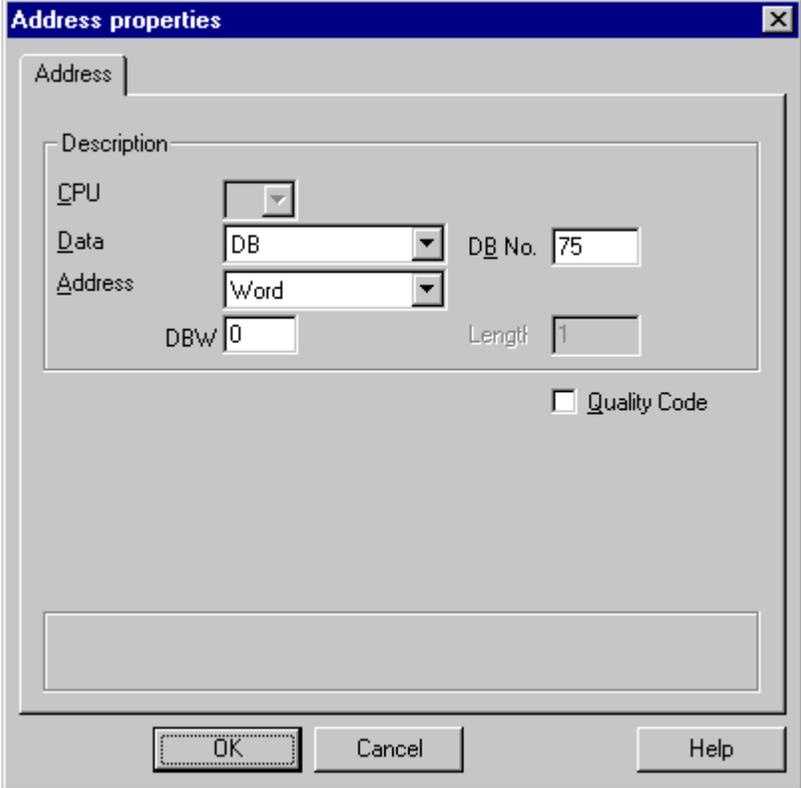
Step	B: Creating the Connection
5	<p>The dialog box <i>Connection Properties</i> will be displayed.</p> <p>In the <i>Ethernet Address</i> field, enter the address that has been set for the communication processor <i>CP 443-1</i>. In this sample, this is the Ethernet Address <i>08.00.06.01.00.00</i>.</p> <p>Additionally, the Rack Number and Slot Number of the CPU module to be accessed must be entered. Make sure that the values of the CPU module are entered here and not the values of the communication processor.</p> <p>Close the dialog box by clicking on <i>OK</i>. Also close the <i>Connection Properties</i> dialog box by clicking on <i>OK</i>.</p> 

Step	B: Creating the Connection
6	<p>Setting the system parameters of the <i>Industrial Ethernet</i> channel unit.</p> <p>These settings are made in the <i>System Parameters</i> dialog box, which is accessed via a  on the <i>Industrial Ethernet</i> entry and then selecting <i>System Parameters</i> from the pop-up menu.</p> <p>In the <i>Channel</i> tab, various settings pertaining to the communication and monitoring a communication can be made. These settings will apply to all channel units of the communication driver.</p> 

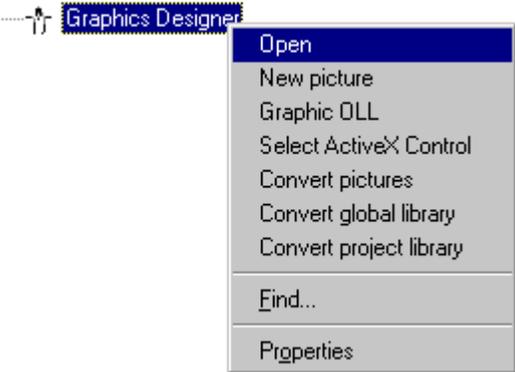
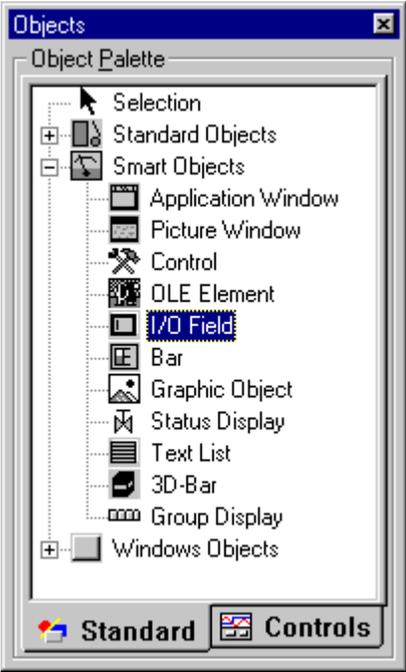
Step	B: Creating the Connection
7	<p>In the <i>Device</i> tab, the access point used by the connection to access the PLC is specified.</p> <p>By default, the access point <i>CP_H1_1</i>: is set. Previously, the communication processor <i>CP 1411</i> has been assigned to the access point <i>CP_H1_1</i>: in the program <i>Setting the PG/PC Interface</i>. If you want the access point to be set automatically, make sure that the correct one is being used, especially if multiple communication processors are used.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

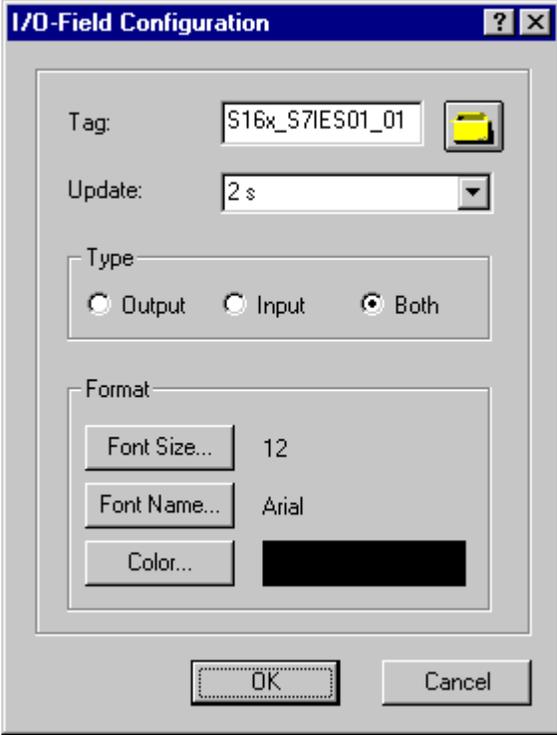
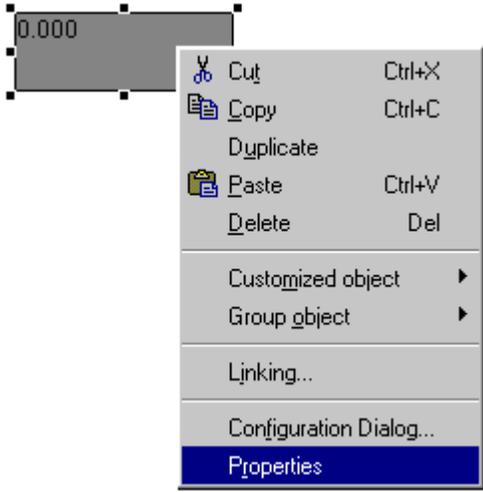
C: Creating the WinCC Tags

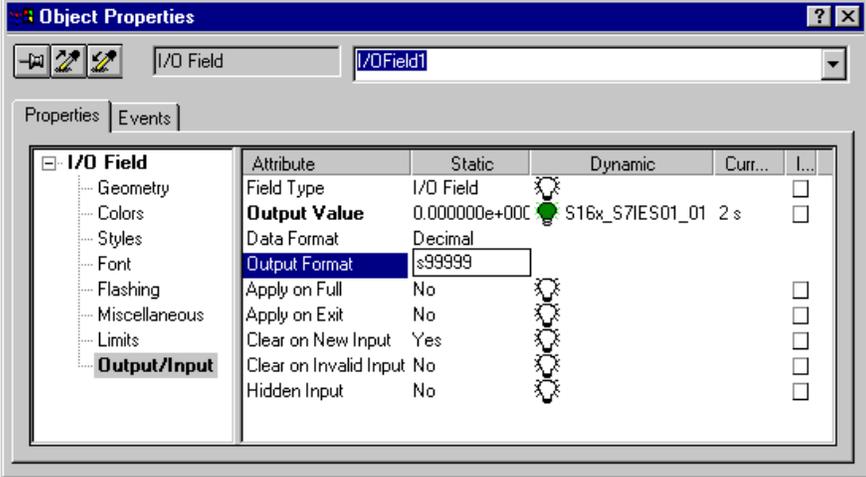
Step	C: Creating the WinCC Tags
1	<p>Creation of the WinCC tags required for the sample.</p> <p>This is done via a  on the newly created connection <i>S7_IES_01</i> and then selecting <i>New Tag</i> from the pop-up menu.</p> 
2	<p>The properties dialog box of the tag will be displayed. In the sample, the <i>Name</i> of the first tag is <i>S16x_S7IES01_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type. <i>Click on the Select button to set the Address of the new tag.</i></p> 

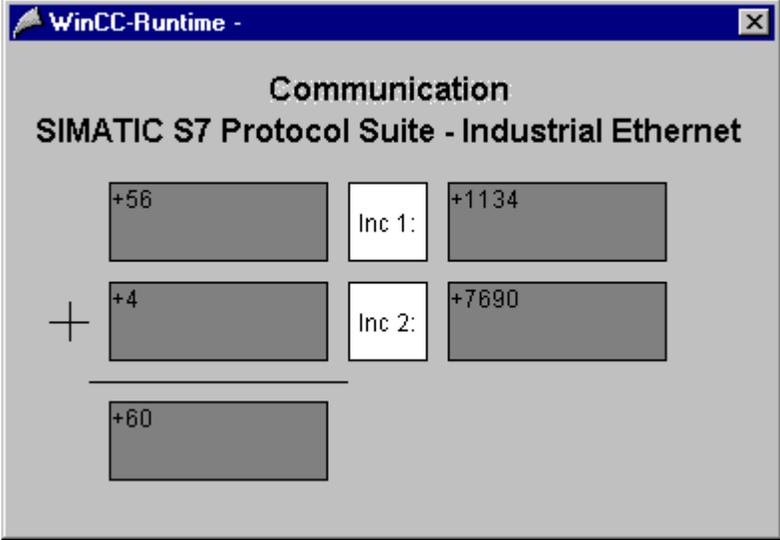
Step	C: Creating the WinCC Tags																		
3	<p>The dialog box <i>Address Properties</i> will be displayed.</p> <p>Set <i>DB</i> as the <i>Data Range</i> and the value <i>75</i> as the <i>DB No.</i>. Set <i>Word</i> in the <i>Address</i> field and the value <i>0</i> in the <i>DBW</i> field. Close the dialog box by clicking on <i>OK</i>. The properties dialog box of the tag is also closed by clicking on <i>OK</i>.</p> <p>The just created WinCC tag is addressed in the range of the DB75, where the first of the two values to be added is located.</p> 																		
4	<p>Creation of the remaining WinCC tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S7IES01_01</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IES01_02</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IES01_03</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IES01_04</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7IES01_05</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> </tbody> </table>	Name	Type	Parameters	 S16x_S7IES01_01	Signed 16-bit value	DB75,DW0	 S16x_S7IES01_02	Signed 16-bit value	DB75,DW0	 S16x_S7IES01_03	Signed 16-bit value	DB75,DW0	 S16x_S7IES01_04	Signed 16-bit value	DB75,DW0	 S16x_S7IES01_05	Signed 16-bit value	DB75,DW0
Name	Type	Parameters																	
 S16x_S7IES01_01	Signed 16-bit value	DB75,DW0																	
 S16x_S7IES01_02	Signed 16-bit value	DB75,DW0																	
 S16x_S7IES01_03	Signed 16-bit value	DB75,DW0																	
 S16x_S7IES01_04	Signed 16-bit value	DB75,DW0																	
 S16x_S7IES01_05	Signed 16-bit value	DB75,DW0																	

D: Creating the WinCC Screen

Step	D: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S7IES01_01</i> via the button displayed below.</p> 

Step	D: Creating the WinCC Screen
	<p>The <i>Update</i> of the tag is set to <i>Upon Change</i>. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p> 

Step	D: Creating the WinCC Screen
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p> 
6	<p>Creation of four additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_3_S7IES_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p> 

Step	D: Creating the WinCC Screen
	<p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the I/O fields. They can be changed by entering values in the individual <i>I/O Fields</i>.</p>  <p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p> 

3.4 Diagnosis of the Communication Connection

The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S7_IES* and the SIMATIC S7 station.

A diagnosis of the sample according to this description makes only sense, if the checks listed below have been completed successfully.

Startup of the Communication Processor CP 1411

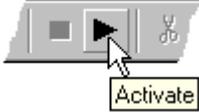
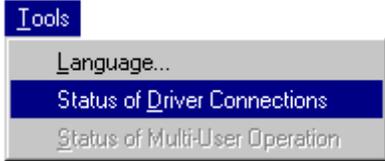
- G: Testing the Communication Processor

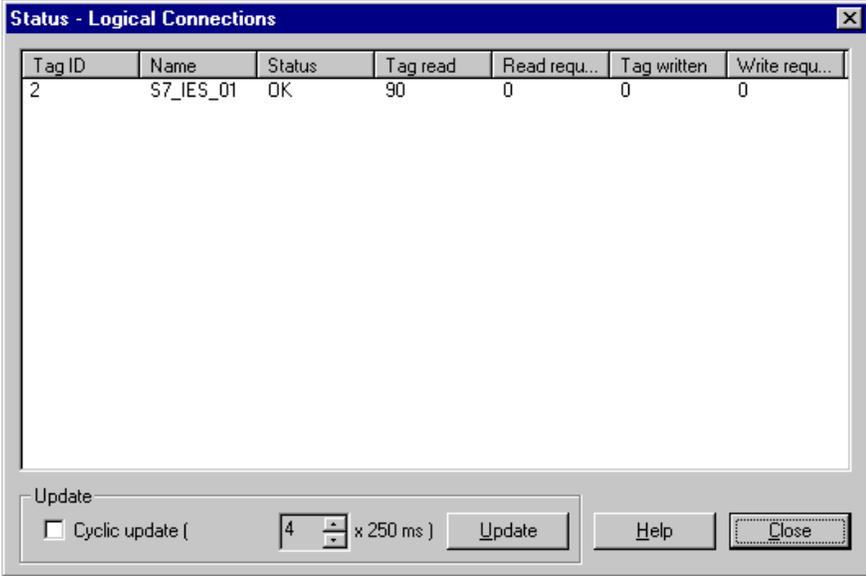
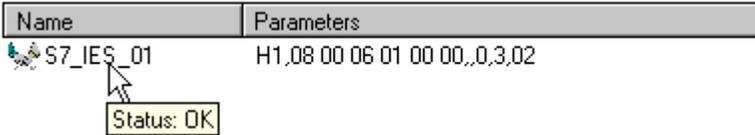
Creation of the STEP7 Project *S7_IES*

- F: Testing the Hardware Configuration

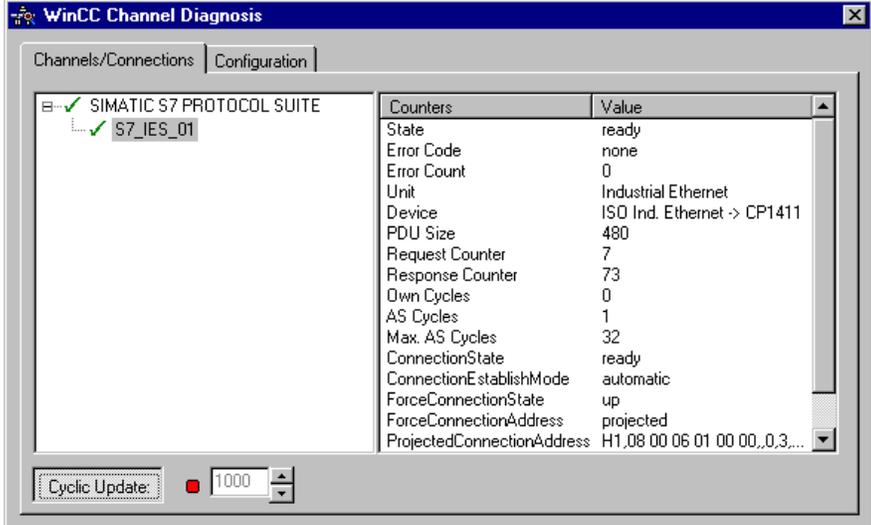
- I: Testing the STEP7 Program

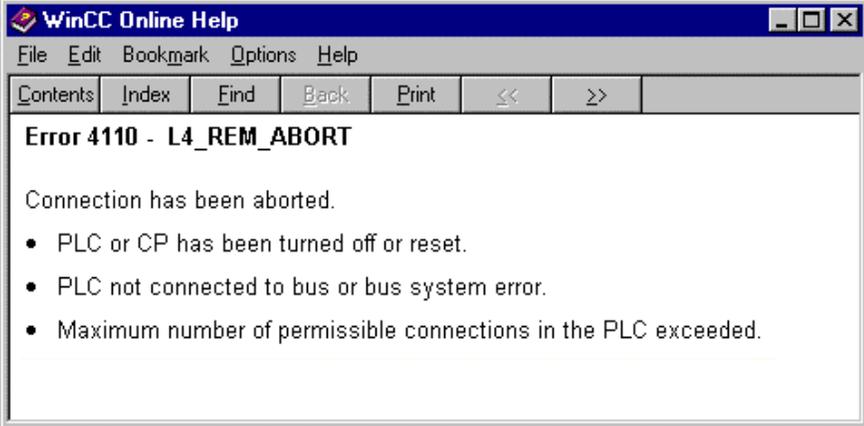
WinCC Explorer

Step	WinCC Explorer
1	<p>Diagnosis of the communication connection in the <i>WinCC Explorer</i>.</p> <p>Switch the project <i>WinCC_S7_IES</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below.</p>  <p>The created WinCC screen <i>com_3_S7IES_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 

Step	WinCC Explorer
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>S7_IES_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p> 
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>.</p> <p>The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p>  <p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> 

Channel Diagnosis

Step	Channel Diagnosis
1	<p>Diagnosis of the communication connection via the program <i>WinCC Channel Diagnosis</i>.</p> <p>Start this program via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Channel Diagnosis</i>.</p>  <p>Channel Diagnosis</p>
2	<p>The program <i>WinCC Channel Diagnosis</i> will be displayed.</p> <p>The <i>Channels/Connections</i> tab displays detailed information about the status of each configured connection. By default, the display is updated every second. The update cycle can be changed in the input field located at the bottom.</p> 
3	<p>If a connection error is detected, the <i>Error Code</i> line in the right window half will display a value specifying the error cause. Detailed information about this error code is displayed by  on the <i>Error Code</i> entry and then selecting <i>Help</i> from the pop-up menu.</p> 

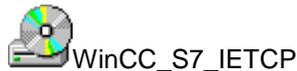
Step	Channel Diagnosis
4	<p>This opens the Online Help to WinCC containing a description of the corresponding error code. Additionally, possible error causes are also listed.</p> 

4 Communication to the SIMATIC S7 via TCP/IP

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder *C:\Communication_Manual*. You have the option to copy the following components to the hard drive:



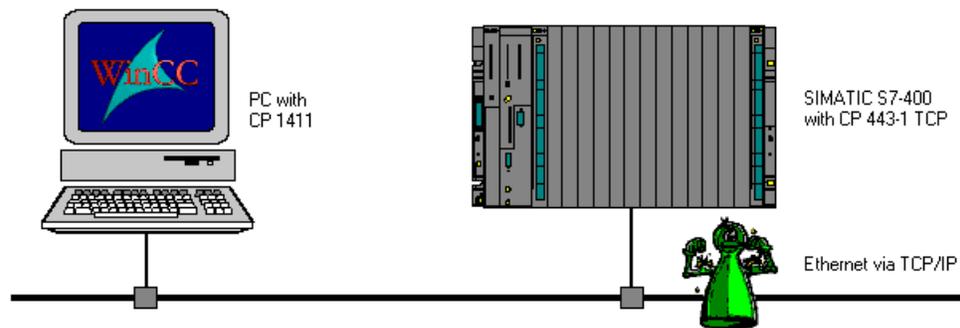
The STEP7 project we will create.



The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a SIMATIC S7 and WinCC. The communication connection is realized via the Industrial Ethernet. As the transport protocol, the TCP/IP Protocol will be used.

Overview of the Structure of the Sample



On the computer side, the connection to the *Industrial Ethernet* network is established via the communication processor *CP 1411*. To install this communication processor in the computer, the driver *IE SOFTNET-S7 BASIC*, located on the *SIMATIC NET* CD-ROM, is needed.

In the WinCC project, the communication driver *SIMATIC S7 Protocol Suite* must be installed. Via its channel unit *TCP/IP*, the connection to the *SIMATIC S7* is configured. The PLC is equipped with a *CPU 416-1* module. The connection to the network is established via the communication processor *CP 443-1 TCP*. For the configuration of this communication processor with the STEP7 software, the option package *NCM S7 Industrial Ethernet* is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 1411
- Creation of the STEP7 Project S7_IETCP
- Creation of the WinCC Project WinCC_S7_IETCP
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>IE SOFTNET S7 BASIC</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 1411</i> .
Windows NT	Windows NT installation software for the installation of the communication processor <i>CP 1411</i> and the <i>TCP/IP Protocol</i> .
STEP7	STEP7 software with option package <i>NCM for Industrial Ethernet</i> for the creation of the STEP7 project.
WinCC	WinCC with the communication driver <i>SIMATIC S7 Protocol Suite</i> for the creation of the WinCC project.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 1411</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>UR1</i>
Power Supply	Power supply <i>PS 407 10A</i> in slot 1 and 2.
CPU Module	CPU module <i>CPU 416-1</i> in slot 3.
Communication Processor	Communication processor <i>CP 443-1 TCP</i> in slot 4.

4.1 Startup of the Communication Processor CP 1411

The following description details the configuration steps necessary to successfully start up the communication processor *CP 1411*. The communication is handled by the *TCP/IP Protocol*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to start up the communication processor *CP 1411*:

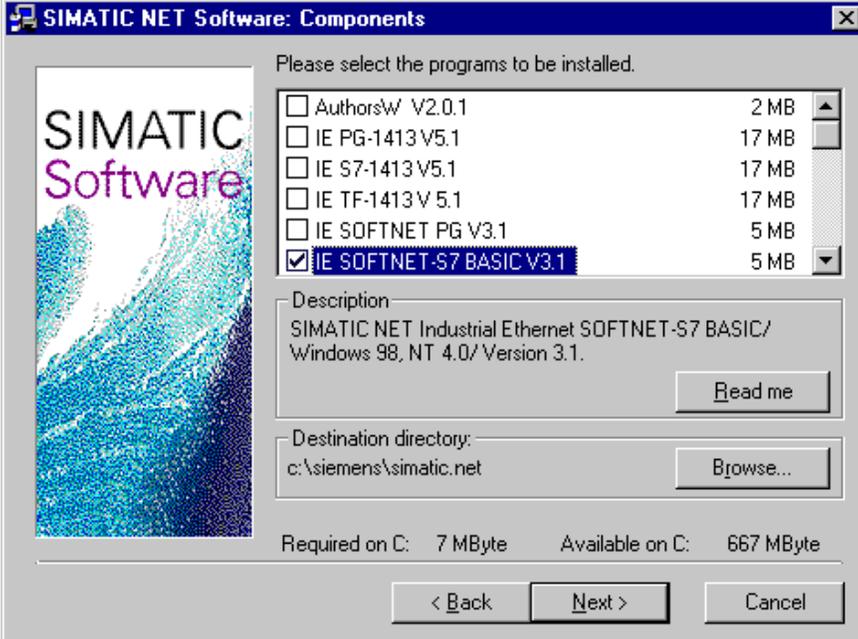
- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Installing the Communication Processor
- D: Installing the Communication Protocol
- E: Configuring the Bindings
- F: Creating an Access Point

A: Mounting the Communication Processor in the Computer

Step	A: Mounting the Communication Processor in the Computer
1	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>The communication card <i>CP 1411</i> requires a free ISA slot in the computer. After the installation of the <i>CP 1411</i>, close the computer's case and start the computer.</p>

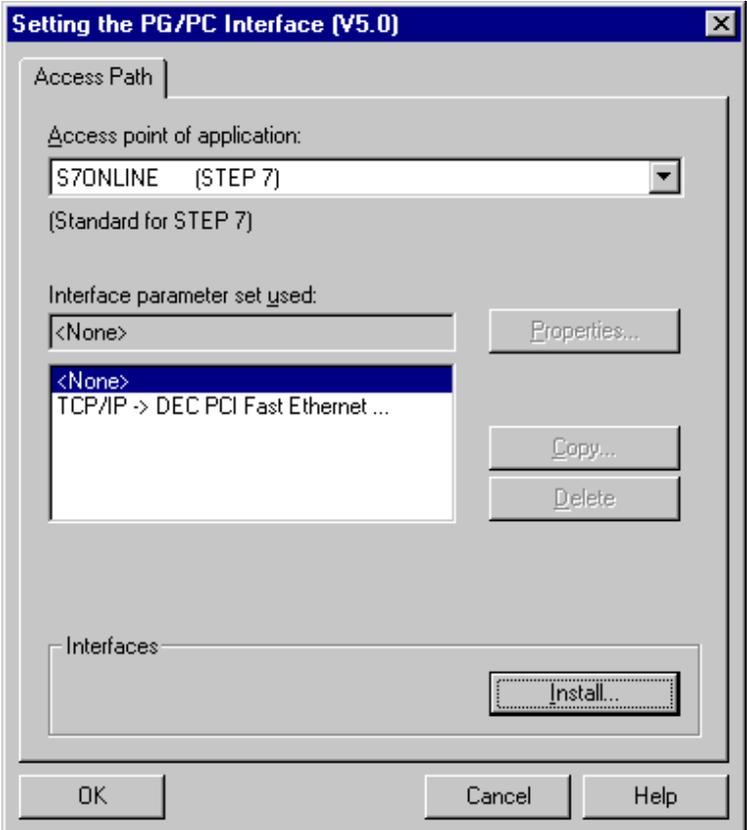
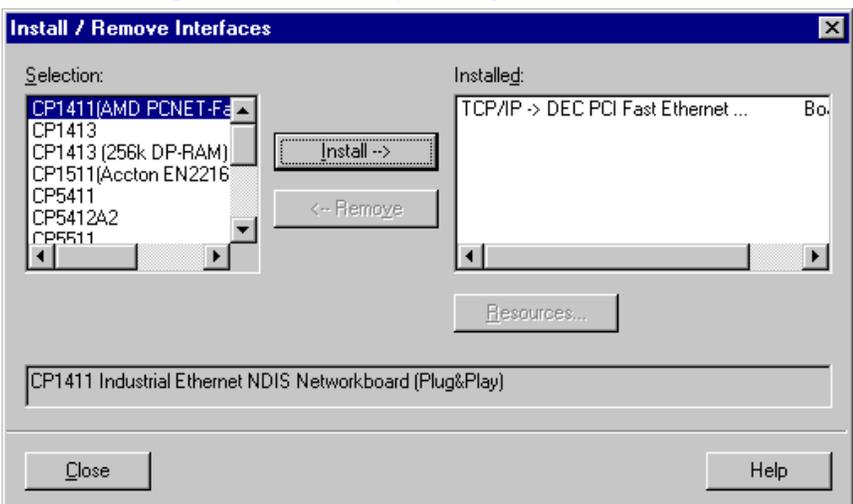
B: Installing the Communication Driver

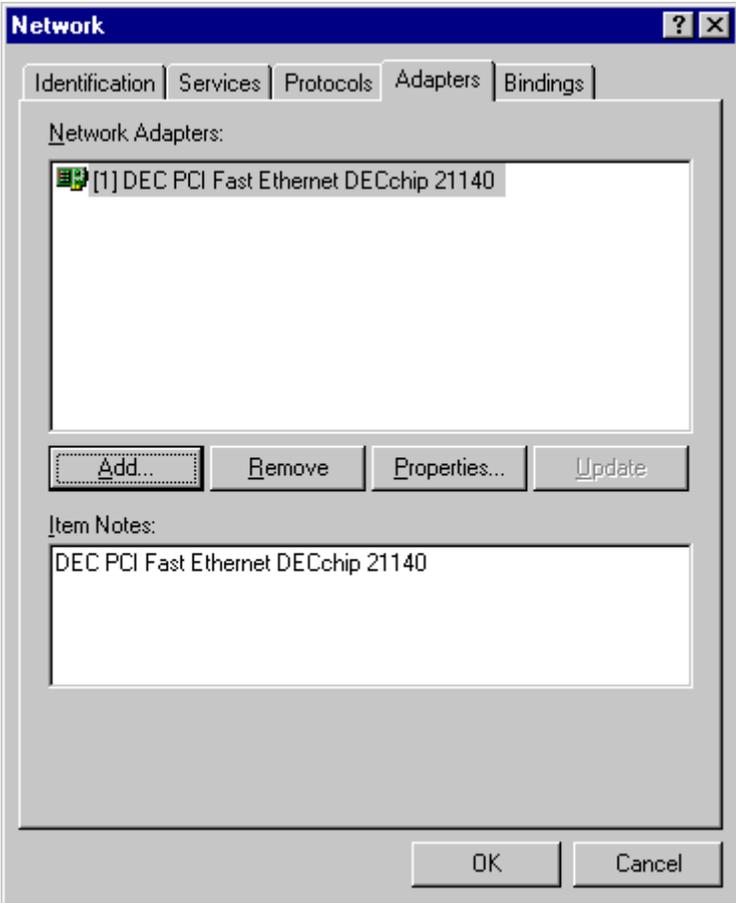
Step	B: Installing the Communication Driver
1	<p>Install the communication driver <i>IE SOFTNET S7 BASIC</i> from the <i>SIMATIC NET</i> CD-ROM.</p> <p>After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="text-align: center;">  </div>

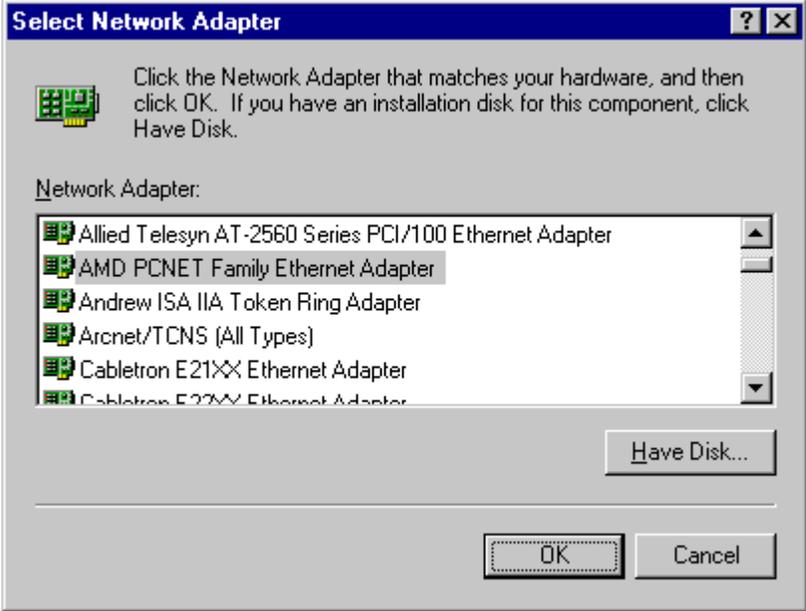
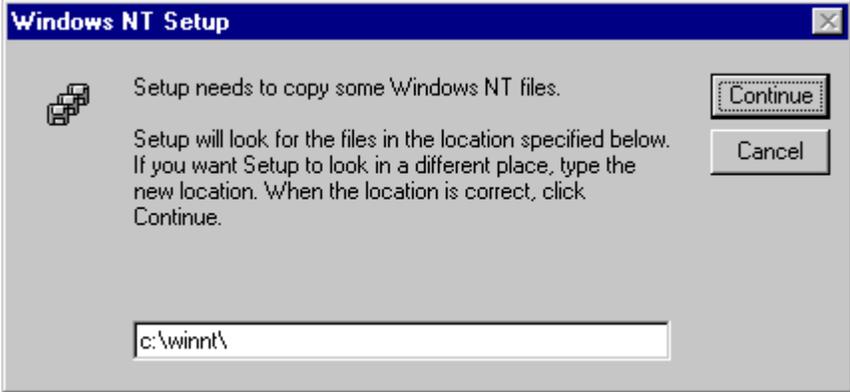
Step	B: Installing the Communication Driver
	<p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>IE SOFTNET-S7 BASIC</i> to be installed must be selected. Finish the installation.</p> 

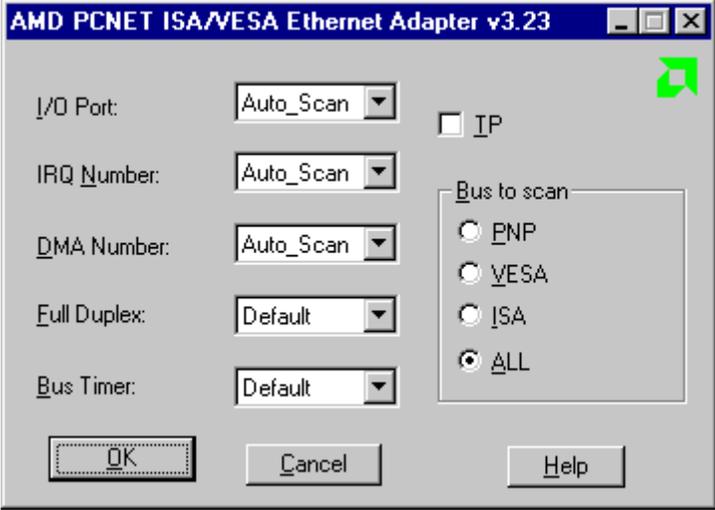
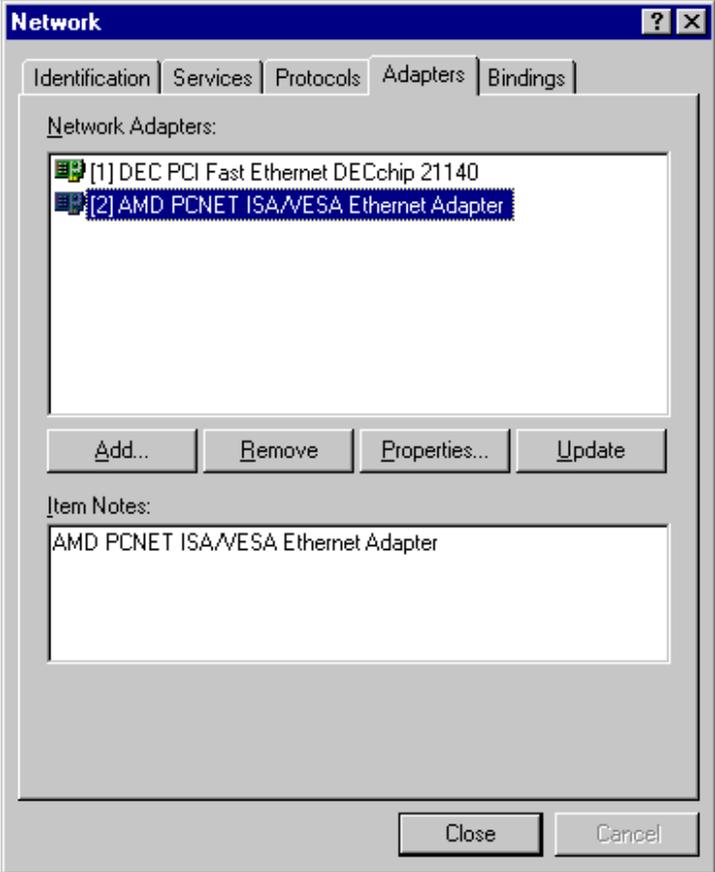
C: Installing the Communication Processor

Step	C: Installing the Communication Processor
1	<p>Install the communication processor <i>CP 1411</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>

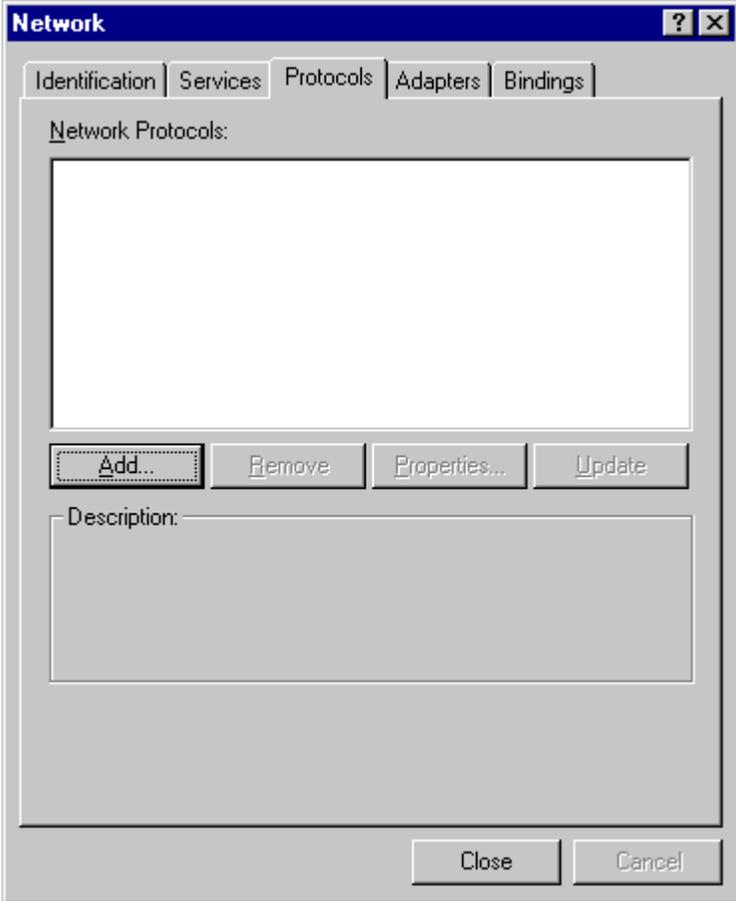
Step	C: Installing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed. The dialog box for installing a new interface is opened via the <i>Install</i> button.</p> 
3	<p>The dialog box <i>Install/Remove Modules</i> will be displayed. The <i>Selection</i> field lists all interfaces that can be installed. Among them will be the entry <i>CP 1411</i>, if the communication driver has been installed previously as outlined in step B. Select the entry <i>CP 1411 (AMD PCNET-Family)</i>. The installation of the communication processor is started by clicking on the <i>Install -></i> button.</p> 

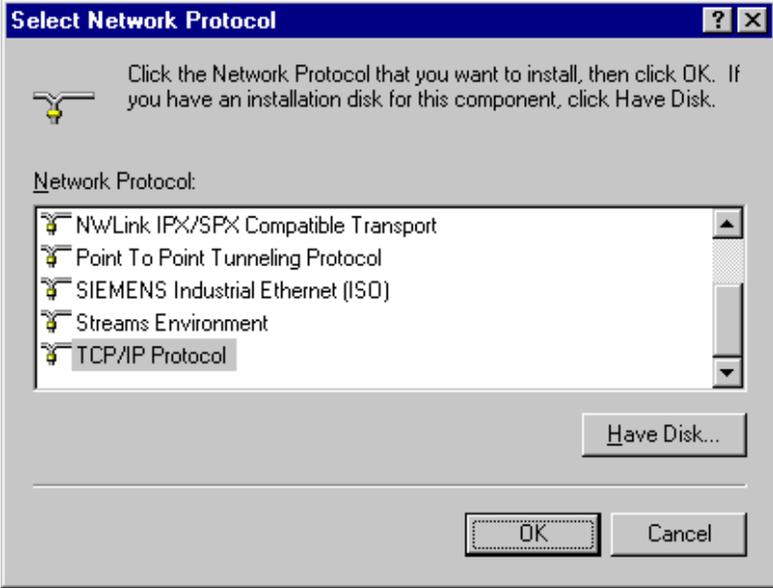
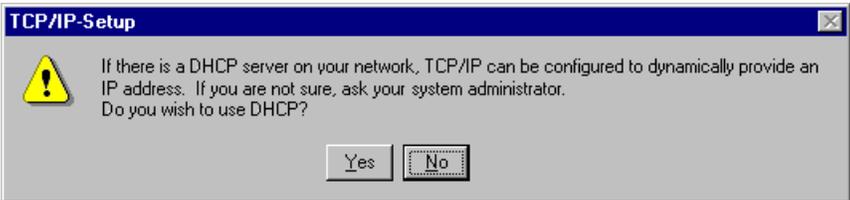
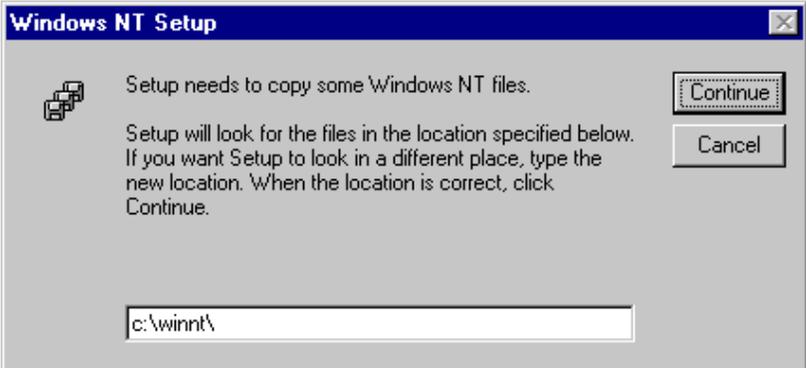
Step	C: Installing the Communication Processor
4	<p>This opens the <i>Network</i> dialog box.</p> <p>In the <i>Adapters</i> tab, install the communication card <i>CP 1411</i> by clicking on the <i>Add</i> button.</p>  <p>The screenshot shows the 'Network' dialog box with the 'Adapters' tab selected. The 'Network Adapters' list contains one entry: '[1] DEC PCI Fast Ethernet DECchip 21140'. Below the list are buttons for 'Add...', 'Remove', 'Properties...', and 'Update'. At the bottom of the dialog are 'OK' and 'Cancel' buttons.</p>

Step	C: Installing the Communication Processor
5	<p>The <i>Select Network Adapter</i> dialog box will be displayed.</p> <p>From the <i>Network Adapter</i> list, select the entry <i>AMD PCNET-Family Ethernet-Adapter</i>. Close the <i>Select Network Adapter</i> dialog box by clicking on <i>OK</i>.</p> 
6	<p>The <i>Windows NT Setup</i> dialog box will be displayed. This dialog box informs you that some Windows NT files must be copied for the installation of the <i>CP 1411</i>.</p> <p>In the input field at the bottom, specify the path in which the appropriate files can be found. Normally, this is the path to the CD-ROM drive (if the files are copied from a Windows NT Installation CD-ROM).</p> <p>Conclude the <i>Windows NT Setup</i> by clicking on the <i>Continue</i> button.</p> 

Step	C: Installing the Communication Processor
7	<p>The setup dialog box for the <i>CP 1411</i> will be displayed.</p> <p>Keep the default settings for the various options. Close the setup dialog box by clicking on <i>OK</i>.</p> 
8	<p>After the installation of the <i>CP 1411</i> is complete, the entry <i>AMD PCNET ISA/VESA Ethernet-Adapter</i> will be displayed in the <i>Network Adapters</i> list of the <i>Adapters</i> tab.</p> 

D: Installing the Communication Protocol

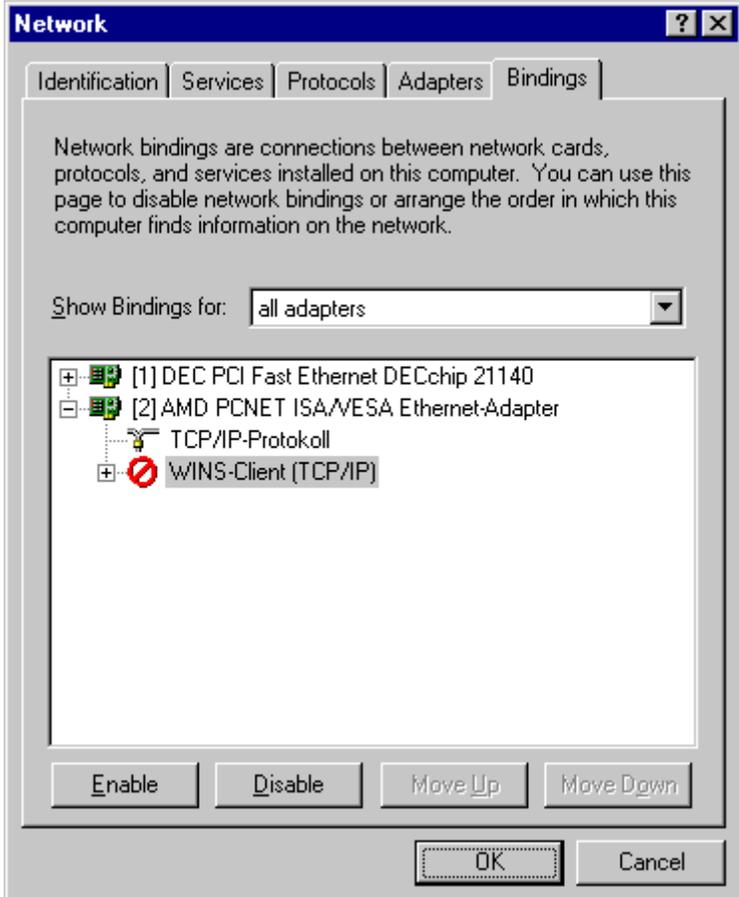
Step	D: Installing the Communication Protocol
1	<p>The <i>TCP/IP Protocol</i> must be installed. All protocols already installed are displayed in the <i>Protocols</i> tab of the <i>Network</i> dialog box.</p> <p>If the <i>TCP/IP Protocol</i> entry is not available, install it via the <i>Add</i> button.</p>  <p>The screenshot shows the 'Network' dialog box with the 'Protocols' tab selected. The 'Network Protocols' list is empty. The 'Add..' button is highlighted with a dotted border. The 'Description:' text area is empty. The 'Close' and 'Cancel' buttons are at the bottom right.</p>

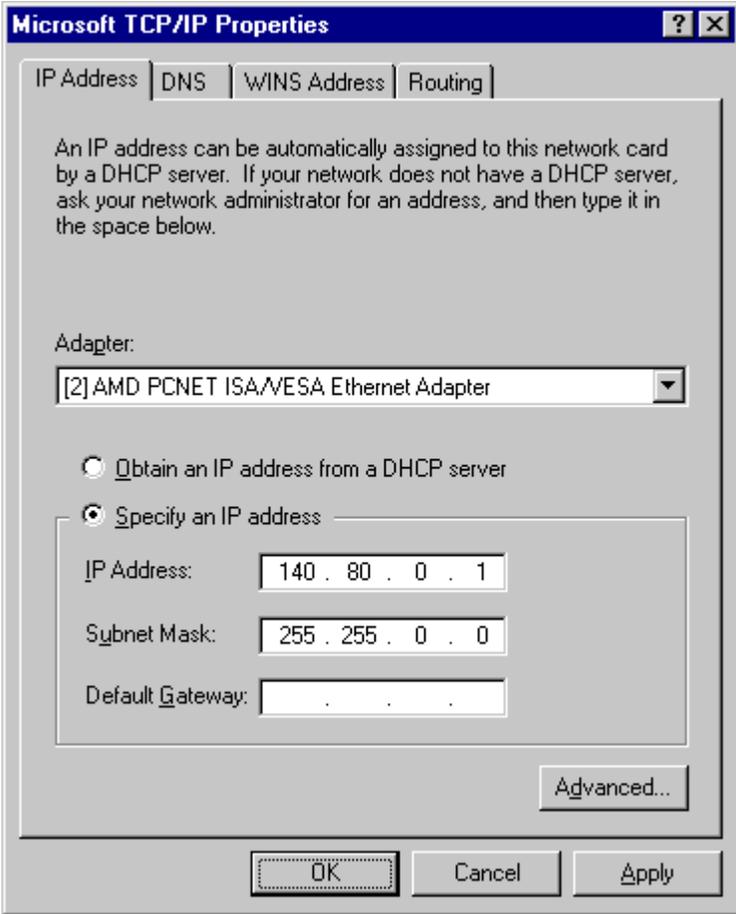
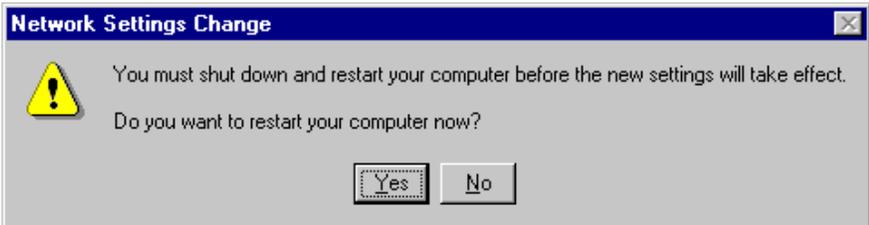
Step	D: Installing the Communication Protocol
2	<p>This opens the <i>Select Network Protocol</i> dialog box.</p> <p>From the <i>Network Protocol</i> list, select the entry <i>TCP/IP Protocol</i>. Close the <i>Select Network Protocol</i> dialog box by clicking on <i>OK</i>.</p> 
3	<p>The <i>TCP/IP Setup</i> dialog box will be displayed.</p> <p>Answer the question if the configuration data for the <i>TCP/IP Protocol</i> are to be retrieved from a DHCP server with <i>No</i>.</p> 
4	<p>The <i>Windows NT Setup</i> dialog box will be displayed. This dialog box informs you that some Windows NT files must be copied for the installation of the <i>TCP/IP Protocol</i>. In the input field at the bottom, specify the path in which the appropriate files can be found. Normally, this is the path to the CD-ROM drive (if the files are copied from a Windows NT Installation CD-ROM). Conclude the <i>Windows NT Setup</i> by clicking on the <i>Continue</i> button.</p> 

Step	D: Installing the Communication Protocol
5	<p>After the installation of the <i>TCP/IP Protocol</i> is complete, it will be displayed in the <i>Network Protocols</i> field of the <i>Protocols</i> tab.</p> 

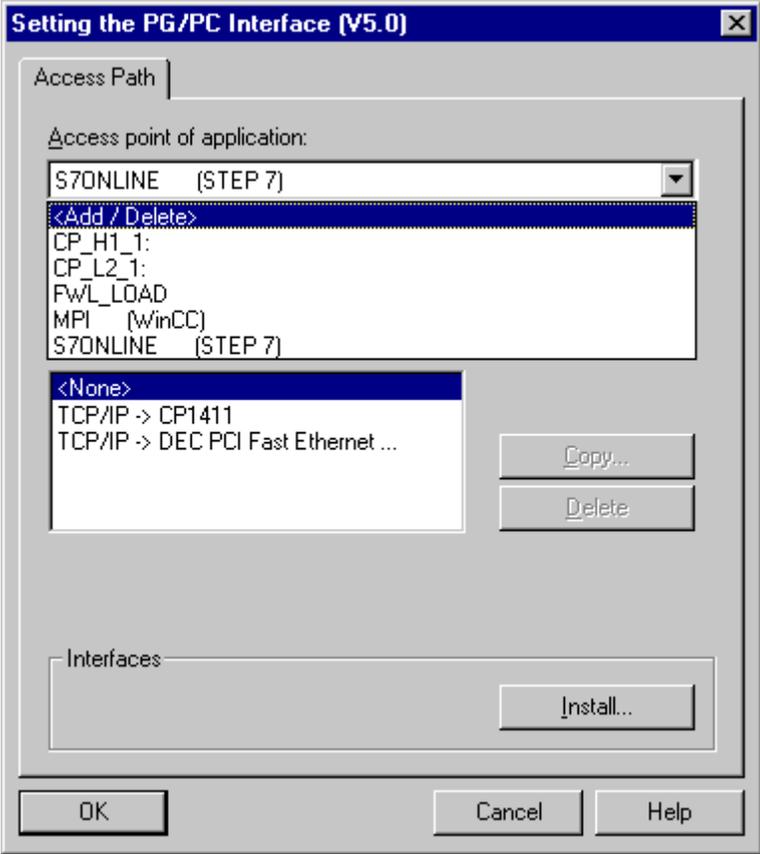
E: Configuring the Bindings

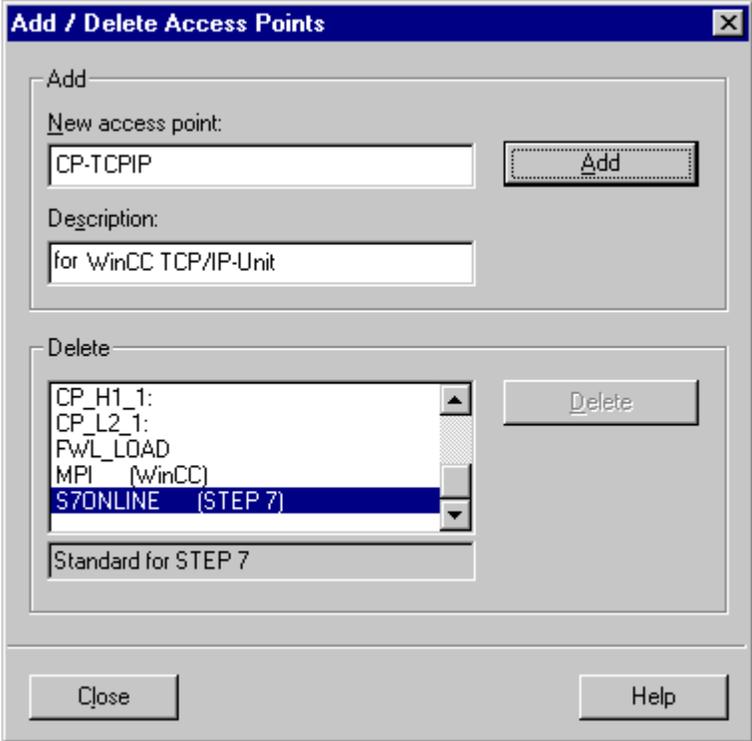
Step	E: Configuring the Bindings
1	<p>The bindings of the communication processor <i>CP 1411</i> must be configured. This is done in the <i>Bindings</i> tab of the <i>Network</i> dialog box.</p> <p>In the <i>Show Bindings for:</i> field, select the entry <i>all adapters</i>.</p> <p>Select all protocols to be used by the communication processor <i>CP 1411</i>. In this sample, the communication processor only communicates via the <i>TCP/IP Protocol</i>. For this purpose, all available protocols except for the <i>TCP/IP Protocol</i> must be disabled for the <i>AMD PCNET ISA/VESA Ethernet-Adapter</i> entry.</p> <p>A protocol is disabled via the <i>Disable</i> button. Disabled protocols are marked as follows:</p> 

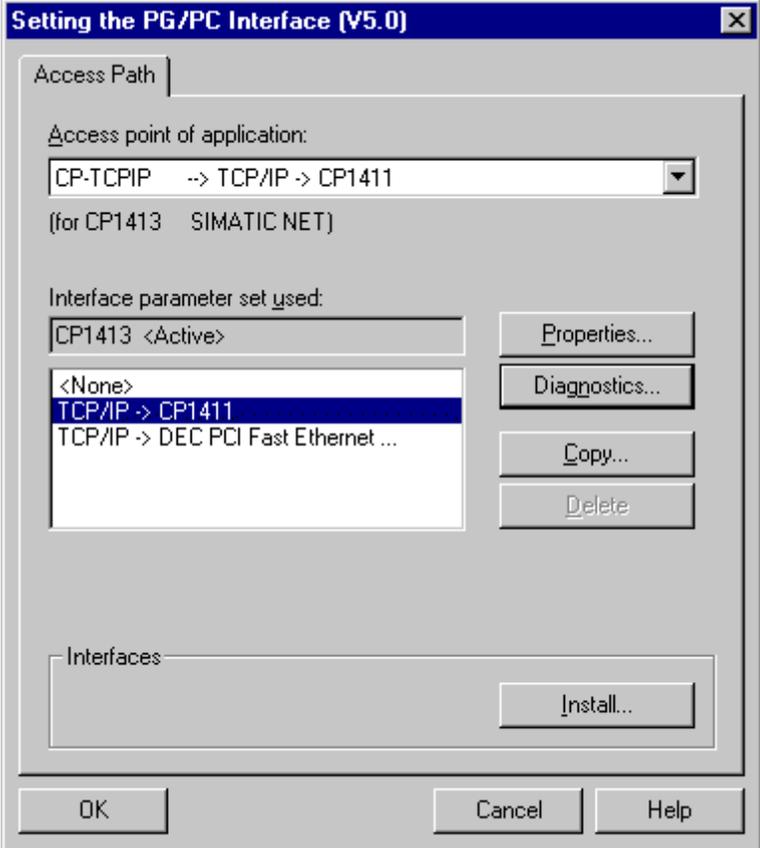
Step	E: Configuring the Bindings
	<p>Close the Network dialog box by clicking on the <i>OK</i> button.</p> <div><p>Network [?] [X]</p><p>Identification Services Protocols Adapters Bindings</p><p>Network bindings are connections between network cards, protocols, and services installed on this computer. You can use this page to disable network bindings or arrange the order in which this computer finds information on the network.</p><p>Show Bindings for: all adapters</p><ul style="list-style-type: none">[+] [1] DEC PCI Fast Ethernet DECchip 21140[-] [2] AMD PCNET ISA/VESA Ethernet-Adapter<ul style="list-style-type: none">TCP/IP-Protokoll<ul style="list-style-type: none">[+] [X] WINS-Client (TCP/IP)<p>Enable Disable Move Up Move Down</p><p>OK Cancel</p></div>

Step	E: Configuring the Bindings
2	<p>The properties dialog box of the TCP/IP Protocol will be displayed.</p> <p>In the <i>Adapter</i> field of the <i>IP Address</i> tab, set the entry <i>AMD PCNET ISA/VESA Ethernet-Adapter</i> for the communication processor <i>CP 1411</i>.</p> <p>The radio-button <i>Specify an IP address</i> is selected to specify an <i>IP Address</i> and <i>Subnet Mask</i>. The same <i>Subnet Mask</i> must also be specified in the configuration of the PLC's <i>CP 443-1 TCP</i> communication processor.</p> <p>Close the properties dialog box of the <i>TCP/IP Protocol</i> by clicking on <i>OK</i>.</p> 
3	<p>The installation and settings made require a restart of the computer. Acknowledge the dialog box displayed by clicking on <i>Yes</i>.</p> 

F: Creating an Access Point

Step	F: Creating an Access Point
1	<p>Creation of an access point for the communication processor <i>CP 1411</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>The dialog box for adding a new access point is opened via the <i>Add/Delete</i> entry from the <i>Access Point of the Application</i> list-box.</p> 

Step	F: Creating an Access Point
3	<p>The dialog box <i>Add/Delete Access Points</i> will be displayed.</p> <p>In the <i>New Access Point</i> field, enter the name of the new access point. For this sample, the name <i>CP-TCPIP</i> is entered. The access point CP-TCPIP is the default access point used by WinCC for the communication via the <i>TCP/IP Protocol</i>. In the <i>Description</i> field, additional information about the access point can be entered.</p> <p>The access point is created via the <i>Add</i> button. The access point will then be displayed in the list of available access points.</p> <p>Exit the dialog box <i>Add/Delete Access Points</i> by clicking on the <i>Close</i> button.</p> 

Step	F: Creating an Access Point
4	<p>In the program <i>Setting the PG/PC Interface</i>, assign the communication processor <i>CP 1411</i> to the new access point.</p> <p>To do so, set the <i>CP-TCPIP</i> entry in the <i>Access Point of the Application</i> field. In the field below, select the entry <i>TCP/IP -> CP1411</i>. This completes the assignment between the access point and the communication processor.</p> <p>Exit the program <i>Setting the PG/PC Interface</i> via the <i>OK</i> button. This concludes the installations and settings required for the operation of the <i>CP 1411</i>.</p> 

4.2 Creation of the STEP7 Project S7_IETCP

The following description details the configuration steps necessary to create and start up the STEP7 project *S7_IETCP*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to create the STEP7 project *S7_IETCP*:

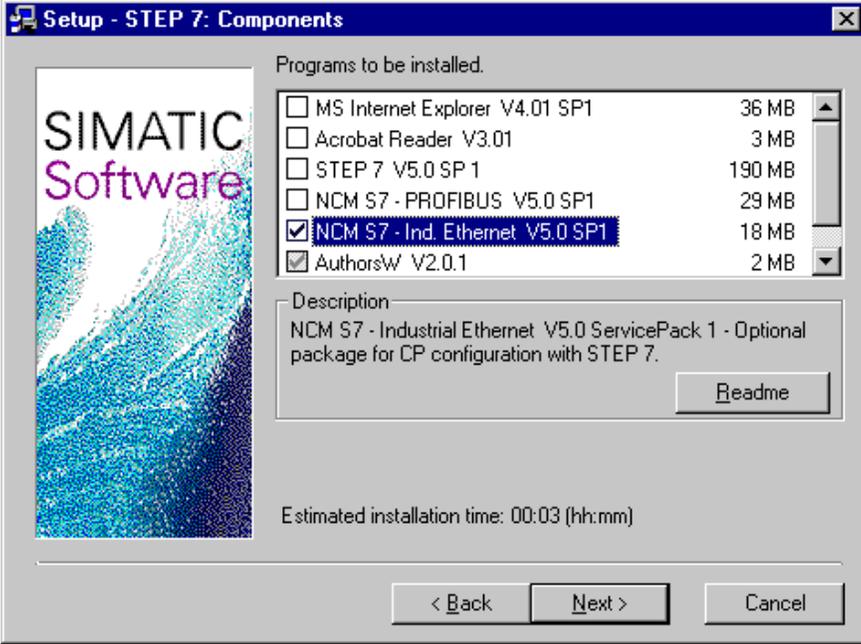
- A: Installing the Hardware
- B: Installing the Option Package
- C: Creating the STEP7 Project
- D: Configuring the Hardware
- E: Loading the Hardware Configuration
- F: Testing the Hardware Configuration
- G: Creating the STEP7 Program
- H: Testing the STEP7 Program

A: Installing the Hardware

Step	A: Installing the Hardware
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 407 10A</i>, the CPU module <i>CPU 416-1</i> and the communication processor <i>CP 443-1 TCP</i>.</p> <p>Establishing the connection from the computer to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 1411</i> in the computer to the communication processor <i>CP 443-1 TCP</i> in the PLC.</p>

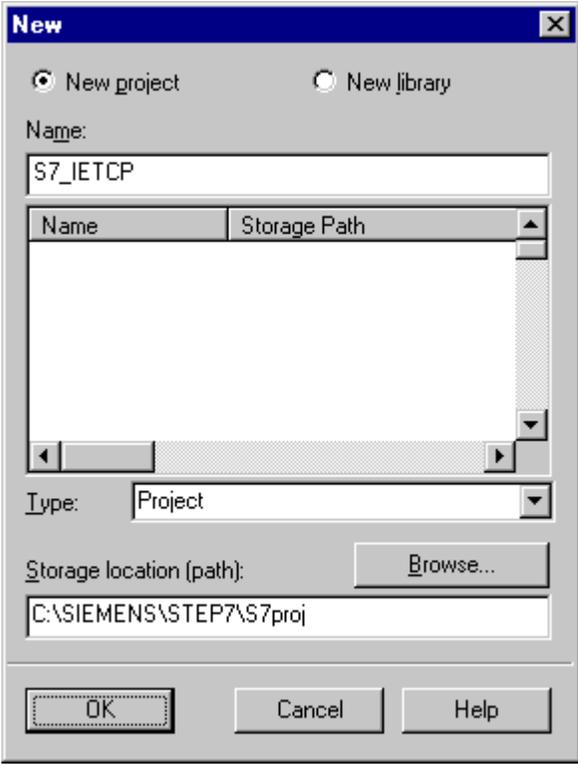
B: Installing the Option Package

Step	B: Installing the Option Package
1	<p>If the option package <i>NCM S7 Industrial Ethernet</i> has not been installed during the installation of <i>STEP7</i>, install it now from the <i>STEP7</i> CD-ROM. This option package is required for the configuration of the communication processor <i>CP 443-1 TCP</i> via the <i>STEP7</i> software.</p> <p>After inserting the <i>STEP7</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <div style="text-align: center;">  setup.exe </div>

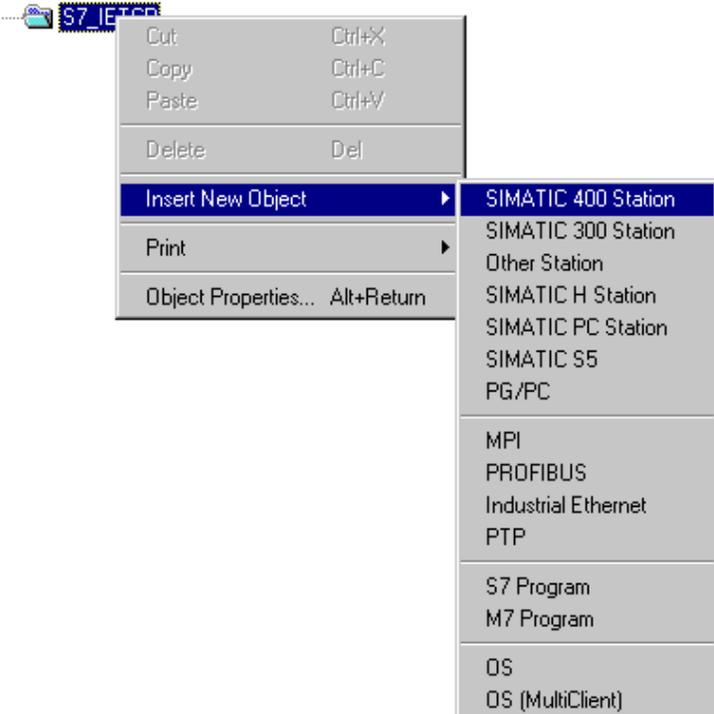
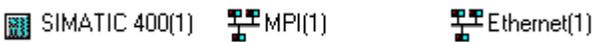
Step	B: Installing the Option Package
2	<p>This starts the installation program.</p> <p>Follow the instructions of the installation program. On the <i>Components</i> page, select the check-box <i>NCM S7 Ind. Ethernet</i>. Finish the installation.</p> 

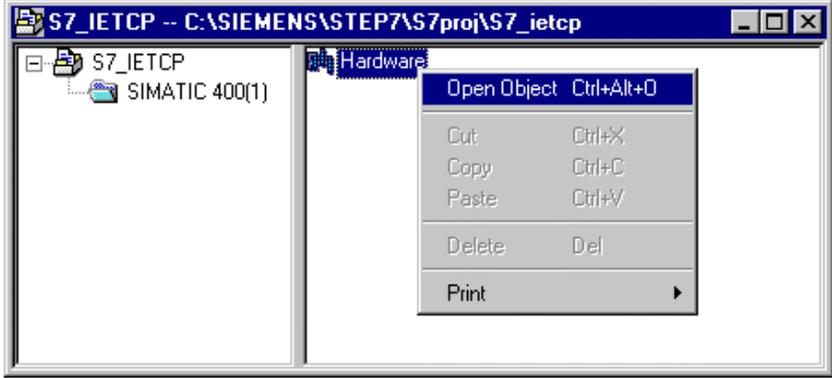
C: Creating the STEP7 Project

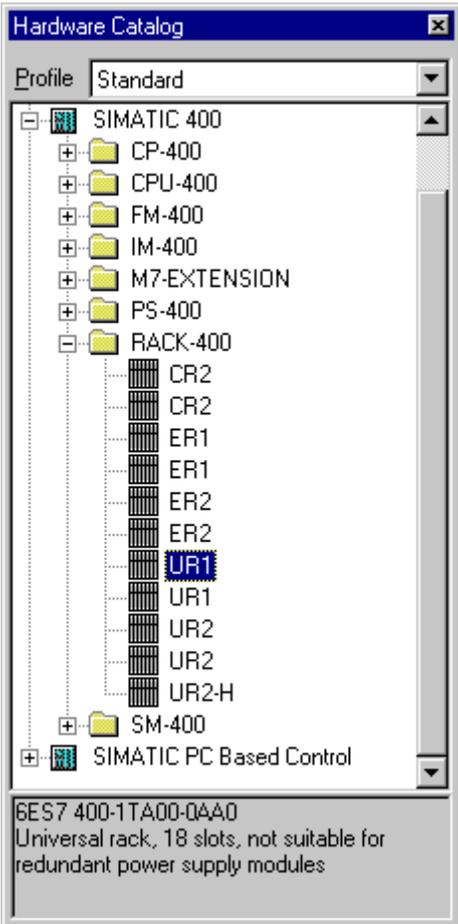
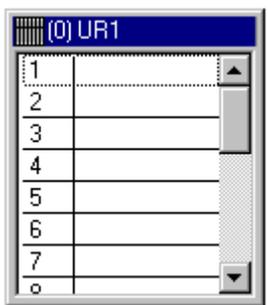
Step	C: Creating the STEP7 Project
1	<p>Create a new STEP7 project in the <i>SIMATIC Manager</i>.</p> <p>It is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC Manager</i>.</p>  <p>SIMATIC Manager</p>

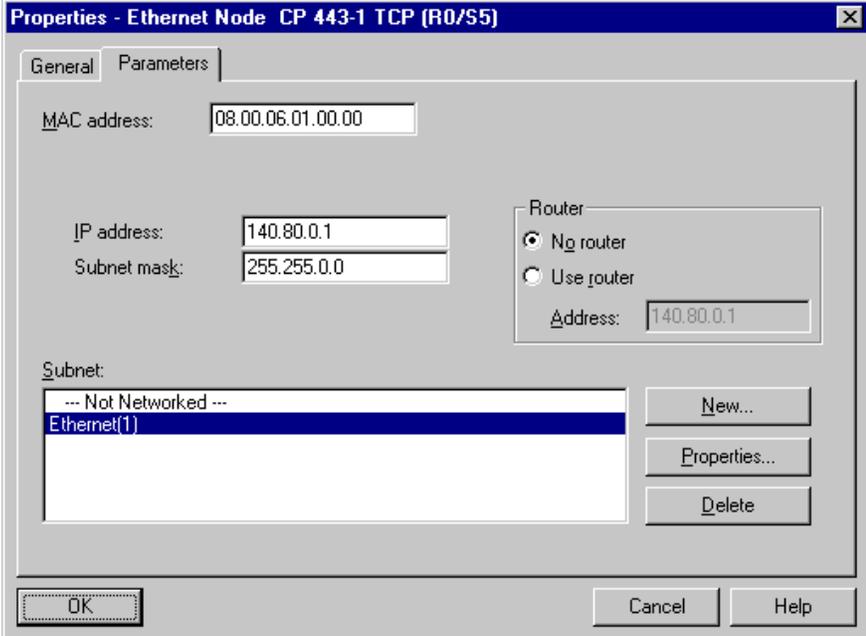
Step	C: Creating the STEP7 Project
2	<p>This displays the <i>SIMATIC Manager</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the parameters of a new STEP7 project will be opened.</p> <p>The <i>New</i> dialog box will be displayed.</p> <p>The radio-button <i>New Project</i> must be selected. In the <i>Name</i> field, the name of the new project to be created is entered. The names of the STEP7 projects created within the framework of this manual all start with <i>S7</i>. They also include a reference to the communication type used. The project of this sample has the name <i>S7_IETCP</i>.</p> <p>By default, projects are stored in the <i>C:\SIEMENS\STEP7\S7proj</i> folder. This can be changed at any time via the <i>Browse</i> button.</p> <p>The <i>New</i> dialog box is closed via the <i>OK</i> button.</p> 

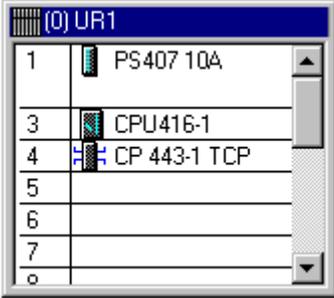
D: Configuring the Hardware

Step	D: Configuring the Hardware
1	<p>The new project will be displayed in the <i>SIMATIC Manager</i>.</p> <p>The hardware for this project must be configured. Two components are needed: One <i>SIMATIC 400-Station</i> and for its networking an <i>Industrial Ethernet</i>.</p> <p>These components are added to the <i>SIMATIC Manager</i> via a  on the project name <i>S7_IETCP</i> and then selecting <i>Insert New Object</i> → <i>SIMATIC 400-Station</i> and <i>Insert New Object</i> → <i>Industrial Ethernet</i> from the pop-up menu.</p> 
2	<p>The just added components will be displayed in the right window of the <i>SIMATIC Manager</i>.</p> 

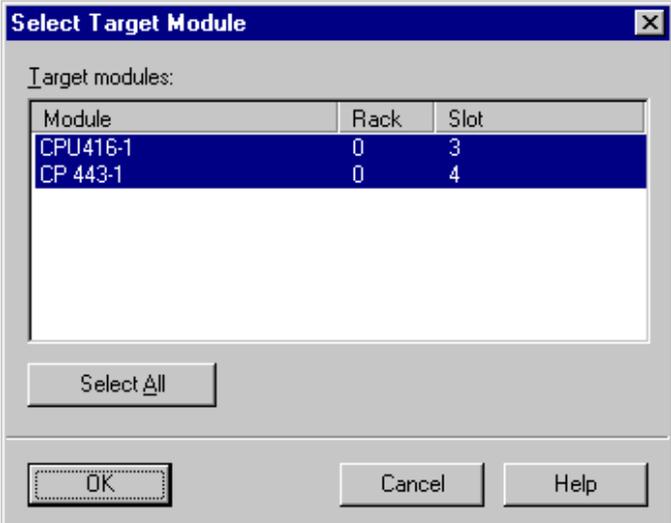
Step	D: Configuring the Hardware
	<p>By  on the component <i>SIMATIC 400(1)</i> in the right window, the point <i>Hardware</i> will be displayed. By  on the point <i>Hardware</i> or  on it and then selecting <i>Open Object</i> from the pop-up menu, the program <i>HW Config</i> will be started.</p> 
3	<p>The program <i>HW Config</i> will be displayed.</p> <p>This program is used to exactly define the hardware used in the PLC and to configure their properties.</p>  <p>HW Konfig</p>
4	<p>By clicking on the toolbar button of the program <i>HW Config</i> displayed below, the <i>Hardware Catalog</i> is opened. This catalog is used to select the required hardware components.</p>  <p>Catalog</p>

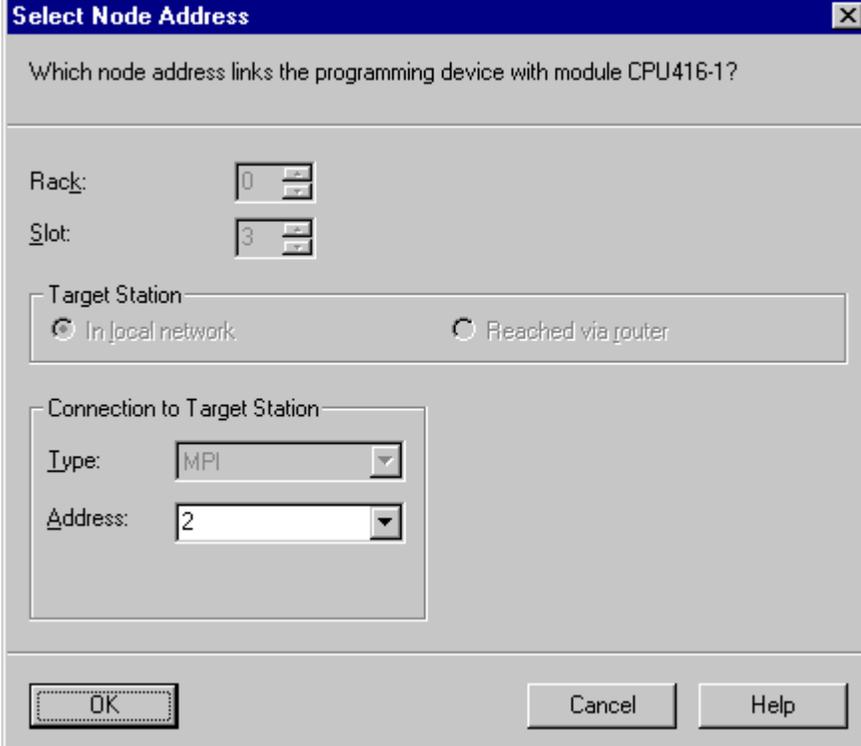
Step	D: Configuring the Hardware
5	<p>The <i>Hardware Catalog</i> will be displayed.</p> <p>The first component selected is the rack. On this rack, all other components will be installed. The rack is inserted into the project via a  or by Dragging Dropping. In this sample, the rack type <i>UR1</i> is used.</p> 
6	<p>The program <i>HW Config</i> will display the currently still empty rack. It received the Rack Number <i>0</i>. During the configuration of the connection in the WinCC project, the Rack Number is one of the parameters that must be set.</p> 
7	<p>Arrange the other hardware components in the rack. This is done by Dragging Dropping the desired components from the <i>Hardware Catalog</i> to the corresponding slot in the rack.</p>

Step	D: Configuring the Hardware
	<p>This sample uses the power supply <i>PS 407 10A</i>. It is inserted into slot <i>1</i>. A power supply of this type occupies two slots.</p> <p>As the CPU module, this sample uses a <i>CPU 416-1</i>. This module is inserted into slot <i>3</i>. Another parameter to be set during the configuration of the connection in the WinCC project is the slot number of the CPU module.</p> <p>We also require the communication processor <i>CP 443-1 TCP</i>. This CP is only available from the <i>Hardware Catalog</i> if the option package <i>NCM S7 Industrial Ethernet</i> has been installed. After the communication processor <i>CP 443-1 TCP</i> has been inserted in the rack, its properties dialog box will open.</p>
8	<p>The properties dialog box of the communication processor <i>CP 443-1 TCP</i> will be displayed.</p> <p>In the MAC Address field of the Parameters tab, enter the desired Ethernet address of the communication processor. However, the settings relevant for the communication via the TCP/IP Protocol are the IP Address and the Subnet Mask.</p> <p>During the configuration of the connection in the WinCC project, the IP Address of the communication processor <i>CP 443-1 TCP</i> is another parameter that has to be set. The value set for the <i>Subnet Mask</i> must be the same value that has been set for the Subnet Mask during the installation of the communication processor <i>CP 1411</i>.</p> <p>In the <i>Subnet</i> field below, assign the entry <i>Ethernet(1)</i> to the communication processor. Close the dialog box by clicking on <i>OK</i>.</p> 

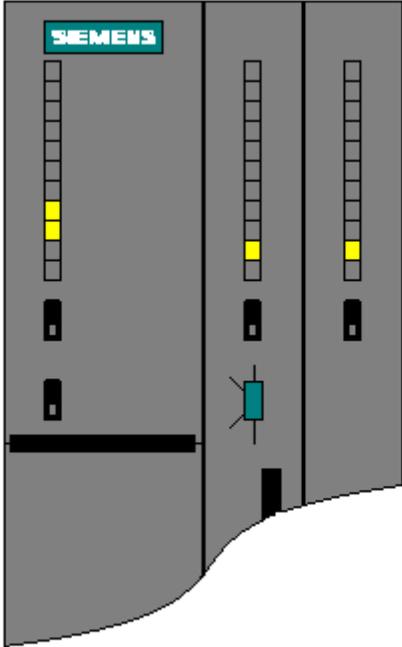
Step	D: Configuring the Hardware
9	<p>The following graphic shows the completed hardware arrangement of the sample.</p> 
10	<p>Save the settings made in the program <i>HW Config</i>. This is done via the toolbar button displayed below.</p> 

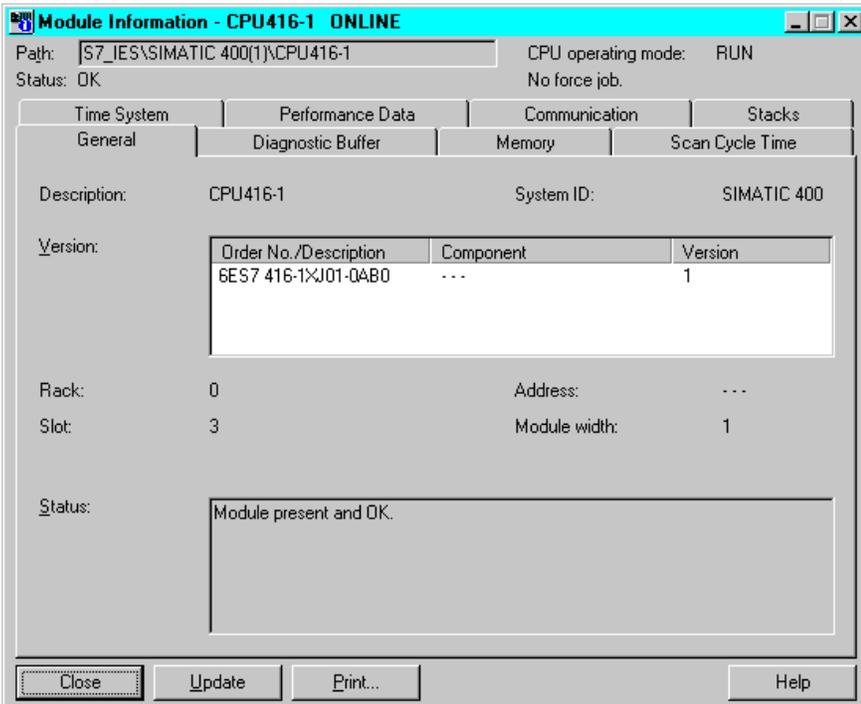
E: Loading the Hardware Configuration

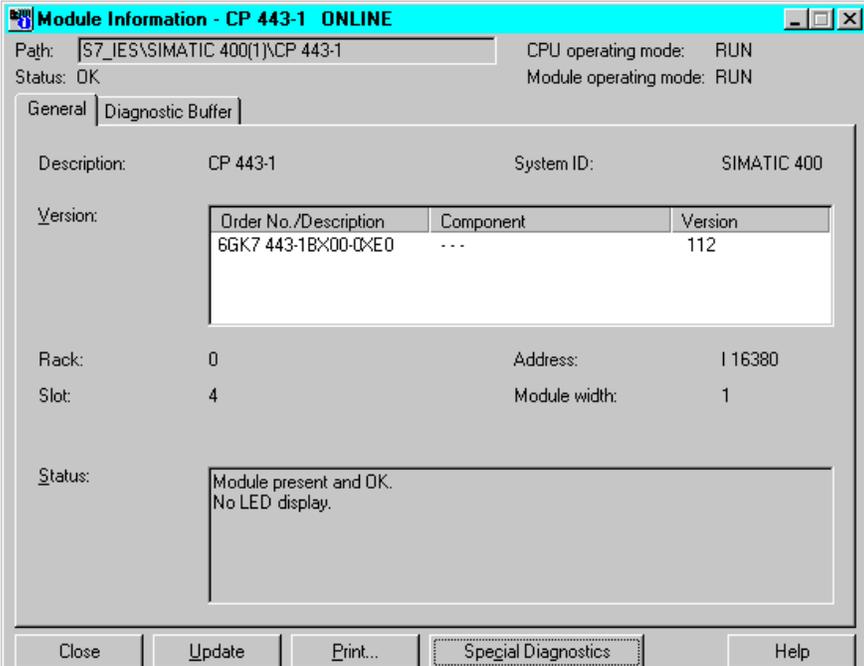
Step	E: Loading the Hardware Configuration
1	<p>The hardware configuration created in the program <i>HW Config</i> must be transferred to the PLC.</p> <p>This is done via the toolbar button displayed below.</p> 
2	<p>A dialog box will be displayed from which the components to be loaded can be selected.</p> <p>For this sample, all displayed components will be selected. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>. Close the dialog box by clicking on <i>OK</i>.</p> 

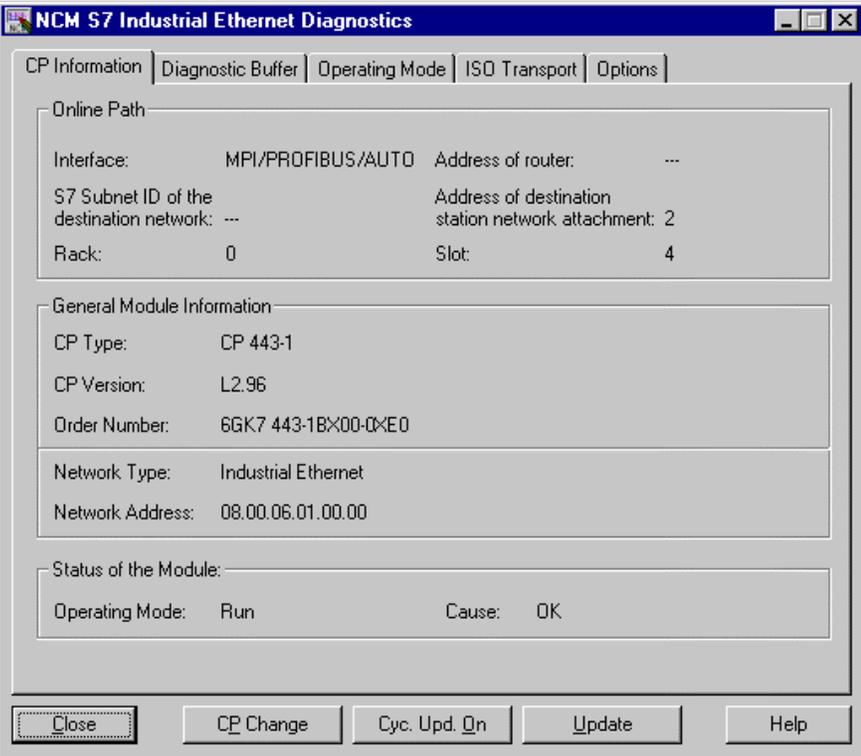
Step	E: Loading the Hardware Configuration
3	<p>Now the dialog box <i>Select Station Address</i> will be displayed.</p> <p>In this dialog box, specify which station address is used by the STEP7 software to communicate with the CPU module. In this sample, the communication is carried out via the MPI interface. The <i>Address</i> of the CPU module is 2.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>The configuration data will now be transferred to the PLC. If necessary, the individual modules will be set to the STOP status.</p> <p>The program <i>HW Config</i> can be exited. The newly added components will be displayed by the <i>SIMATIC Manager</i> for the station <i>SIMATIC 400(1)</i>.</p> 

F: Testing the Hardware Configuration

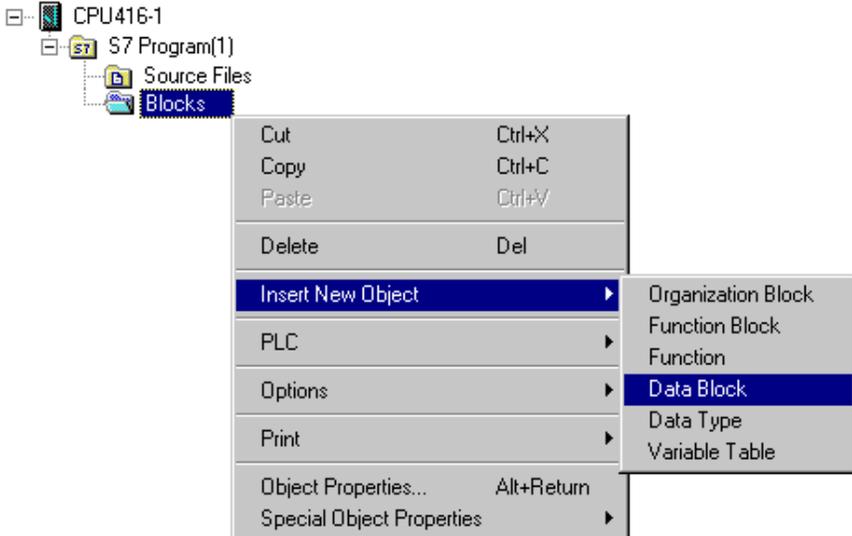
Step	F: Testing the Hardware Configuration
1	<p>Testing of the hardware configuration made.</p> <p>If the key switch of the CPU module is set to <i>RUN</i> or <i>RUN-P</i> and the operating mode switch of the communication processor is set to <i>RUN</i>, only the status LEDs signifying the <i>RUN</i> operating mode should be displayed.</p> <p>If this is not the case, there is an error. The following steps help you localize this error. However, these steps should still be performed even if the status LEDs show no error. This allows you to recognize uncritical errors and faulty configurations.</p> 

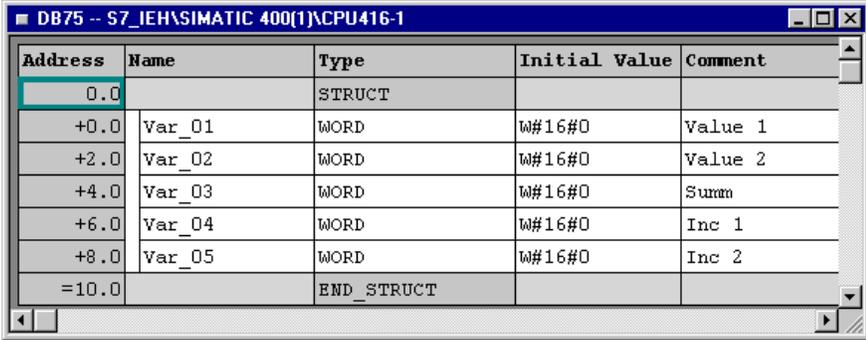
Step	F: Testing the Hardware Configuration
2	<p>Testing the configuration of the CPU module.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the CPU module in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the CPU module will be displayed.</p> <p>The <i>General</i> tab displays various general data of the CPU module. In the <i>Status</i> field, the current module status and any existing errors are displayed.</p> <p>The <i>Diagnosis Buffer</i> tab contains more detailed information about existing errors and how to correct them.</p> <p>The dialog box can be exited via the <i>Close</i> button.</p> 

Step	F: Testing the Hardware Configuration
3	<p>Testing the configuration of the communication processor.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the communication processor in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the communication processor will be displayed. The <i>General</i> tab displays various general data of the module.</p> <p>A dialog box for a more detailed diagnosis of the communication processor can be accessed via the <i>Special Diagnosis</i> button.</p> 

Step	F: Testing the Hardware Configuration
4	<p>The dialog box <i>NCM S7 Industrial Ethernet Diagnosis</i> will be displayed. The <i>CP Information</i> tab displays general information about the module. The dialog box can be exited via the <i>Close</i> button. The Module Status dialog box can also be exited via the <i>Close</i> button.</p> 

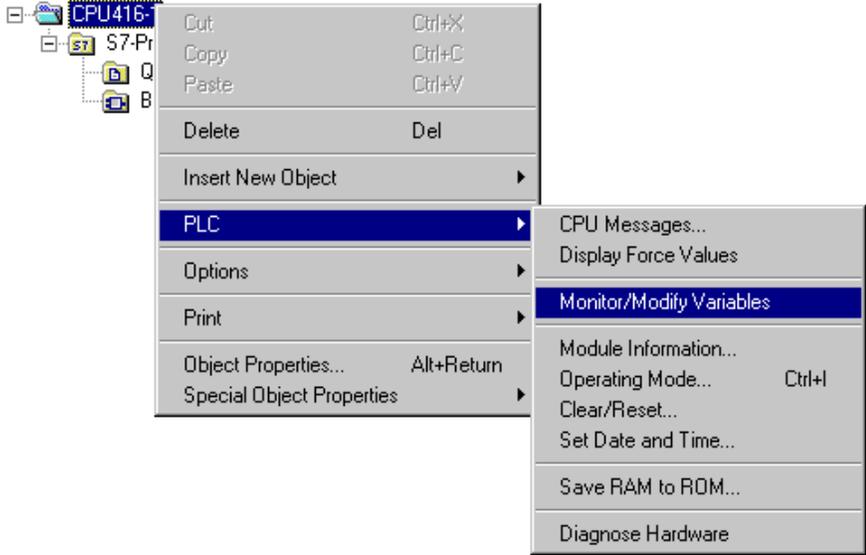
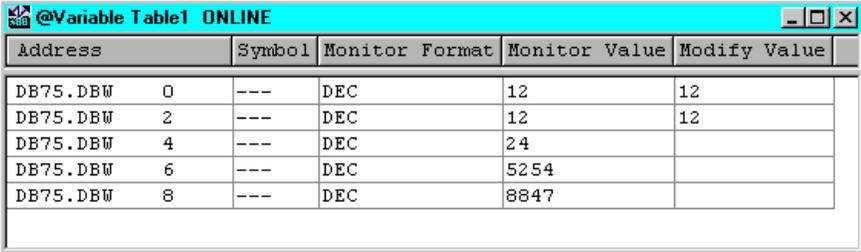
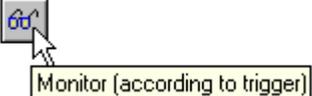
G: Creating the STEP7 Program

Step	G: Creating the STEP7 Program
1	<p>Creation of the <i>S7 Program</i>.</p> <p>This sample project requires the operation block <i>OBI</i> and a data block. <i>OBI</i> is available by default, the required data block must be created. This is done in the <i>SIMATIC Manager</i> via a  on the sub-entry <i>Modules</i> of the entry <i>S7 Program(1)</i> of the configured CPU module and then selecting <i>Insert New Object</i> → <i>Data Block</i> from the pop-up menu.</p> <p>The properties dialog box of the data block will be opened. As the block's Name enter <i>DB75</i> and close the dialog box with <i>OK</i>.</p> 
2	<p>The newly created data block <i>DB75</i> will be displayed in the right window of the project.</p> <p>Via a  on this data block or a  and then selecting <i>Open Object</i> from the pop-up menu, the content of the block can be programmed. This starts the program <i>LAD/STL/SCF</i>.</p> 

Step	G: Creating the STEP7 Program															
3	<p>The program <i>LAD/STL/SCF</i> is displayed.</p> <p>Acknowledge the dialog box <i>New Data Block</i> by clicking on <i>OK</i>.</p> 															
4	<p>Programming the <i>DB75</i>.</p> <p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits.</p> <p>Two additional tags with a length of 16 Bits are created, whose values are cyclically incremented in <i>OBI</i>.</p> <p>The tags created in the data block <i>DB75</i> are visualized in the WinCC project. To do so, WinCC tags with corresponding addresses are created there.</p> <p>The following graphic displays the programmed data block <i>DB75</i>.</p> 															
5	<p>Save the block and load it into the PLC. This is done via the toolbar button displayed below. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>.</p> 															
6	<p>Programming the <i>OBI</i>.</p> <p>Open the block in the program <i>LAD/STL/SCF</i>.</p> <p>First, two values in the <i>DB75</i> are added and then stored again in <i>DB75</i>.</p> <p>Netzwerk 1: Addition</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Adding two 16-Bit Values The result is stored in another 16-Bit Value</p> </div> <table border="1" style="margin: 5px 0;"> <tbody> <tr> <td>OPN</td> <td>DB</td> <td>75</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>0</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>2</td> </tr> <tr> <td>+I</td> <td></td> <td></td> </tr> <tr> <td>T</td> <td>DBW</td> <td>4</td> </tr> </tbody> </table> <p>Next, a value in the <i>DB75</i> is incremented every second.</p>	OPN	DB	75	L	DBW	0	L	DBW	2	+I			T	DBW	4
OPN	DB	75														
L	DBW	0														
L	DBW	2														
+I																
T	DBW	4														

Step	G: Creating the STEP7 Program
	<p>Network 2: Second Cycle</p> <p>Generation of a second cycle at M 0.0</p> <pre> AN M 0.0 L S5T#1S SD T 1 A T 1 = M 0.0 </pre> <p>Network 3: Counting in a second cycle</p> <p>Counting a value in a second cycle At 10000, reset to 0</p> <pre> AN M 0.0 JC M001 L DBW 6 L 1 +I T DBW 6 L 10000 <I JC M001 L 0 T DBW 6 M001: NOP 0 </pre> <p>Finally, a value in the <i>DB75</i> is incremented every time the <i>OB1</i> run.</p> <p>Network 4: Counting in the cycle time</p> <p>Counting a value each time the OB is executed At 10000, reset to 0</p> <pre> L DBW 8 L 1 +I T DBW 8 L 10000 <I JC M002 L 0 T DBW 8 M002: NOP 0 </pre>
7	<p>Save the block <i>OB1</i> and load it into the PLC. This is done via the corresponding buttons on the toolbar.</p> <p>This completes the creation of the STEP7 project and it can now be run. Exit the program <i>LAD/STL/SCF</i>.</p>

H: Testing the STEP7 Program

Step	H: Testing the STEP7 Program																																				
1	<p>Testing the program with the STEP7 software.</p> <p>For this purpose, a tag table is created. This is done in the <i>SIMATIC Manager</i> via a  on the entry of the configured CPU module and then selecting <i>Target System</i> → <i>Monitor/Control Tag</i> from the pop-up menu.</p> 																																				
2	<p>An editor for creating and using a tag table will be displayed.</p> <p>The following shows a completed tag table. In this table, enter all tags created in the <i>DB75</i>.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Symbol</th> <th>Monitor</th> <th>Format</th> <th>Monitor Value</th> <th>Modify Value</th> </tr> </thead> <tbody> <tr> <td>DB75.DBW 0</td> <td>---</td> <td>DEC</td> <td></td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 2</td> <td>---</td> <td>DEC</td> <td></td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 4</td> <td>---</td> <td>DEC</td> <td></td> <td>24</td> <td></td> </tr> <tr> <td>DB75.DBW 6</td> <td>---</td> <td>DEC</td> <td></td> <td>5254</td> <td></td> </tr> <tr> <td>DB75.DBW 8</td> <td>---</td> <td>DEC</td> <td></td> <td>8847</td> <td></td> </tr> </tbody> </table>	Address	Symbol	Monitor	Format	Monitor Value	Modify Value	DB75.DBW 0	---	DEC		12	12	DB75.DBW 2	---	DEC		12	12	DB75.DBW 4	---	DEC		24		DB75.DBW 6	---	DEC		5254		DB75.DBW 8	---	DEC		8847	
Address	Symbol	Monitor	Format	Monitor Value	Modify Value																																
DB75.DBW 0	---	DEC		12	12																																
DB75.DBW 2	---	DEC		12	12																																
DB75.DBW 4	---	DEC		24																																	
DB75.DBW 6	---	DEC		5254																																	
DB75.DBW 8	---	DEC		8847																																	
3	<p>Monitoring the current tag values.</p> <p>By clicking on the toolbar button displayed below, the current values of the corresponding tags in the PLC are displayed in the column <i>Status Value</i>.</p>  <p>Controlling the tag values.</p> <p>Values can be entered in the column <i>Control Value</i>. By clicking on the toolbar button displayed below, these values will be written to the corresponding tags in the PLC.</p>																																				

Step	H: Testing the STEP7 Program
	<p>Note that tags can only be controlled while the operating mode switch of the CPU module is set to <i>RUN-P</i>.</p> 
4	<p>The created tag table can now be saved.</p> <p>In this sample, the table is saved under the name <i>VAT1</i>. After checking the program in the PLC, the tag table can be closed. This concludes the configuration of the STEP7 project and the <i>SIMATIC Manager</i> can be exited.</p> 

4.3 Creation of the WinCC Project WinCC_S7_IETCP

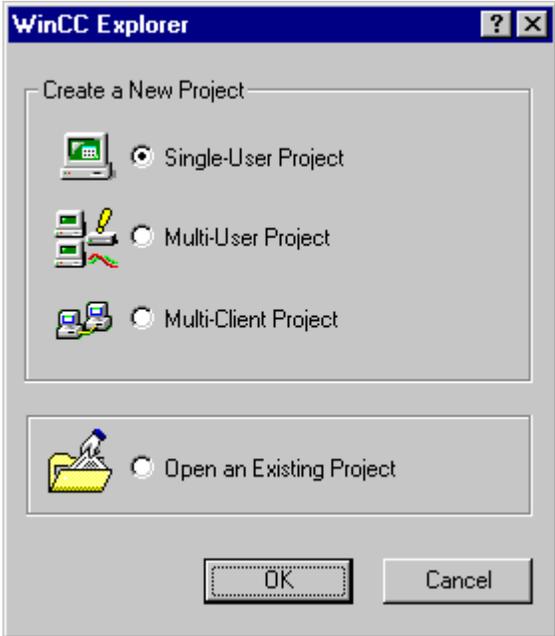
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S7_IETCP*.

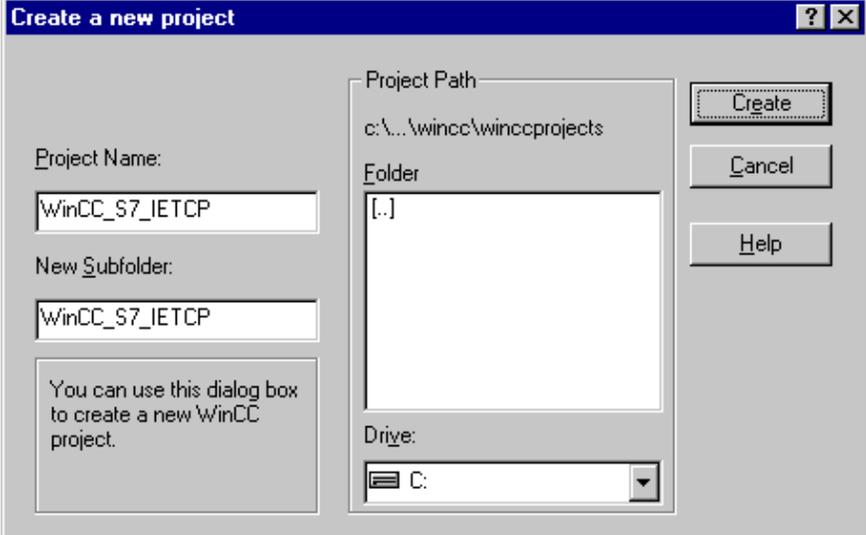
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_S7_IETCP*:

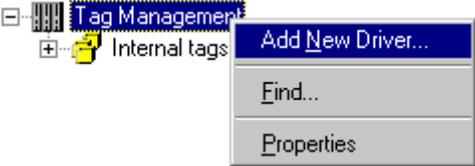
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Tags
- D: Creating the WinCC Screen

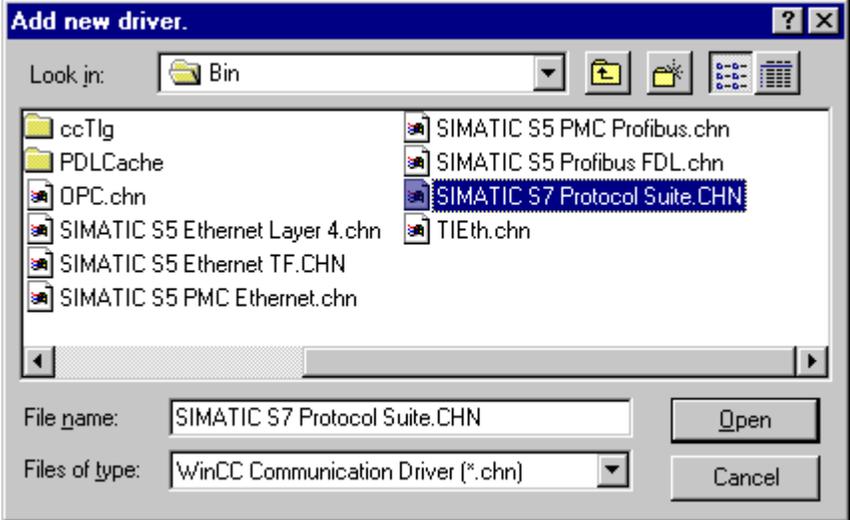
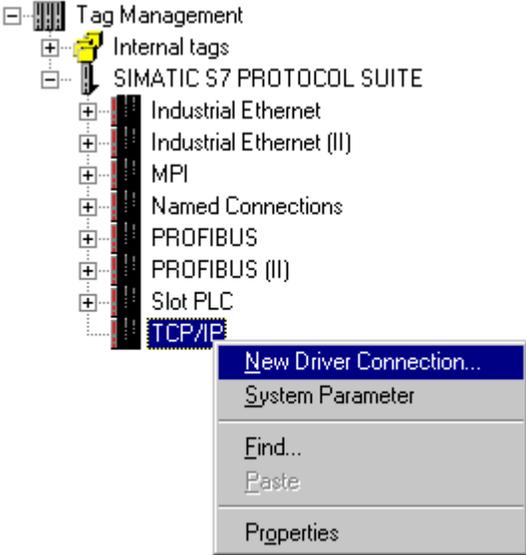
A: Creating the WinCC Project

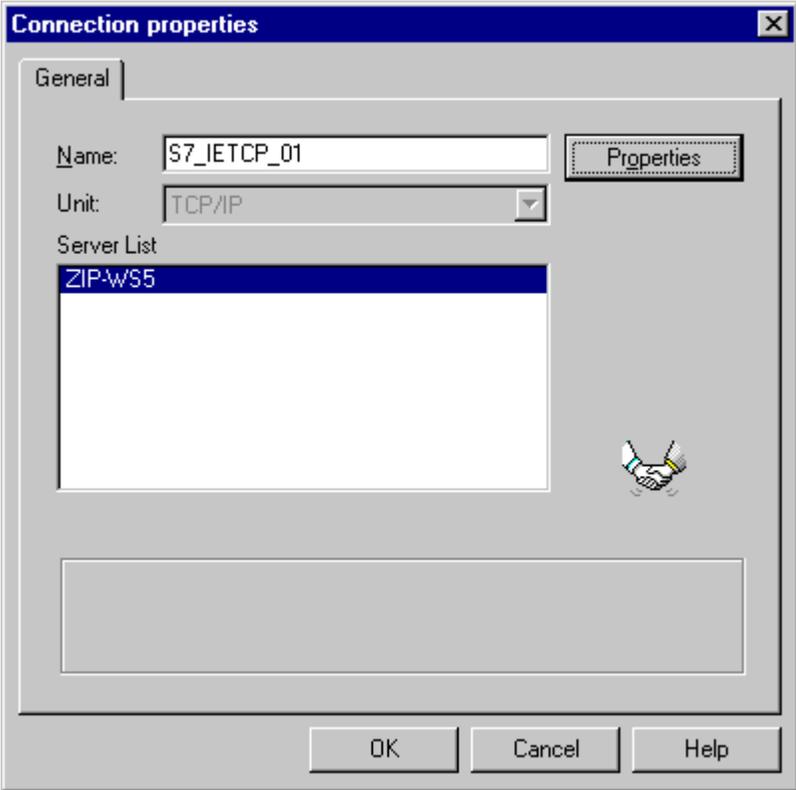
Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>This will display the <i>WinCC Explorer</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened. For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

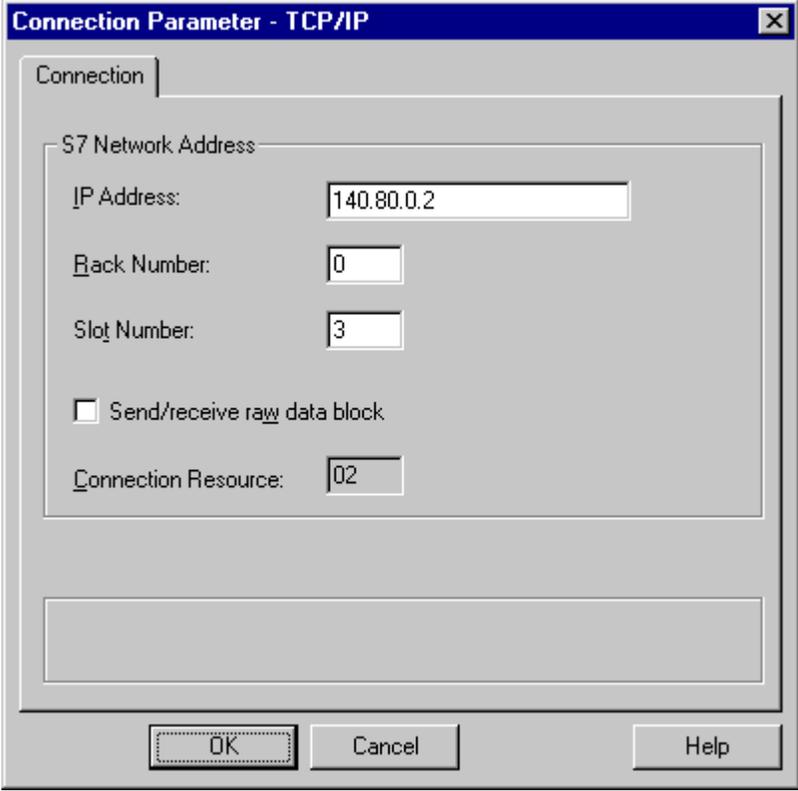
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S7_IETCP</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

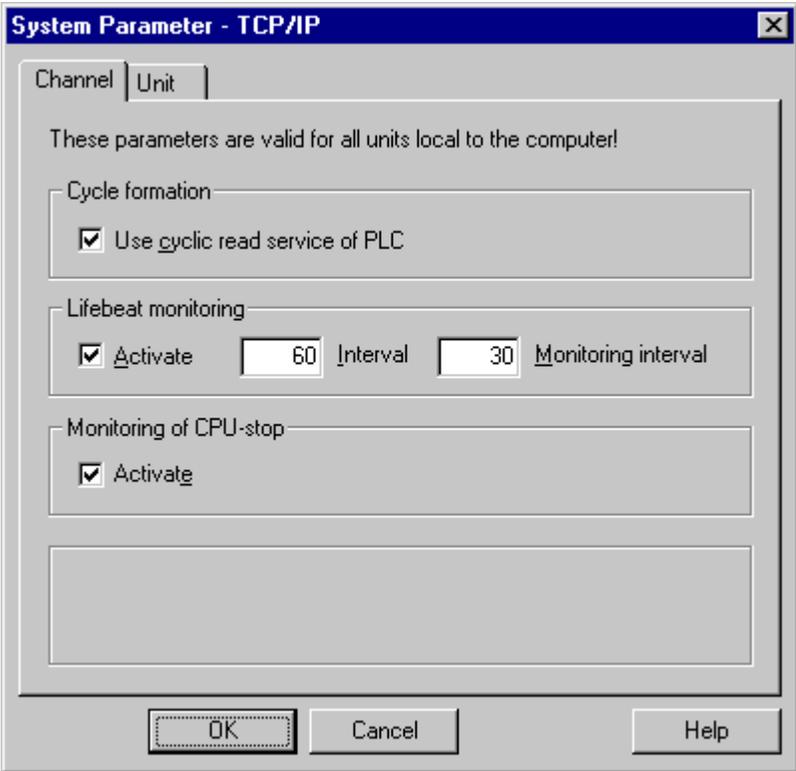
B: Creating the Connection

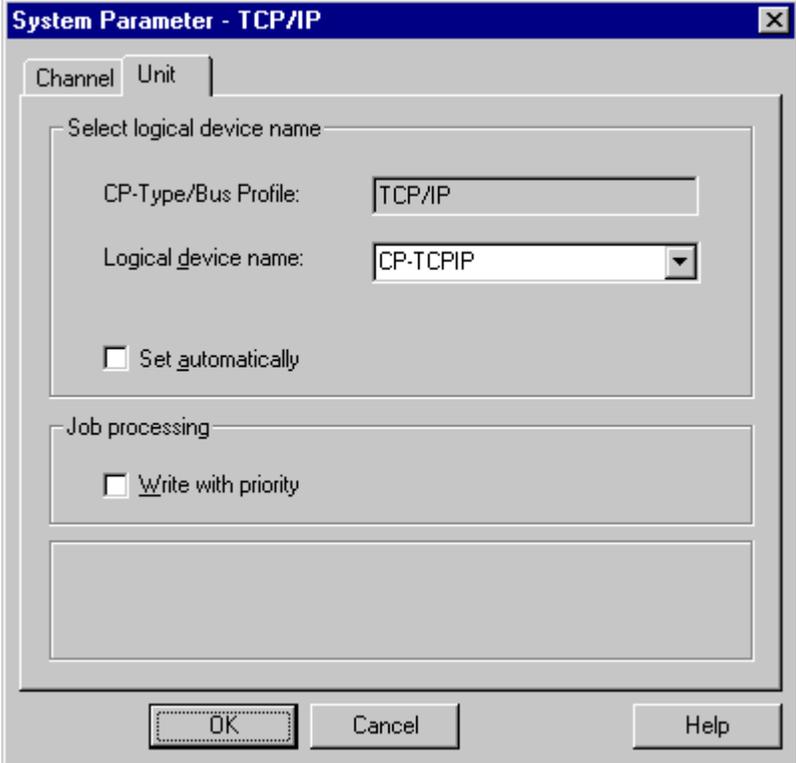
Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. For the communication to the <i>SIMATIC S7</i>, the driver <i>SIMATIC S7 Protocol Suite</i> is required. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added driver <i>SIMATIC S7 Protocol Suite</i> will be displayed as a sub-entry to Tag Management.</p> <p>The driver contains eight different channel units. In this sample, the channel unit <i>TCP/IP</i> is used. Create a new connection for this channel unit by  on <i>TCP/IP</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> 

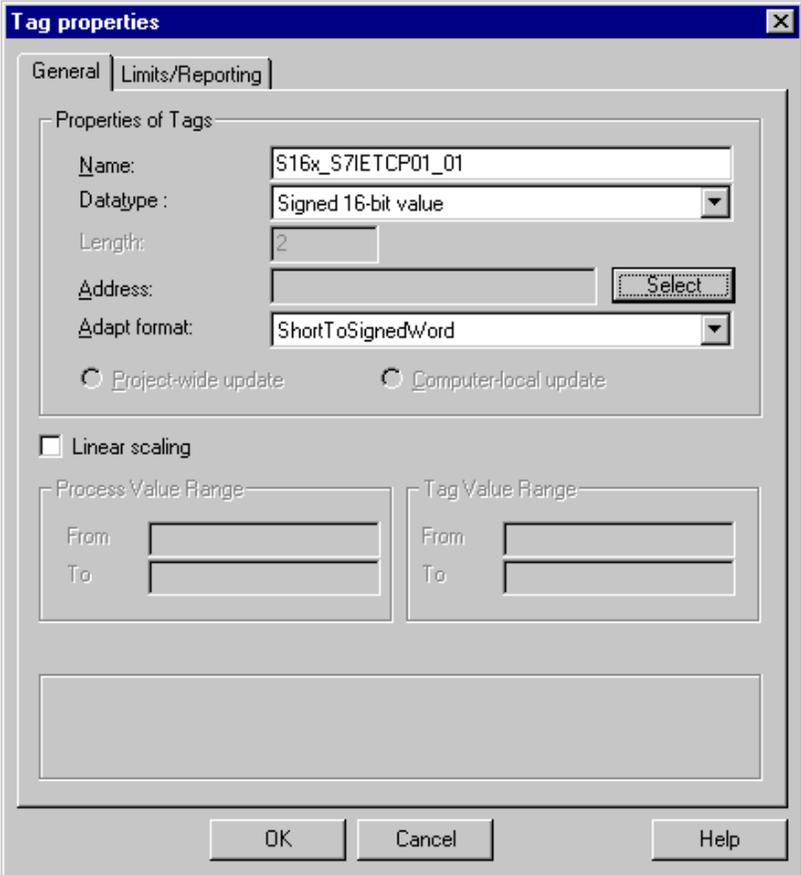
Step	B: Creating the Connection
4	<p>The properties dialog box of the connection will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered. In this sample, this is <i>S7_IETCP_01</i>.</p> <p>Click on the <i>Properties</i> button to define the connection properties.</p> 

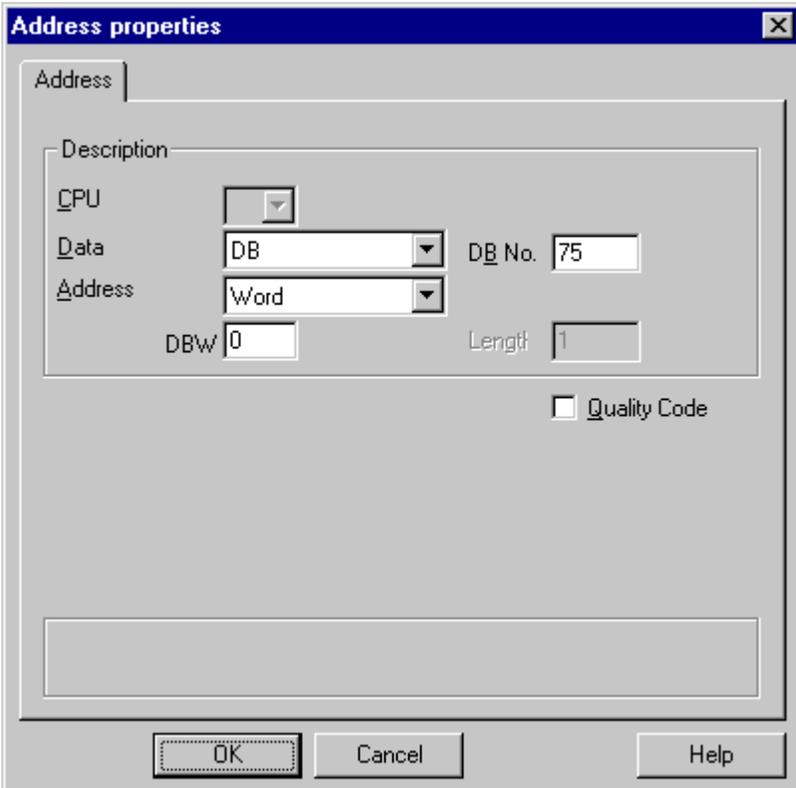
Step	B: Creating the Connection
5	<p>The dialog box Connection Properties will be displayed.</p> <p>In the IP Address field, enter the address that has been set for the communication processor <i>CP 443-1 TCP</i>. For this sample, this is the address <i>140.80.0.2</i>.</p> <p>Additionally, the Rack Number and Slot Number of the CPU module to be accessed must be entered. Make sure that the values of the CPU module are entered here and not the values of the communication processor.</p> <p>Close the dialog box by clicking on <i>OK</i>. Also close the <i>Connection Properties</i> dialog box by clicking on <i>OK</i>.</p> 

Step	B: Creating the Connection
6	<p>Setting the system parameters of the <i>TCP/IP</i> channel unit.</p> <p>These settings are made in the <i>System Parameters</i> dialog box accessed via a  R on the <i>TCP/IP</i> entry and then selecting <i>System Parameters</i> from the pop-up menu.</p> <p>In the <i>Channel</i> tab, various settings pertaining to the communication and monitoring a communication can be made. These settings will apply to all channel units of the communication driver.</p> 

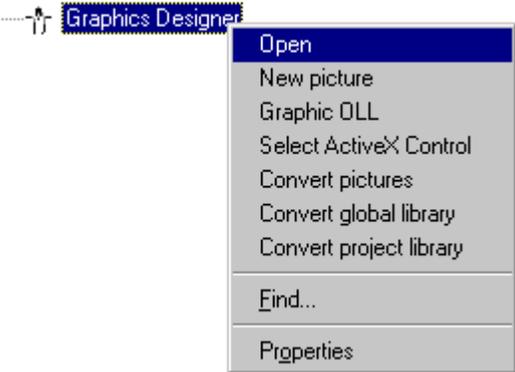
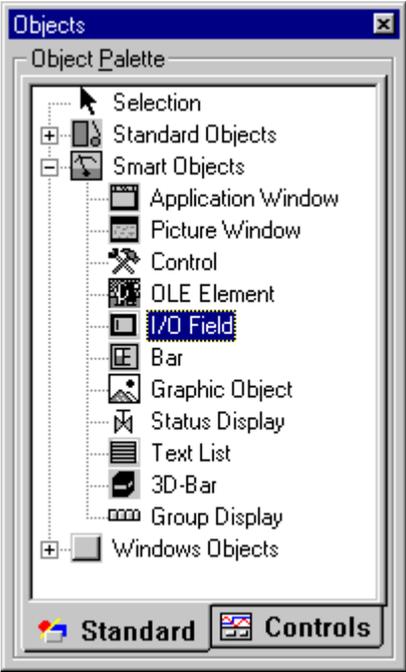
Step	B: Creating the Connection
7	<p>In the <i>Device</i> tab, the access point used by the connection to access the PLC is specified.</p> <p>By default, the access point <i>CP-TCPIP</i> is set. Previously, the communication processor <i>CP 1411</i> has been assigned to the access point <i>CP-TCPIP</i> in the program <i>Setting the PG/PC Interface</i>. If you want the access point to be set automatically, make sure that the correct one is being used, especially if multiple communication processors are used.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

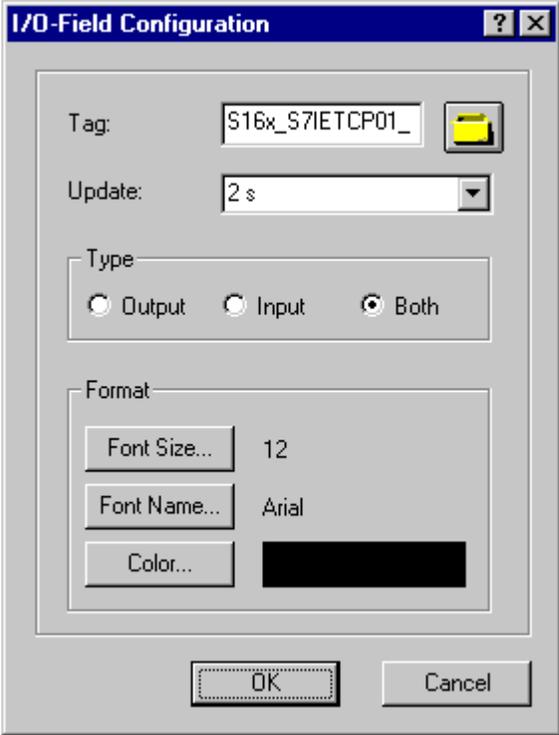
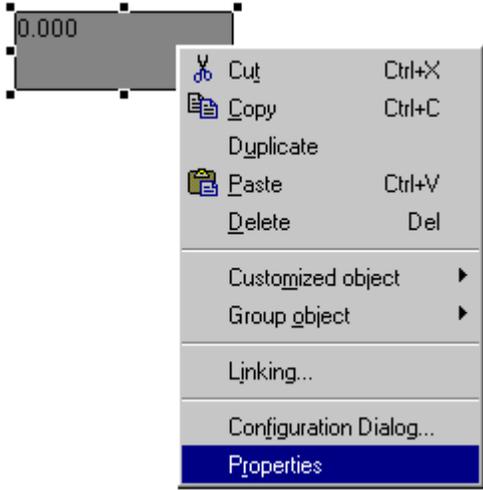
C: Creating the WinCC Tags

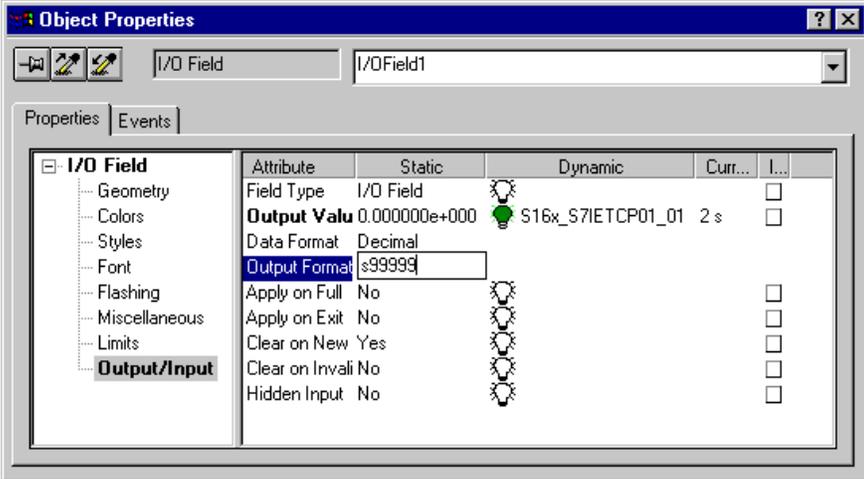
Step	C: Creating the WinCC Tags
1	<p>Creation of the WinCC tags required for the sample.</p> <p>This is done via a  on the newly created connection <i>S7_IETCP_01</i> and then selecting <i>New Tag</i> from the pop-up menu.</p> 
2	<p>The properties dialog box of the tag will be displayed.</p> <p>In the sample, the <i>Name</i> of the first tag is <i>S16x_S7IETCP01_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type. Click on the <i>Select</i> button to set the Address of the new tag.</p> 

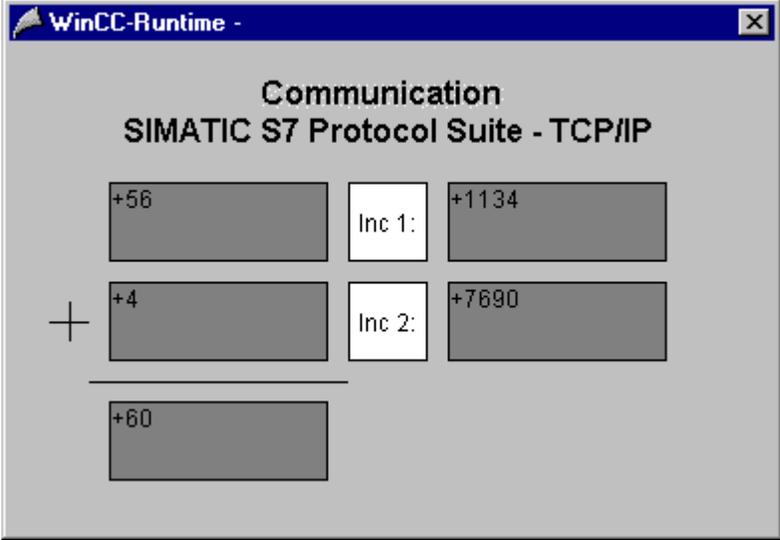
Step	C: Creating the WinCC Tags																		
3	<p>The dialog box <i>Address Properties</i> will be displayed.</p> <p>Set <i>DB</i> as the <i>Data Range</i> and the value <i>75</i> as the <i>DB No.</i>. Set <i>Word</i> in the <i>Address</i> field and the value <i>0</i> in the <i>DBW</i> field. Close the dialog box by clicking on <i>OK</i>. The properties dialog box of the tag is also closed by clicking on <i>OK</i>.</p> <p>The just created WinCC tag is addressed in the range of the DB75, where the first of the two values to be added is located.</p> 																		
4	<p>Creation of the remaining WinCC tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td>S16x_S7IETCP01_01</td> <td>Signed 16-bit value</td> <td>DB75,Dw0</td> </tr> <tr> <td>S16x_S7IETCP01_02</td> <td>Signed 16-bit value</td> <td>DB75,Dw2</td> </tr> <tr> <td>S16x_S7IETCP01_03</td> <td>Signed 16-bit value</td> <td>DB75,Dw4</td> </tr> <tr> <td>S16x_S7IETCP01_04</td> <td>Signed 16-bit value</td> <td>DB75,Dw6</td> </tr> <tr> <td>S16x_S7IETCP01_05</td> <td>Signed 16-bit value</td> <td>DB75,Dw8</td> </tr> </tbody> </table>	Name	Type	Parameters	S16x_S7IETCP01_01	Signed 16-bit value	DB75,Dw0	S16x_S7IETCP01_02	Signed 16-bit value	DB75,Dw2	S16x_S7IETCP01_03	Signed 16-bit value	DB75,Dw4	S16x_S7IETCP01_04	Signed 16-bit value	DB75,Dw6	S16x_S7IETCP01_05	Signed 16-bit value	DB75,Dw8
Name	Type	Parameters																	
S16x_S7IETCP01_01	Signed 16-bit value	DB75,Dw0																	
S16x_S7IETCP01_02	Signed 16-bit value	DB75,Dw2																	
S16x_S7IETCP01_03	Signed 16-bit value	DB75,Dw4																	
S16x_S7IETCP01_04	Signed 16-bit value	DB75,Dw6																	
S16x_S7IETCP01_05	Signed 16-bit value	DB75,Dw8																	

D: Creating the WinCC Screen

Step	D: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	D: Creating the WinCC Screen
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S7IETCP01_01</i> via the button displayed below.</p>  <p>Leave the <i>Update</i> of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p>  <p>The <i>I/O-Field Configuration</i> dialog box is shown with the following settings: Tag: S16x_S7IETCP01_ (with folder icon) Update: 2 s Type: <input type="radio"/> Output <input type="radio"/> Input <input checked="" type="radio"/> Both Format: Font Size... 12, Font Name... Arial, Color... (black)</p>
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p>  <p>The image shows an <i>I/O Field</i> displaying the value 0.000. A context menu is open over it, listing the following options: Cut (Ctrl+X), Copy (Ctrl+C), Duplicate, Paste (Ctrl+V), Delete (Del), Customized object, Group object, Linking..., Configuration Dialog..., and Properties (highlighted).</p>

Step	D: Creating the WinCC Screen
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p>  <p>The screenshot shows the 'Object Properties' dialog box with the 'Properties' tab selected. The 'Output/Input' property is expanded, and the 'Output Format' is set to 's99999'. The 'Output Value' is 0.000000e+000, and the 'Data Format' is 'Decimal'. The 'Output Format' is highlighted in blue.</p>
6	<p>Creation of four additional <i>I/O Fields</i> for the display of the remaining tags.</p> <p>Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_3_S7IETCP_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p>  <p>The screenshot shows a button with a lightbulb icon and the text 'Runtime' below it. A mouse cursor is pointing at the button.</p>

Step	D: Creating the WinCC Screen
	<p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the I/O fields. They can be changed by entering values in the individual <i>I/O Fields</i>.</p>  <p>The screenshot shows a window titled 'WinCC-Runtime -' with a sub-header 'Communication SIMATIC S7 Protocol Suite - TCP/IP'. It contains several input fields: a top row with '+56', 'Inc 1:', and '+1134'; a middle row with '+4', 'Inc 2:', and '+7690'; and a bottom row with '+60'. A plus sign is visible to the left of the '+4' field. The fields are arranged in a grid-like structure.</p> <p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p>  <p>The second screenshot shows a single input field with the value '+0'. The field is grayed out, indicating a communication error.</p>

4.4 Diagnosis of the Communication Connection

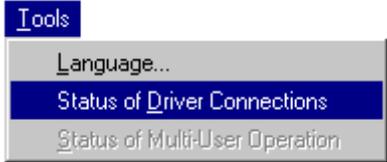
The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S7_IETCP* and the SIMATIC S7 station.

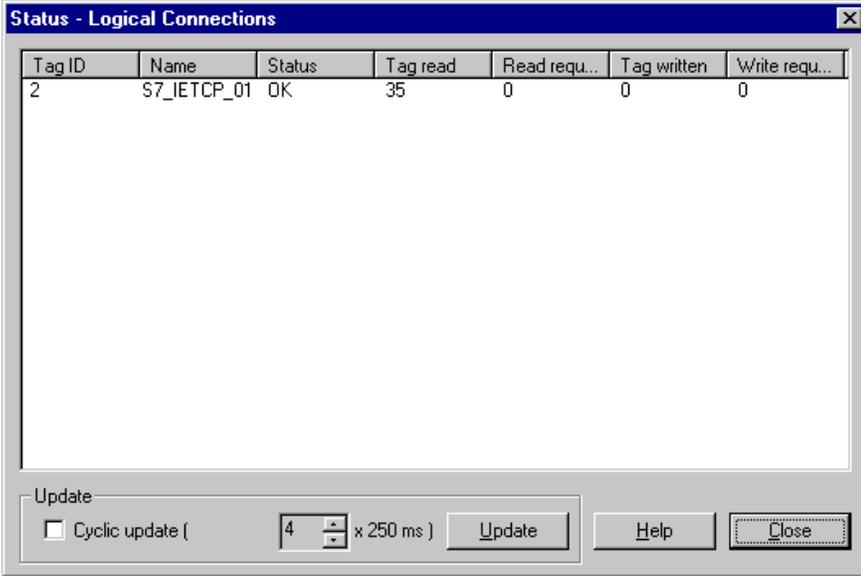
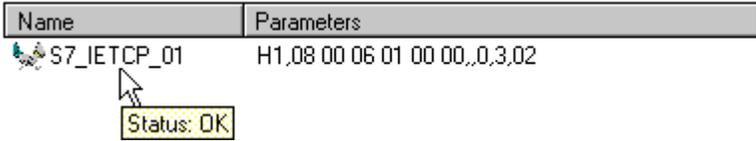
A diagnosis of the sample according to this description makes only sense, if the checks listed below have been completed successfully.

Creation of the STEP7 Project *S7_IETCP*

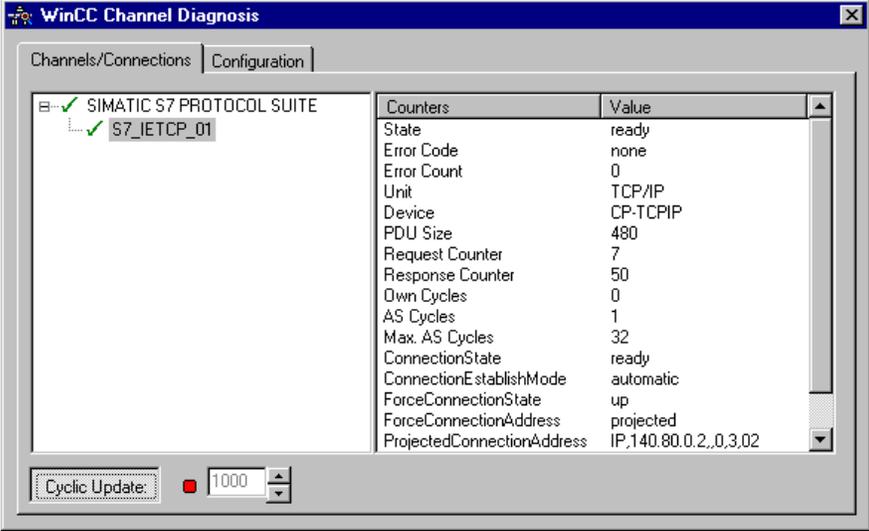
- F: Testing the Hardware Configuration
- H: Testing the STEP7 Program

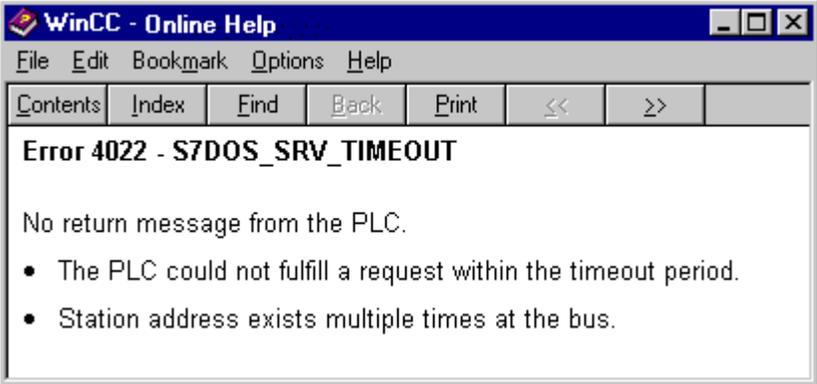
WinCC Explorer

Step	WinCC Explorer
1	<p>Diagnosis of the communication connection from the <i>WinCC Explorer</i>. Switch the project <i>WinCC_S7_IETCP</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below.</p>  <p>The created WinCC screen <i>com_3_S7IETCP_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 

Step	WinCC Explorer
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>S7_IETCP_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p> 
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>.</p> <p>The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p>  <p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> 

Channel Diagnosis

Step	Channel Diagnosis								
1	<p>Diagnosis of the communication connection via the program <i>WinCC Channel Diagnosis</i>.</p> <p>Start this program via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Channel Diagnosis</i>.</p>  <p>Channel Diagnosis</p>								
2	<p>The program <i>WinCC Channel Diagnosis</i> will be displayed.</p> <p>The <i>Channels/Connections</i> tab displays detailed information about the status of each configured connection. By default, the display is updated every second. The update cycle can be changed in the input field located at the bottom.</p> 								
3	<p>If a connection error is detected, the <i>Error Code</i> line in the right window half will display a value specifying the error cause. Detailed information about this error code is displayed by  on the <i>Error Code</i> entry and then selecting <i>Help</i> from the pop-up menu.</p> <table border="1"> <thead> <tr> <th>Counters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>State</td> <td>disconnected</td> </tr> <tr> <td>Error Code</td> <td>4022</td> </tr> <tr> <td>Error Co</td> <td>0</td> </tr> </tbody> </table>	Counters	Value	State	disconnected	Error Code	4022	Error Co	0
Counters	Value								
State	disconnected								
Error Code	4022								
Error Co	0								

Step	Channel Diagnosis
4	<p>This opens the Online Help to WinCC containing a description of the corresponding error code. Additionally, possible error causes are also listed.</p>  <p>WinCC - Online Help</p> <p>File Edit Bookmark Options Help</p> <p>Contents Index Find Back Print << >></p> <p>Error 4022 - S7DOS_SRV_TIMEOUT</p> <p>No return message from the PLC.</p> <ul style="list-style-type: none">• The PLC could not fulfill a request within the timeout period.• Station address exists multiple times at the bus.

5 Communication to the SIMATIC S7 via OPC

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder C:\Communication_Manual. You have the option to copy the following components to the hard drive:



The database file of the communication processor CP 1413.



The STEP7 project we will create.

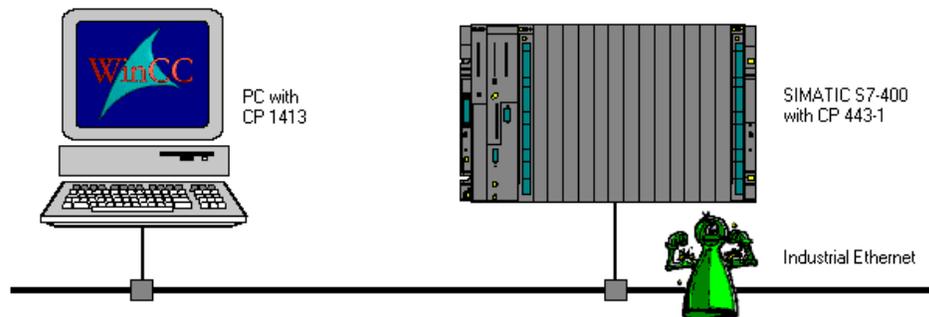


The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a *SIMATIC S7* and *WinCC*. In this sample, the communication connection is realized via the *Industrial Ethernet*. By making only slight changes, the communication via the *PROFIBUS* is also possible.

The S7 OPC Server running on the computer makes the data of the PLC available to other applications running on the same computer and to applications running on the network. The S7 OPC Server communicates with the PLC via the communication processor CP 1413.

Overview of the Structure of the Sample



On the computer side, the connection to the *Industrial Ethernet* network is established via the communication processor *CP 1413*. To install this communication processor in the computer, the driver *IE S7 1413*, located on the *SIMATIC NET* CD-ROM, is needed. In addition, the *S7 OPC Server*, also located on the *SIMATIC NET* CD-ROM, is needed. In the WinCC project, the communication driver *OPC* must be installed. Using this *OPC Client*, the connection to the *S7 OPC Server* is configured.

The PLC is equipped with a *CPU 416-1* module. The connection to the network is established via the communication processor *CP 443-1*. For the configuration of this communication processor with the STEP7 software, the option package *NCM S7 Industrial Ethernet* is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 1413
- Creation of the STEP7 Project S7_OPC
- Configuration of the S7 OPC Server
- Creation of the WinCC Project WinCC_S7_OPC
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>IE S7-1413</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 1413</i> . <i>S7 OPC Server</i> for the communication to the <i>OPC Client</i> from WinCC.
STEP7	STEP7 software with option package <i>NCM for Industrial Ethernet</i> for the creation of the STEP7 project.
WinCC	WinCC with the communication driver <i>OPC</i> for the creation of the WinCC project.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 1413</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>UR1</i>
Power Supply	Power supply <i>PS 407 10A</i> in slot 1 and 2.
CPU Module	CPU module <i>CPU 416-1</i> in slot 3.
Communication Processor	Communication processor <i>CP 443-1</i> in slot 4.

5.1 Startup of the Communication Processor CP 1413

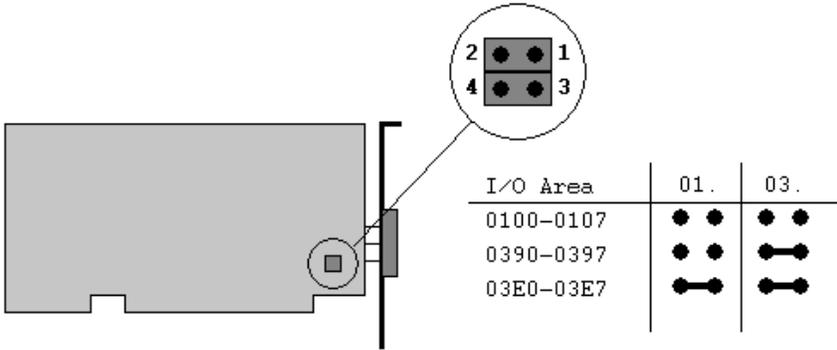
The following description details the configuration steps necessary to successfully start up the communication processor *CP 1413*.

Overview of the Configuration Steps

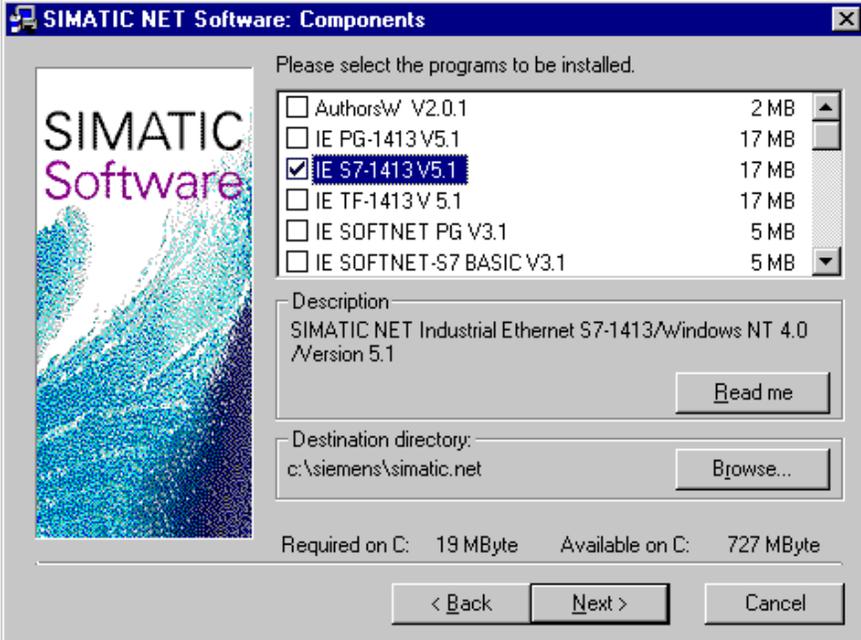
The following lists the configuration steps necessary to start up the communication processor *CP 1413*:

- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Installing the Communication Processor
- D: Assigning the Communication Processor
- E: Testing the Communication Processor

A: Mounting the Communication Processor in the Computer

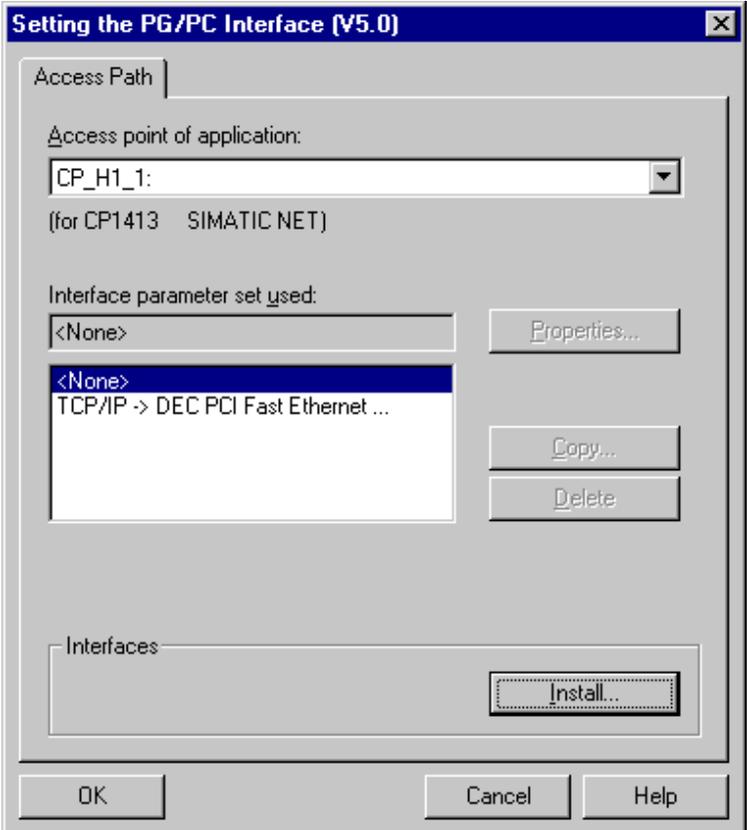
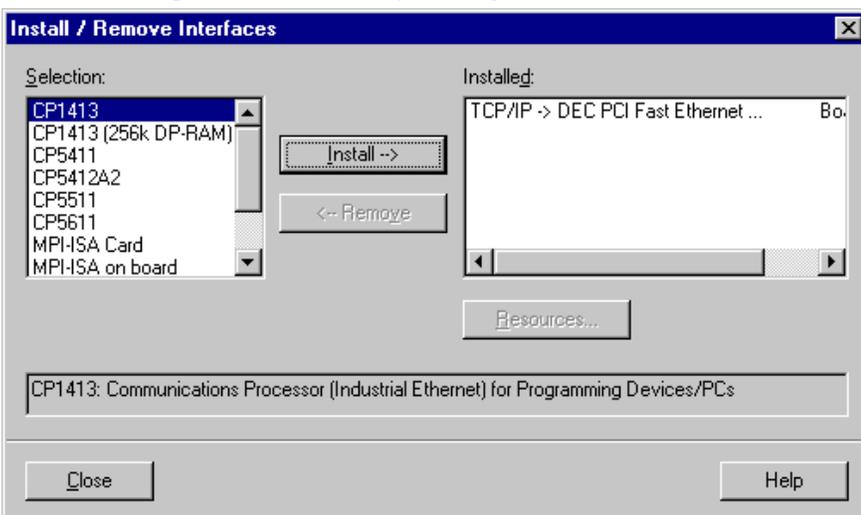
Step	A: Mounting the Communication Processor in the Computer												
1	<p>Check the selected jumper settings at the <i>CP 1413</i>.</p> <p>During the installation of the <i>CP 1413</i>, the <i>I/O Range</i> must be specified. The <i>I/O Range</i> is set via <i>jumper</i>s.</p> <p>By default, the <i>I/O Range</i> is set to <i>03E0-03E7</i>. The settings <i>0100-0117</i> and <i>0390-0397</i> are also possible. The following graphic illustrates the jumper settings necessary for the various <i>I/O Ranges</i>.</p>  <table border="1"> <thead> <tr> <th>I/O Area</th> <th>01.</th> <th>03.</th> </tr> </thead> <tbody> <tr> <td>0100-0107</td> <td>● ●</td> <td>● ●</td> </tr> <tr> <td>0390-0397</td> <td>● ●</td> <td>— —</td> </tr> <tr> <td>03E0-03E7</td> <td>— —</td> <td>— —</td> </tr> </tbody> </table>	I/O Area	01.	03.	0100-0107	● ●	● ●	0390-0397	● ●	— —	03E0-03E7	— —	— —
I/O Area	01.	03.											
0100-0107	● ●	● ●											
0390-0397	● ●	— —											
03E0-03E7	— —	— —											
2	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>For the communication card <i>CP 1413</i>, a free ISA slot in the computer is required. After the installation of the <i>CP 1413</i>, close the computer's case and start the computer.</p>												

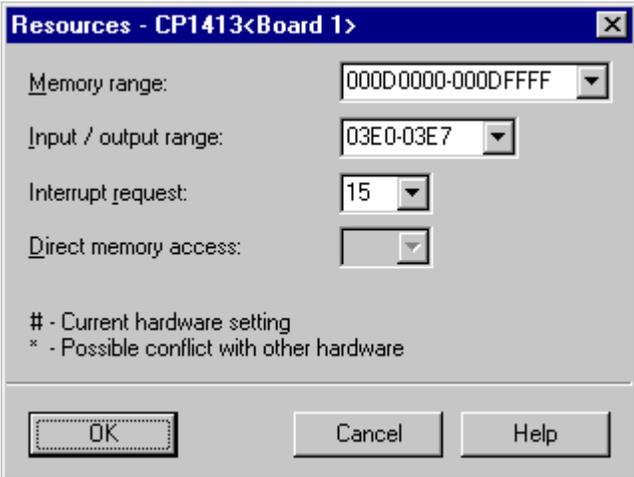
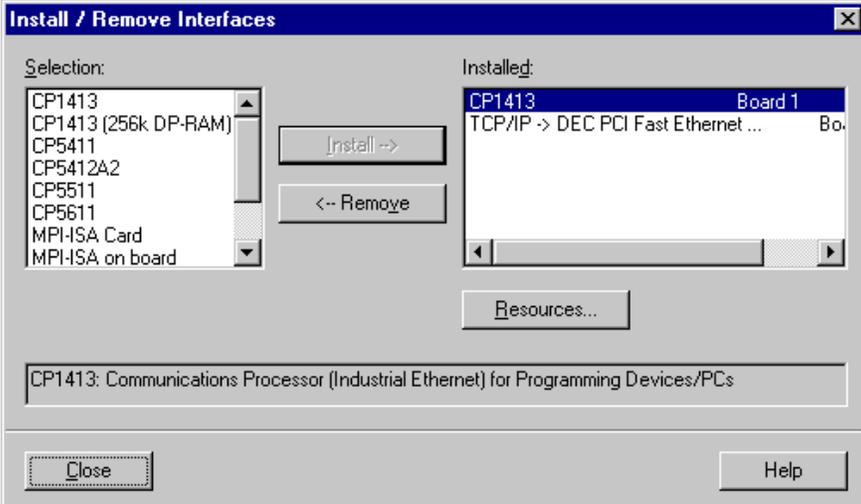
B: Installing the Communication Driver

Step	B: Installing the Communication Driver
1	<p>Install the communication driver <i>IE S7-1413</i> from the <i>SIMATIC NET</i> CD-ROM. After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">SIMATIC NET Software Installieren</p> </div> <p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>IE S7-1413</i> to be installed must be selected. Finish the installation.</p> <div style="border: 1px solid black; padding: 5px;">  </div>

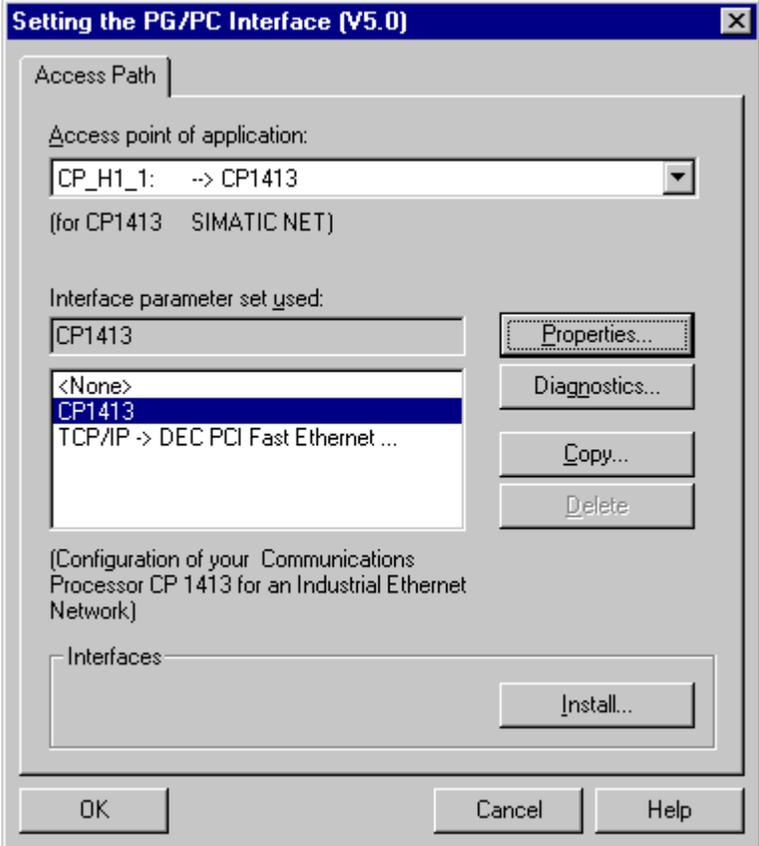
C: Installing the Communication Processor

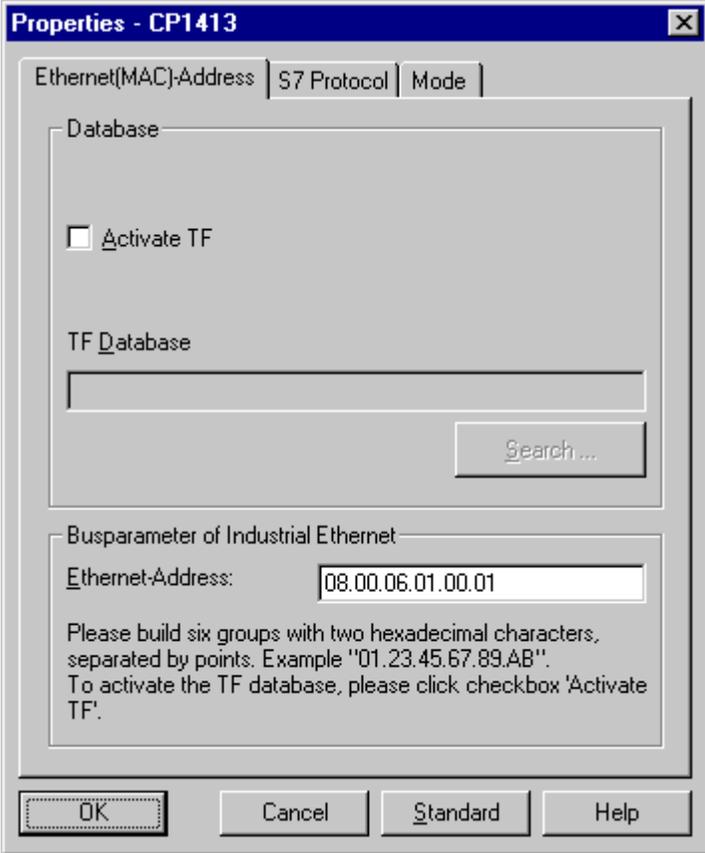
Step	C: Installing the Communication Processor
1	<p>Install the communication processor <i>CP 1413</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Setting the PG/PC Interface</p>

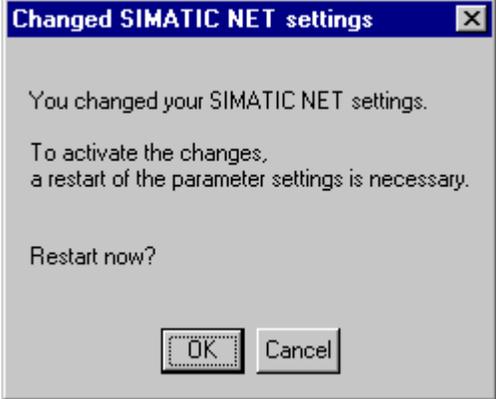
Step	C: Installing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>The dialog box for installing a new interface is opened via the <i>Install</i> button.</p> 
3	<p>The dialog box <i>Install/Remove Modules</i> will be displayed. The <i>Selection</i> field lists all interfaces that can be installed. Among them will be the entry <i>CP 1413</i>, if the communication driver has been installed previously as outlined in step B.</p> <p>From the <i>Selection</i> field, select the entry <i>CP 1413</i>. The installation of the communication processor is started by clicking on the <i>Install -></i> button.</p> 

Step	C: Installing the Communication Processor
4	<p>The dialog box <i>Resources - CP 1413</i> will be displayed.</p> <p>The settings for the <i>Memory Range</i>, <i>I/O Range</i> and <i>Interrupt</i> have to be specified.</p> <p>The <i>I/O Range</i> has already been determined via the <i>Jumper Settings</i> at the <i>CP 1413</i>.</p> <p>Make sure that the assigned resources have not already been taken by other modules in the computer. Information about already taken system resources can be obtained from the <i>Resources</i> tab accessed via <i>Start</i> → <i>Programs</i> → <i>Administrative Tools (Common)</i> → <i>Windows NT Diagnostics</i>.</p> <p>Close the <i>Resources</i> tab by clicking on <i>OK</i>.</p> 
5	<p>In the dialog box <i>Install/Remove Modules</i>, the <i>Installed</i> field will now contain the entry for the <i>CP 1413</i>.</p> <p>Exit the dialog box <i>Install/Remove Modules</i> via the <i>Close</i> button.</p> 

D: Assigning the Communication Processor

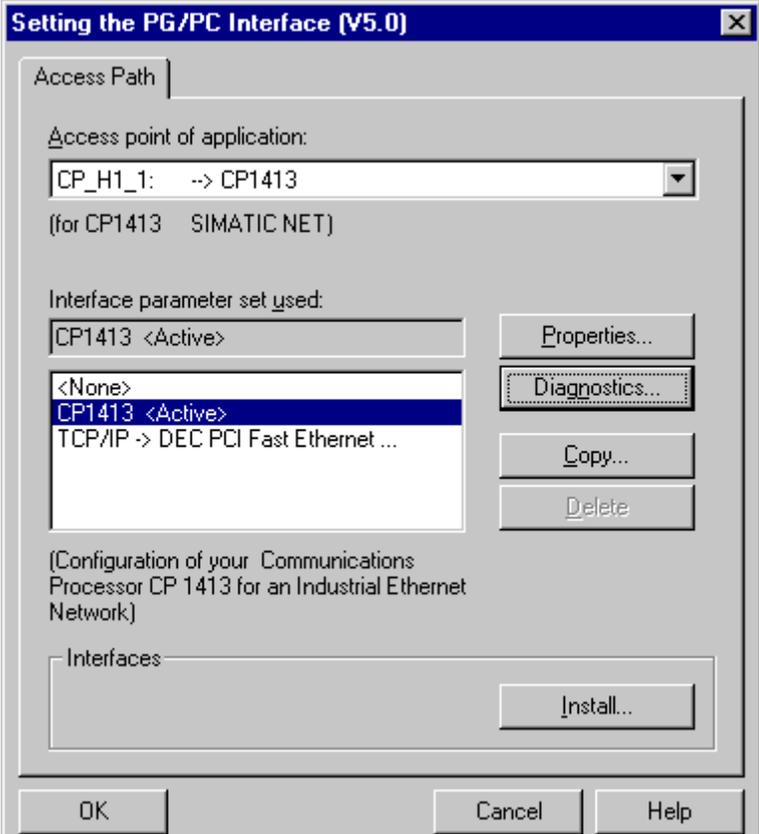
Step	D: Assigning the Communication Processor
1	<p>In the program <i>Setting the PG/PC Interface</i>, assign the access point <i>CP_H1_1</i>: to the just installed interface.</p> <p>It has been created automatically during the installation of the communication driver <i>IE S7-1413</i>.</p> <p>In the field <i>Access Point of the Application</i>, set the entry <i>CP_H1_1</i>:. In the field below, select the entry <i>CP1413</i>. This completes the assignment between the access point and the communication processor.</p> 

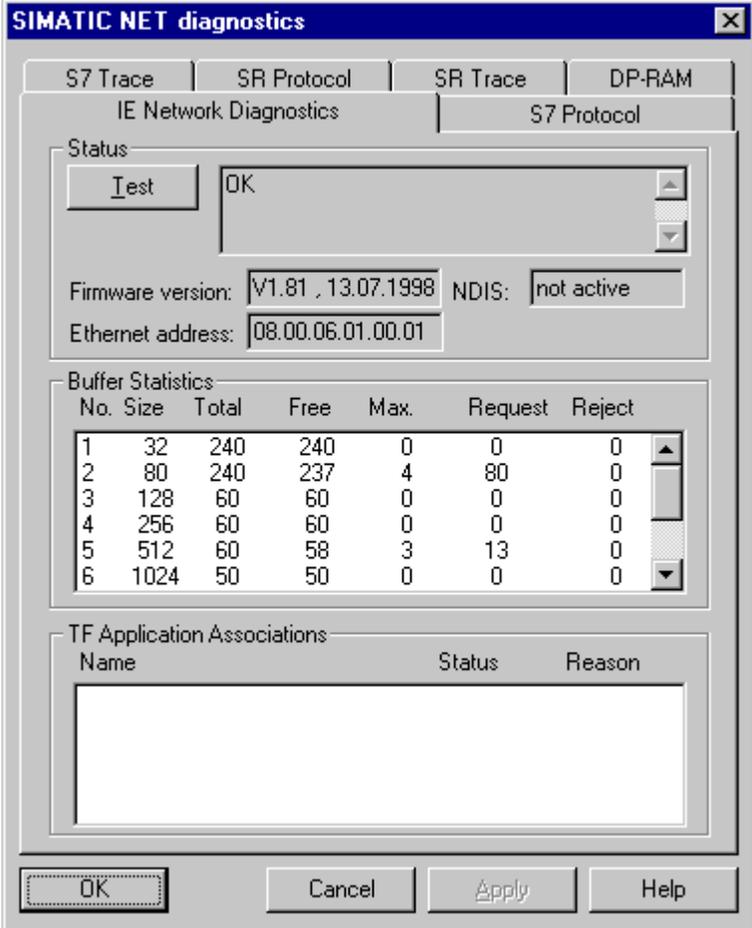
Step	D: Assigning the Communication Processor
2	<p>Setting the properties of the communication processor <i>CP 1413</i>.</p> <p>The dialog box for setting the properties is opened via the <i>Properties</i> button of the <i>Setting the PG/PC Interface</i> program.</p> <p>The dialog box <i>Properties - CP 1413</i> will be displayed.</p> <p>In the <i>Ethernet (MAC) Address</i> tab, enter the <i>Ethernet Address</i> of the <i>CP 1413</i>. In our sample, this is <i>08.00.06.01.00.01</i>.</p> <p>The <i>Ethernet Address</i> is six Bytes long and structured as follows for SIEMENS devices:</p> <ul style="list-style-type: none"> • <i>08.00.06</i>: The first six digits of the hexadecimal value correspond to the number for SIEMENS. • <i>01</i>: The next two digits specify the range for SIEMENS. • <i>0</i>: The next digit signifies the SIMATIC system. • <i>0.01</i>: The last three digits correspond to the significant station address of a SIEMENS device. 

Step	D: Assigning the Communication Processor
3	<p>Exit the program <i>Setting the PG/PC Interface</i> via the <i>OK</i> button.</p> <p>A dialog box will be displayed requesting the restart of the <i>CP 1413</i>. Acknowledge this dialog box by clicking on <i>OK</i>, which will result in the restart of the communication processor <i>CP 1413</i>.</p> <p>This completes the installation of the communication processor.</p> 

E: Testing the Communication Processor

Step	E: Testing the Communication Processor
1	<p>Check the proper installation of the communication processor <i>CP 1413</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>

Step	E: Testing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface to be checked. In this case, select the entry <i>CP 1413</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The check for a proper installation is activated by clicking on the <i>Diagnostics</i> button.</p> 

Step	E: Testing the Communication Processor																																																							
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>In the <i>IE Network Diagnostics</i> tab, the diagnosis is started via the <i>Test</i> button. The result of the diagnosis will be displayed immediately following.</p> <p>If the result of the diagnosis is positive (correct installation), the dialog box can be exited with <i>OK</i>. In this case, the program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>. The configuration of the communication to the S7 is continued in the following section.</p> <p>However, if the result of the diagnosis is negative (incorrect installation), the error must be localized and corrected. Troubleshooting procedures are described in the section <i>Is the Communication Module in the Computer operational?</i>.</p>  <p>SIMATIC NET diagnostics</p> <p>S7 Trace SR Protocol SR Trace DP-RAM</p> <p>IE Network Diagnostics S7 Protocol</p> <p>Status:</p> <p><input type="button" value="Test"/> OK</p> <p>Firmware version: V1.81, 13.07.1998 NDIS: not active</p> <p>Ethernet address: 08.00.06.01.00.01</p> <p>Buffer Statistics</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Size</th> <th>Total</th> <th>Free</th> <th>Max.</th> <th>Request</th> <th>Reject</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>32</td> <td>240</td> <td>240</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>2</td> <td>80</td> <td>240</td> <td>237</td> <td>4</td> <td>80</td> <td>0</td> </tr> <tr> <td>3</td> <td>128</td> <td>60</td> <td>60</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>4</td> <td>256</td> <td>60</td> <td>60</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>5</td> <td>512</td> <td>60</td> <td>58</td> <td>3</td> <td>13</td> <td>0</td> </tr> <tr> <td>6</td> <td>1024</td> <td>50</td> <td>50</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>TF Application Associations</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Status</th> <th>Reason</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p><input type="button" value="OK"/> <input type="button" value="Cancel"/> <input type="button" value="Apply"/> <input type="button" value="Help"/></p>	No.	Size	Total	Free	Max.	Request	Reject	1	32	240	240	0	0	0	2	80	240	237	4	80	0	3	128	60	60	0	0	0	4	256	60	60	0	0	0	5	512	60	58	3	13	0	6	1024	50	50	0	0	0	Name	Status	Reason			
No.	Size	Total	Free	Max.	Request	Reject																																																		
1	32	240	240	0	0	0																																																		
2	80	240	237	4	80	0																																																		
3	128	60	60	0	0	0																																																		
4	256	60	60	0	0	0																																																		
5	512	60	58	3	13	0																																																		
6	1024	50	50	0	0	0																																																		
Name	Status	Reason																																																						

5.2 Creation of the STEP7 Project S7_OPC

The following description details the configuration steps necessary to create and start up the STEP7 project *S7_OPC*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to create the STEP7 project *S7_OPC*:

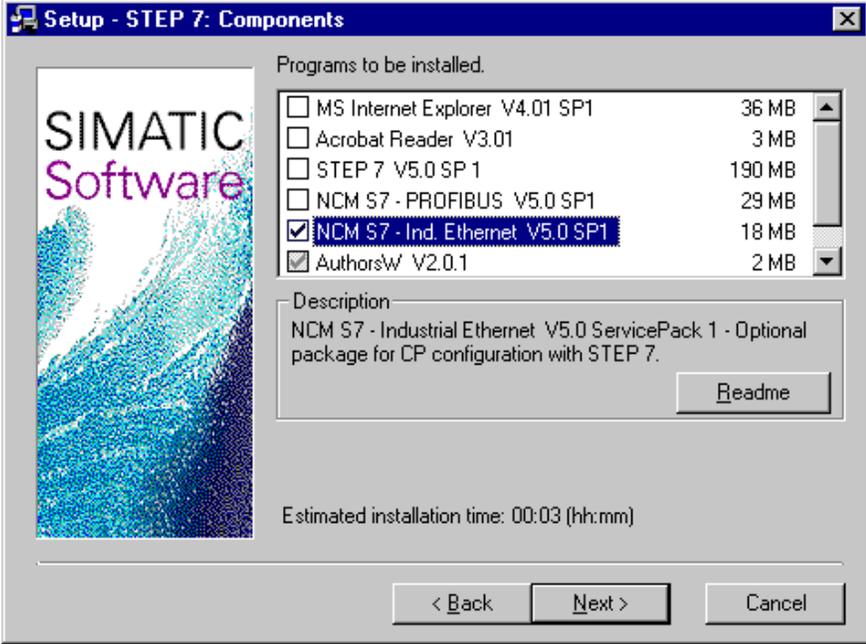
- A: Installing the Hardware
- B: Installing the Option Package
- C: Creating the STEP7 Project
- D: Configuring the Hardware
- E: Loading the Hardware Configuration
- F: Testing the Hardware Configuration
- G: Creating the STEP7 Program
- H: Testing the STEP7 Program

A: Installing the Hardware

Step	A: Installing the Hardware
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 407 10A</i>, the CPU module <i>CPU 416-1</i> and the communication processor <i>CP 443-1</i>.</p> <p>Establishing the connection from the programming device to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 1413</i> in the computer to the communication processor <i>CP 443-1</i> in the PLC.</p>

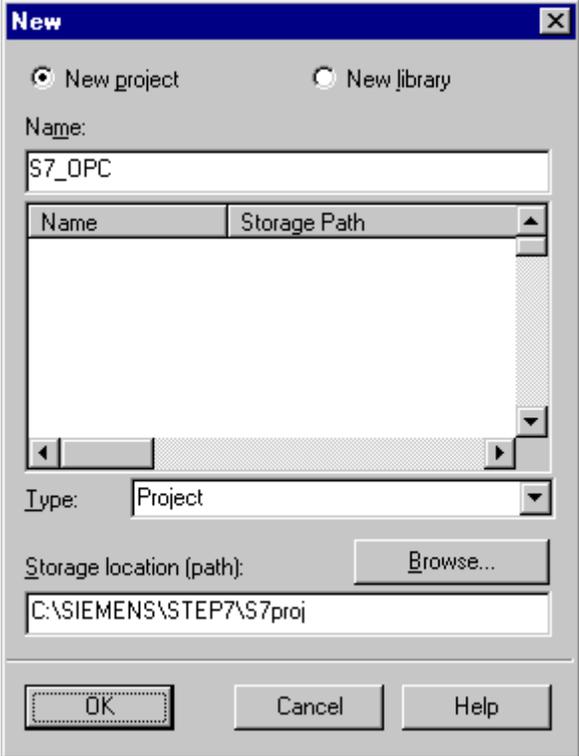
B: Installing the Option Package

Step	B: Installing the Option Package
1	<p>If the option package <i>NCM S7 Industrial Ethernet</i> has not been installed during the installation of <i>STEP7</i>, install it now from the <i>STEP7</i> CD-ROM. This option package is required for the configuration of the communication processor <i>CP 443-1</i> via the <i>STEP7</i> software.</p> <p>After inserting the <i>STEP7</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <div style="text-align: center;">  setup.exe </div>

Step	B: Installing the Option Package
2	<p>This starts the installation program.</p> <p>Follow the instructions of the installation program. On the <i>Components</i> page, select the check-box <i>NCM S7 Ind. Ethernet</i>. Finish the installation.</p> 

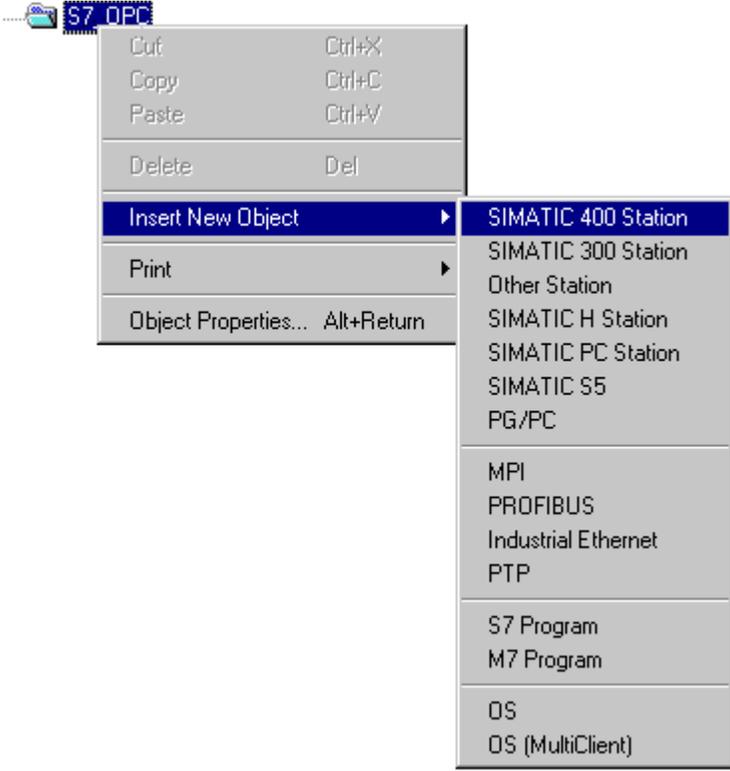
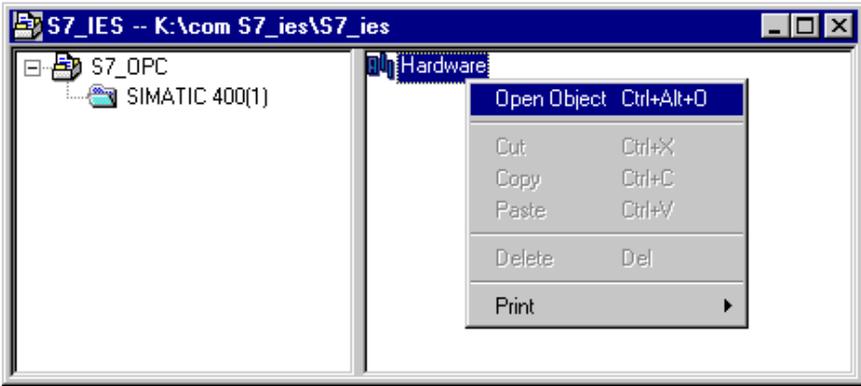
C: Creating the STEP7 Project

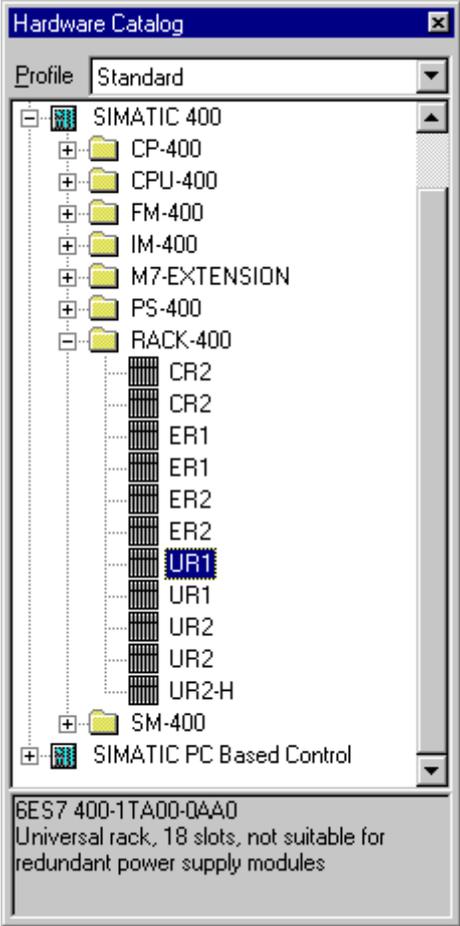
Step	C: Creating the STEP7 Project
1	<p>Create a new STEP7 project in the <i>SIMATIC Manager</i>.</p> <p>It is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC Manager</i>.</p>  <p>SIMATIC Manager</p>
2	<p>This displays the <i>SIMATIC Manager</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the parameters of a new STEP7 project will be opened.</p> <p>The <i>New</i> dialog box will be displayed.</p> <p>The radio-button <i>New Project</i> must be selected. In the <i>Name</i> field, the name of the new project to be created is entered. The names of the STEP7 projects created within the framework of this manual all start with <i>S7</i>. They also include a reference to the communication type used. The project of this sample has the name <i>S7_OPC</i>.</p>

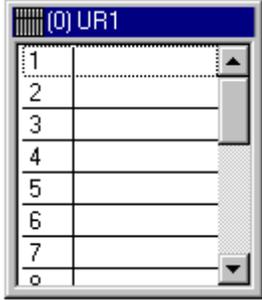
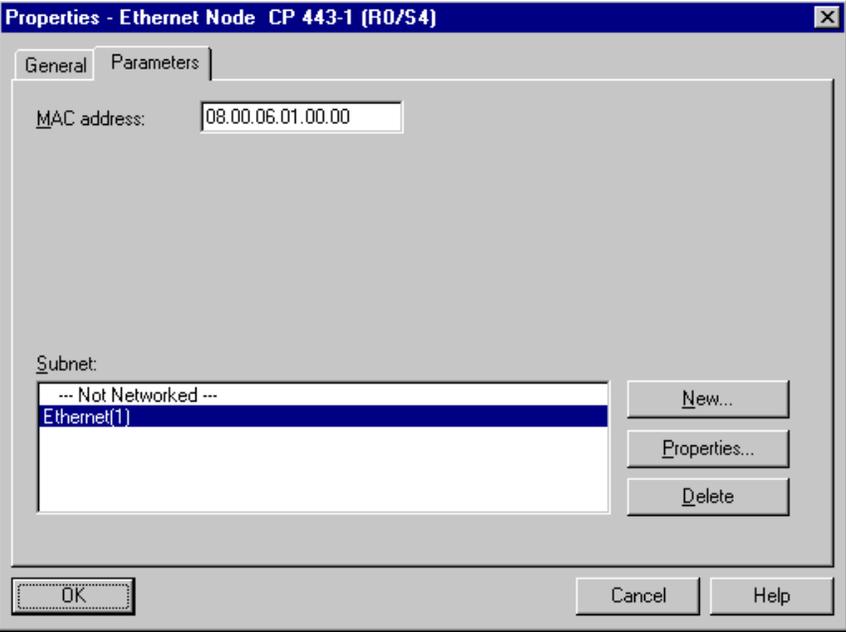
Step	C: Creating the STEP7 Project
	<p>By default, projects are stored in the <i>C:\SIEMENS\STEP7\S7proj</i> folder. This can be changed at any time via the <i>Browse</i> button.</p> <p>The <i>New</i> dialog box is closed via the <i>OK</i> button.</p> 

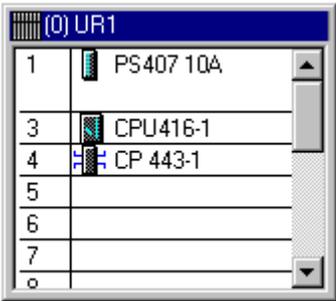
D: Configuring the Hardware

Step	D: Configuring the Hardware
1	<p>The new project will be displayed in the <i>SIMATIC Manager</i>.</p> <p>The hardware for this project must be configured. Three components are needed: A <i>SIMATIC 400-Station</i>, a <i>PG/PC</i> and for their networking an <i>Industrial Ethernet</i>.</p>

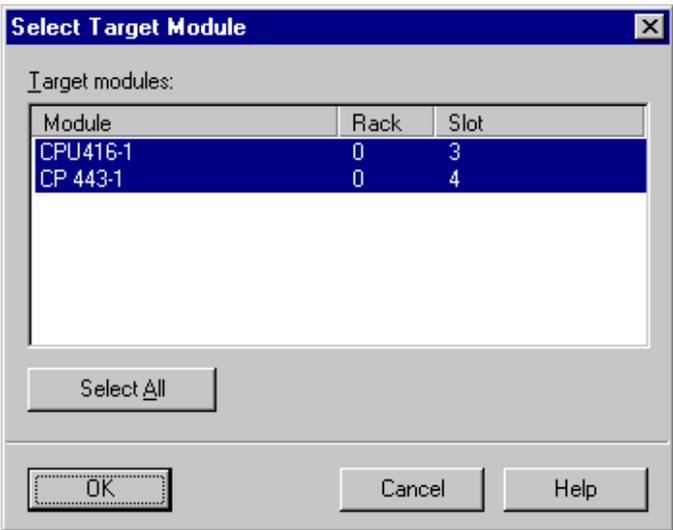
Step	D: Configuring the Hardware
	<p>These components are added to the <i>SIMATIC Manager</i> via a  on the project name <i>S7_IEH</i> and then selecting <i>Insert New Object</i> → <i>SIMATIC 400-Station</i> and <i>Insert New Object</i> → <i>Industrial Ethernet</i> from the pop-up menu.</p> 
2	<p>The just added components will be displayed in the right window of the <i>SIMATIC Manager</i>.</p> <p> SIMATIC 400(1)  MPI(1)  Ethernet(1)</p> <p>By  on the component <i>SIMATIC 400(1)</i> in the right window, the point <i>Hardware</i> will be displayed. By  on the point <i>Hardware</i> or  on it and then selecting <i>Open Object</i> from the pop-up menu, the program <i>HW Config</i> will be started.</p> 

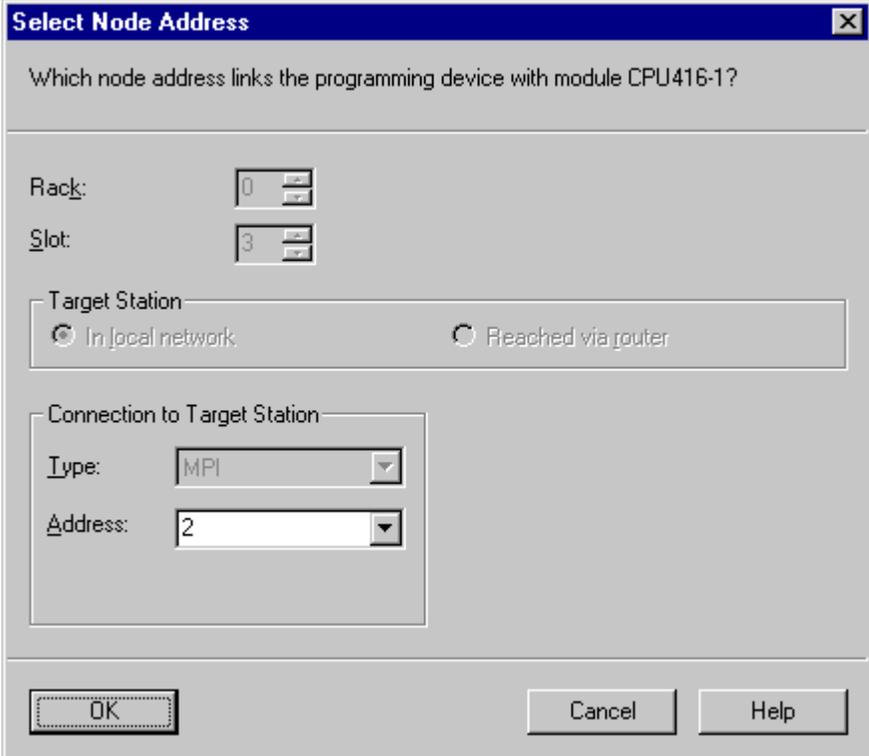
Step	D: Configuring the Hardware
3	<p>The program <i>HW Config</i> will be displayed.</p> <p>This program is used to exactly define the hardware used in the PLC and to configure their properties.</p>  <p>HW Konfig</p>
4	<p>By clicking on the toolbar button of the program <i>HW Config</i> displayed below, the <i>Hardware Catalog</i> is opened. This catalog is used to select the required hardware components.</p>  <p>Catalog</p>
5	<p>The <i>Hardware Catalog</i> will be displayed.</p> <p>The first component selected is the rack. On this rack, all other components will be installed. The rack is inserted into the project via a  or by Dragging Dropping. In this sample, the rack type <i>UR1</i> is used.</p>  <p>The screenshot shows the 'Hardware Catalog' window with the 'Standard' profile. Under 'SIMATIC 400', the 'RACK-400' folder is expanded, and the 'UR1' component is selected. Below the list, the selected component details are shown: '6ES7 400-1TA00-0AA0 Universal rack, 18 slots, not suitable for redundant power supply modules'.</p>

Step	D: Configuring the Hardware
6	<p>The program <i>HW Config</i> will display the currently still empty rack.</p> 
7	<p>Arrange the other hardware components in the rack. This is done by Dragging Dropping the desired components from the <i>Hardware Catalog</i> to the corresponding slot in the rack.</p> <p>This sample uses the power supply <i>PS 407 10A</i>. It is inserted into slot <i>1</i>. A power supply of this type occupies two slots.</p> <p>As the CPU module, this sample uses a <i>CPU 416-1</i>. This module is inserted into slot <i>3</i>.</p> <p>We also require the communication processor <i>CP 443-1</i>. This CP is only available from the <i>Hardware Catalog</i> if the option package <i>NCM S7 Industrial Ethernet</i> has been installed. After the communication processor <i>CP 443-1</i> has been inserted in the rack, its properties dialog box will open.</p>
8	<p>The <i>Ethernet Interface</i> properties dialog box of the <i>CP 443-1</i> will be displayed.</p> <p>In the <i>MAC Address</i> field of the <i>Parameters</i> tab, enter the desired Ethernet address of the communication processor. During the creation of the database file for the communication processor <i>CP 1413</i> in the computer, this address is one of the parameters that must be set.</p> <p>In the <i>Subnet</i> field below, assign the entry <i>Ethernet(1)</i> to the communication processor. Close the dialog box by clicking on <i>OK</i>.</p> 

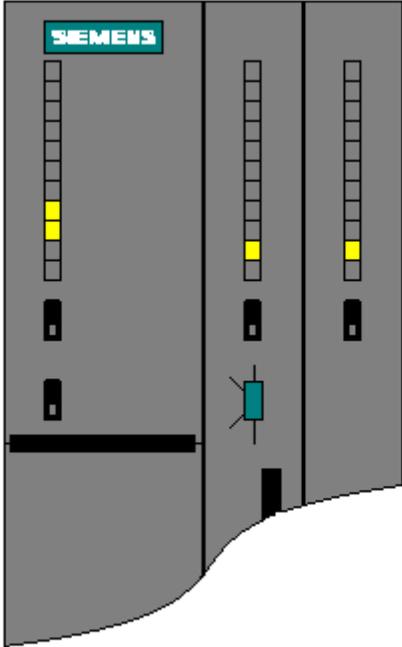
Step	D: Configuring the Hardware
9	<p>The following graphic shows the completed hardware arrangement of the sample.</p> 
10	<p>Save the settings made in the program <i>HW Config</i>. This is done via the toolbar button displayed below.</p> 

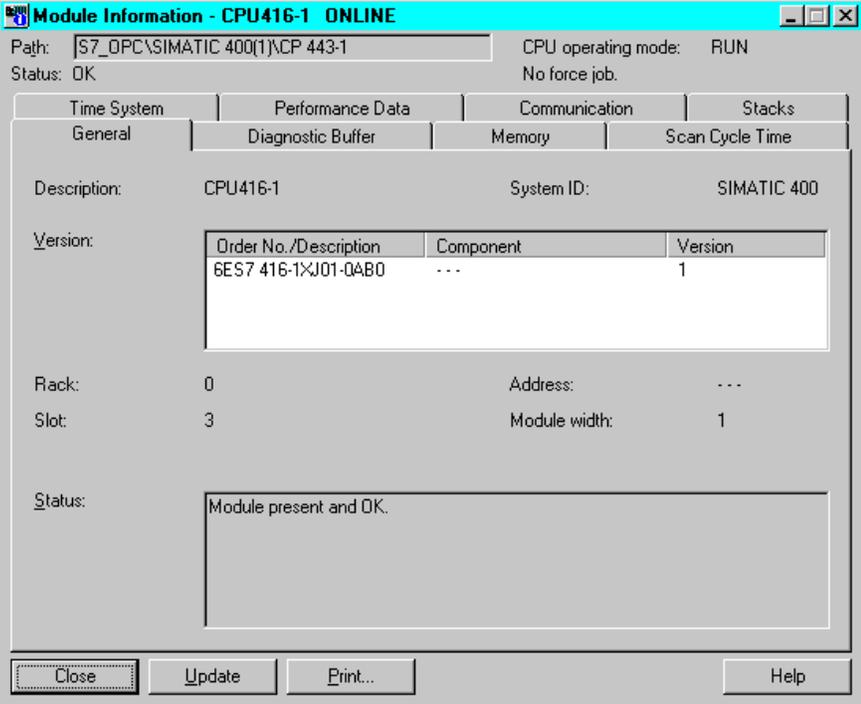
E: Loading the Hardware Configuration

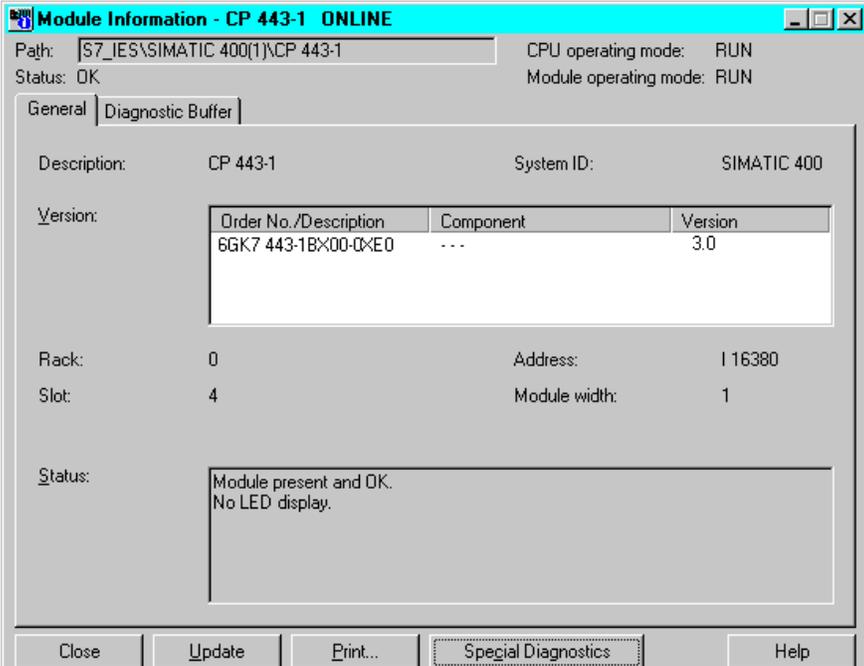
Step	E: Loading the Hardware Configuration									
1	<p>The hardware configuration created in the program <i>HW Config</i> must be transferred to the PLC.</p> <p>This is done via the toolbar button displayed below.</p> 									
2	<p>A dialog box will be displayed from which the components to be loaded can be selected.</p> <p>For this sample, all displayed components will be selected. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>. Close the dialog box by clicking on <i>OK</i>.</p>  <table border="1"> <thead> <tr> <th>Module</th> <th>Rack</th> <th>Slot</th> </tr> </thead> <tbody> <tr> <td>CPU416-1</td> <td>0</td> <td>3</td> </tr> <tr> <td>CP 443-1</td> <td>0</td> <td>4</td> </tr> </tbody> </table>	Module	Rack	Slot	CPU416-1	0	3	CP 443-1	0	4
Module	Rack	Slot								
CPU416-1	0	3								
CP 443-1	0	4								

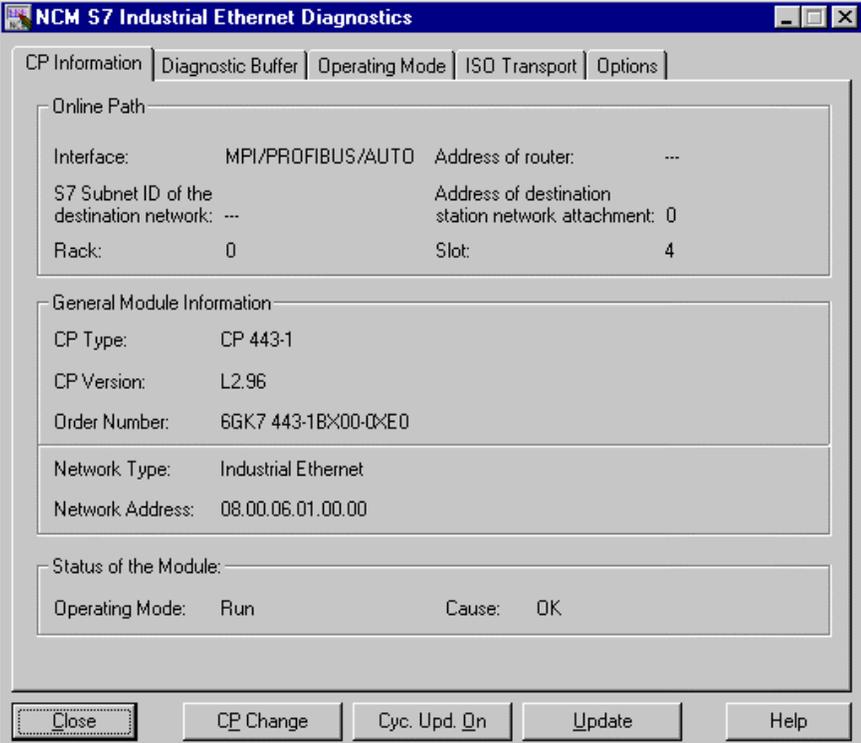
Step	E: Loading the Hardware Configuration
3	<p>Now the dialog box <i>Select Station Address</i> will be displayed.</p> <p>In this dialog box, specify which station address is used by the STEP7 software to communicate with the CPU module. In this sample, the communication is carried out via the MPI interface. The <i>Address</i> of the CPU module is 2.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>The configuration data will now be transferred to the PLC. If necessary, the individual modules will be set to the STOP status.</p> <p>The program <i>HW Config</i> can be exited.</p> <p>The newly added components will be displayed by the <i>SIMATIC Manager</i> for the station <i>SIMATIC 400(1)</i>.</p> 

F: Testing the Hardware Configuration

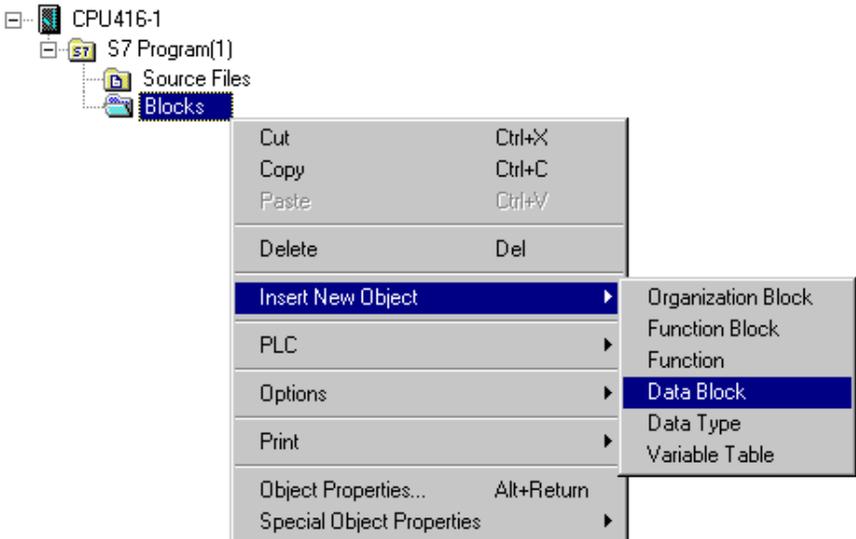
Step	F: Testing the Hardware Configuration
1	<p>Testing of the hardware configuration made.</p> <p>If the key switch of the CPU module is set to <i>RUN</i> or <i>RUN-P</i> and the operating mode switch of the communication processor is set to <i>RUN</i>, only the status LEDs signifying the <i>RUN</i> operating mode should be displayed.</p> <p>If this is not the case, there is an error. The following steps help you localize this error. However, these steps should still be performed even if the status LEDs show no error. This allows you to recognize uncritical errors and faulty configurations.</p> 

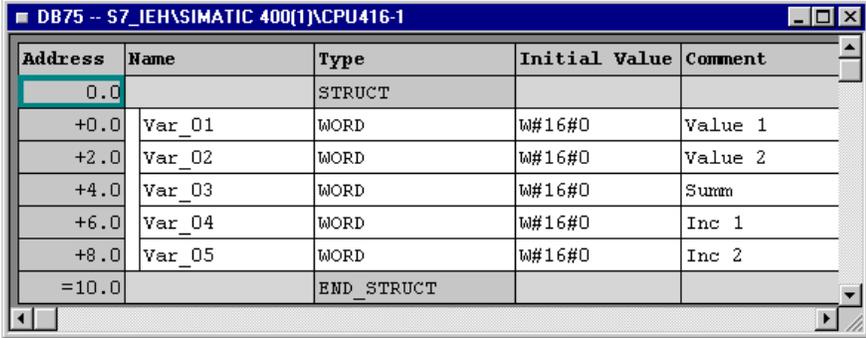
Step	F: Testing the Hardware Configuration
2	<p>Testing the configuration of the CPU module.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the CPU module in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the CPU module will be displayed.</p> <p>The <i>General</i> tab displays various general data of the CPU module. In the <i>Status</i> field, the current module status and any existing errors are displayed.</p> <p>The <i>Diagnosis Buffer</i> tab contains more detailed information about existing errors and how to correct them.</p> <p>The dialog box can be exited via the <i>Close</i> button.</p> 

Step	F: Testing the Hardware Configuration
3	<p>Testing the configuration of the communication processor.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the communication processor in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the communication processor will be displayed. The <i>General</i> tab displays various general data of the module.</p> <p>A dialog box for a more detailed diagnosis of the communication processor can be accessed via the <i>Special Diagnosis</i> button.</p> 

Step	F: Testing the Hardware Configuration
4	<p>The dialog box <i>NCM S7 Industrial Ethernet Diagnosis</i> will be displayed.</p> <p>The <i>CP Information</i> tab displays general information about the module. Among other things, the network address set can be checked.</p> <p>The dialog box can be exited via the <i>Close</i> button. The Module Status dialog box can also be exited via the <i>Close</i> button.</p> 

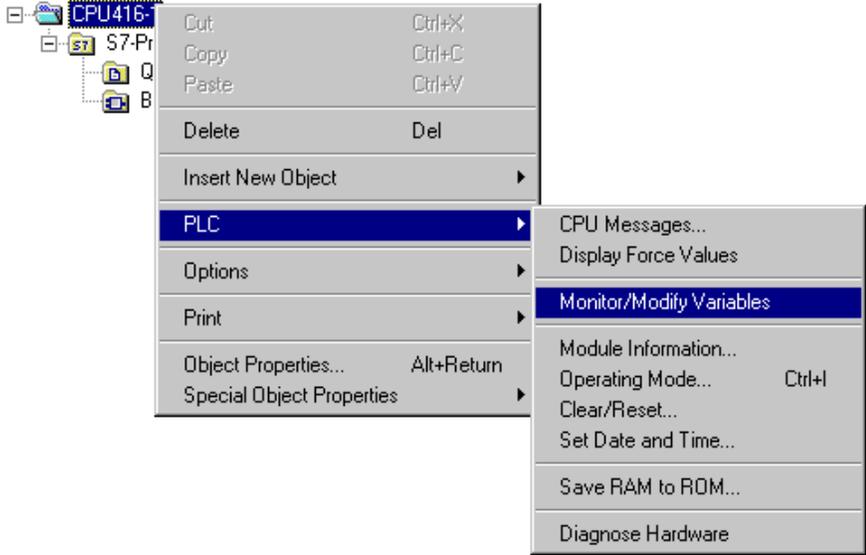
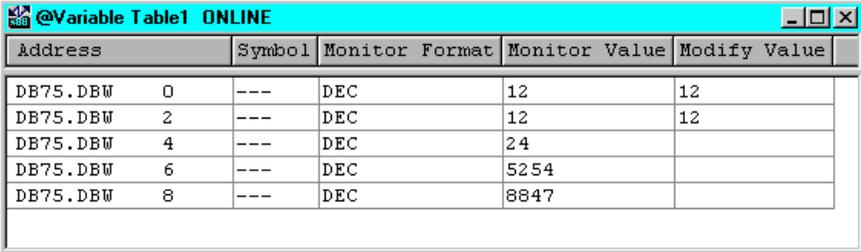
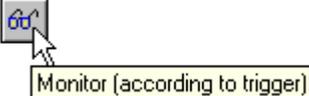
G: Creating the STEP7 Program

Step	G: Creating the STEP7 Program
1	<p>Creation of the <i>S7 Program</i>.</p> <p>This sample project requires the operation block <i>OBI</i> and a data block. <i>OBI</i> is available by default, the required data block must be created. This is done in the <i>SIMATIC Manager</i> via a  on the sub-entry <i>Modules</i> of the entry <i>S7 Program(1)</i> of the configured CPU module and then selecting <i>Insert New Object</i> → <i>Data Block</i> from the pop-up menu.</p> <p>The properties dialog box of the data block will be opened. As the block's <i>Name</i> enter <i>DB75</i> and close the dialog box with <i>OK</i>.</p> 
2	<p>The newly created data block <i>DB75</i> will be displayed in the right window of the project.</p> <p>Via a  on this data block or a  and then selecting <i>Open Object</i> from the pop-up menu, the content of the block can be programmed. This starts the program <i>LAD/STL/SCF</i>.</p> 

Step	G: Creating the STEP7 Program															
3	<p>The program <i>LAD/STL/SCF</i> is displayed.</p> <p>Acknowledge the dialog box <i>New Data Block</i> by clicking on <i>OK</i>.</p>  <p>KOP AWL FUP</p>															
4	<p>Programming the <i>DB75</i>.</p> <p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits.</p> <p>Two additional tags with a length of 16 Bits are created, whose values are cyclically incremented in <i>OBI</i>.</p> <p>The following graphic displays the programmed data block <i>DB75</i>.</p> 															
5	<p>Save the block and load it into the PLC. This is done via the toolbar button displayed below. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>.</p>  <p>Download</p>															
6	<p>Programming the <i>OBI</i>.</p> <p>Open the block in the program <i>LAD/STL/SCF</i>.</p> <p>First, two values in the <i>DB75</i> are added and then stored again in <i>DB75</i>.</p> <p>Netzwerk 1: Addition</p> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> <p>Adding two 16-Bit Values The result is stored in another 16-Bit Value</p> </div> <table border="1" style="margin-top: 10px;"> <tbody> <tr> <td>OPN</td> <td>DB</td> <td>75</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>0</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>2</td> </tr> <tr> <td>+I</td> <td></td> <td></td> </tr> <tr> <td>T</td> <td>DBW</td> <td>4</td> </tr> </tbody> </table> <p>Next, a value in the <i>DB75</i> is incremented every second.</p>	OPN	DB	75	L	DBW	0	L	DBW	2	+I			T	DBW	4
OPN	DB	75														
L	DBW	0														
L	DBW	2														
+I																
T	DBW	4														

Step	G: Creating the STEP7 Program
	<p>Network 2: Second Cycle</p> <p>Generation of a second cycle at M 0.0</p> <pre> AN M 0.0 L S5T#1S SD T 1 A T 1 = M 0.0 </pre> <p>Network 3: Counting in a second cycle</p> <p>Counting a value in a second cycle At 10000, reset to 0</p> <pre> AN M 0.0 JC M001 L DBW 6 L 1 +I T DBW 6 L 10000 <I JC M001 L 0 T DBW 6 M001: NOP 0 </pre> <p>Finally, a value in the <i>DB75</i> is incremented every time the <i>OBI</i> run.</p> <p>Network 4: Counting in the cycle time</p> <p>Counting a value each time the OB is executed At 10000, reset to 0</p> <pre> L DBW 8 L 1 +I T DBW 8 L 10000 <I JC M002 L 0 T DBW 8 M002: NOP 0 </pre>
7	<p>Save the block <i>OBI</i> and load it into the PLC. This is done via the corresponding buttons on the toolbar.</p> <p>This completes the creation of the STEP7 project and it can now be run. Exit the program <i>LAD/STL/SCF</i>.</p>

H: Testing the STEP7 Program

Step	H: Testing the STEP7 Program																																				
1	<p>Testing the program with the STEP7 software.</p> <p>For this purpose, a tag table is created. This is done in the <i>SIMATIC Manager</i> via a  on the entry of the configured CPU module and then selecting <i>Target System</i> → <i>Monitor/Control Tag</i> from the pop-up menu.</p> 																																				
2	<p>An editor for creating and using a tag table will be displayed.</p> <p>The following shows a completed tag table. In this table, enter all tags created in the <i>DB75</i>.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Symbol</th> <th>Monitor</th> <th>Format</th> <th>Monitor Value</th> <th>Modify Value</th> </tr> </thead> <tbody> <tr> <td>DB75.DBW 0</td> <td>---</td> <td>DEC</td> <td></td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 2</td> <td>---</td> <td>DEC</td> <td></td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 4</td> <td>---</td> <td>DEC</td> <td></td> <td>24</td> <td></td> </tr> <tr> <td>DB75.DBW 6</td> <td>---</td> <td>DEC</td> <td></td> <td>5254</td> <td></td> </tr> <tr> <td>DB75.DBW 8</td> <td>---</td> <td>DEC</td> <td></td> <td>8847</td> <td></td> </tr> </tbody> </table>	Address	Symbol	Monitor	Format	Monitor Value	Modify Value	DB75.DBW 0	---	DEC		12	12	DB75.DBW 2	---	DEC		12	12	DB75.DBW 4	---	DEC		24		DB75.DBW 6	---	DEC		5254		DB75.DBW 8	---	DEC		8847	
Address	Symbol	Monitor	Format	Monitor Value	Modify Value																																
DB75.DBW 0	---	DEC		12	12																																
DB75.DBW 2	---	DEC		12	12																																
DB75.DBW 4	---	DEC		24																																	
DB75.DBW 6	---	DEC		5254																																	
DB75.DBW 8	---	DEC		8847																																	
3	<p>Monitoring the current tag values.</p> <p>By clicking on the toolbar button displayed below, the current values of the corresponding tags in the PLC are displayed in the column <i>Status Value</i>.</p>  <p>Controlling the tag values.</p> <p>Values can be entered in the column <i>Control Value</i>. By clicking on the toolbar button displayed below, these values will be written to the corresponding tags in the PLC.</p>																																				

Step	H: Testing the STEP7 Program
	<p>Note that tags can only be controlled while the operating mode switch of the CPU module is set to <i>RUN-P</i>.</p>  <p>The image shows a mouse cursor clicking on a button with a double-headed arrow icon. A tooltip box is visible below the button, containing the text 'Modify (according to trigger)'.</p>
4	<p>The created tag table can now be saved.</p> <p>In this sample, the table is saved under the name <i>VAT1</i>. After checking the program in the PLC, the tag table can be closed. This concludes the configuration of the STEP7 project and the <i>SIMATIC Manager</i> can be exited.</p>  <p>The image shows a small icon of a tag table with the text 'VAT1' next to it.</p>

5.3 Configuration of the S7 OPC Server

The following description details the steps necessary to configure the *S7 OPC Server*.

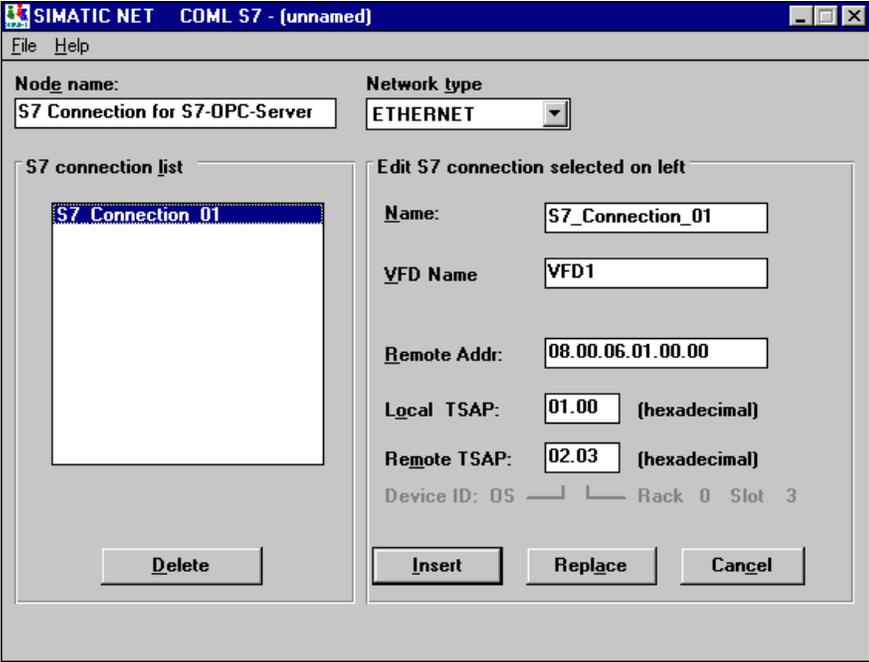
Overview of the Configuration Steps

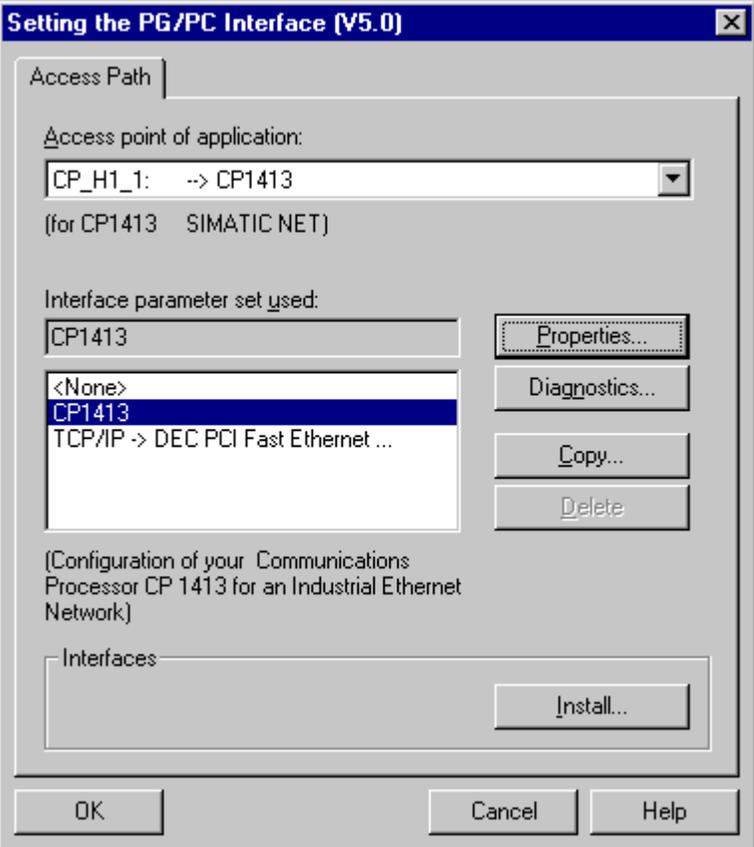
The following lists the steps necessary to configure the *S7 OPC Server*:

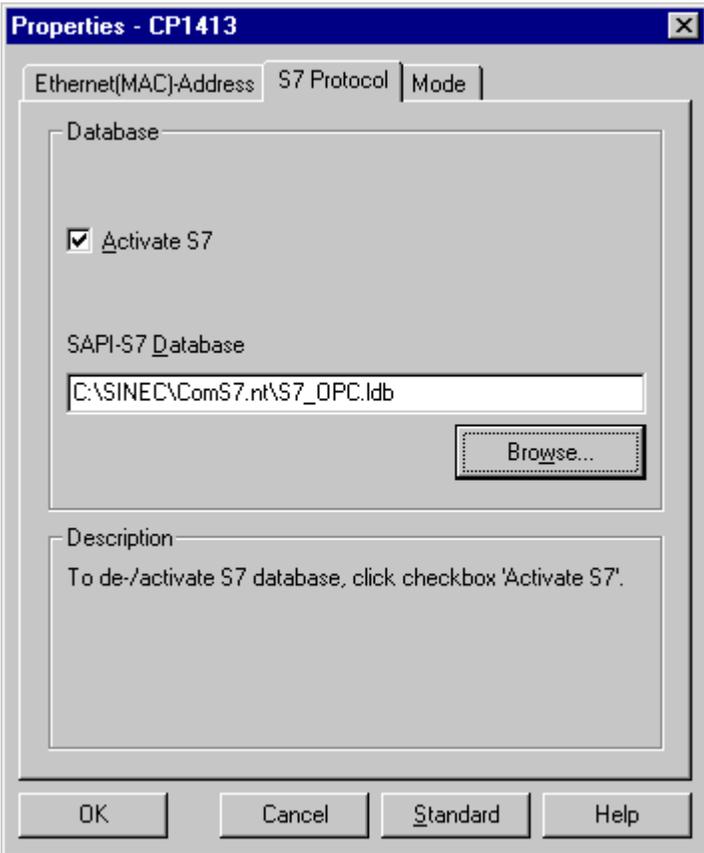
- A: Activating the S7 Protocol
- B: Installing the S7 OPC Server
- C: Setting the DCOM Configuration
- D: Configuring the S7 OPC Server
- E: Testing the S7 OPC Server

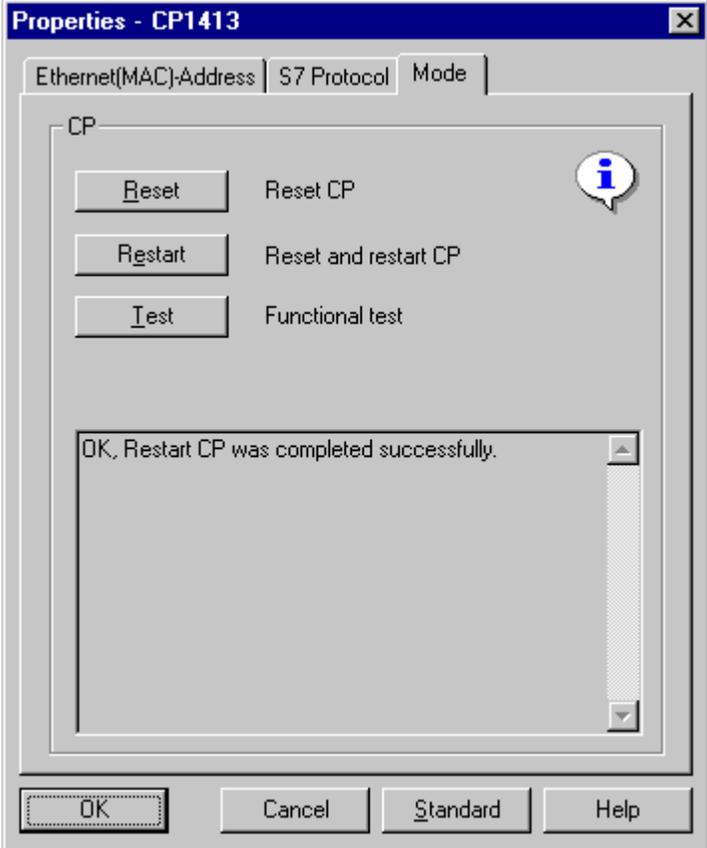
A: Activating the S7 Protocol

Step	A: Activating the S7 Protocol
1	<p>Creation of the database file for the S7 Protocol using the program COML S7.</p> <p>This program is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC NET</i> → <i>COML S7</i>.</p> <div style="text-align: center;">  <p>COML S7</p> </div>
2	<p>The program <i>COML S7</i> will be displayed.</p> <p>In the database file, define the <i>S7 Connection</i> which is going to be used by the <i>S7 OPC Server</i> to access the PLC.</p> <p>As the <i>Network Type</i>, select the entry <i>ETHERNET</i>.</p> <p>In the right area of the program's dialog box, the <i>S7</i> connection properties can be defined. As the <i>Name</i> of the connection, enter <i>S7_Connection_01</i>, as the <i>VFD Name</i>, enter the name <i>VFD1</i>. The <i>Remote Address</i>, that is the Ethernet address of the communication processor in the PLC, this sample uses <i>08.00.06.01.00.00</i>.</p>

Step	A: Activating the S7 Protocol
	<p>As the Local TSAP, this sample uses 01.00. The first two digits represent a device identifier, the second two digits must always be 0. As the Remote TSAP, this sample uses 02.03. The first two digits represent the ID of the resource reserved for an operator station in the S7. The second two digits indicate the rack and slot number of the CPU module to be accessed.</p> <p>Clicking on the <i>Add</i> button adds the new S7 connection to the database file list of existing connections.</p> 
3	<p>Save the settings made as a text file.</p> <p>This is done via the <i>File</i> → <i>Save Text DB</i> menu. In this sample, the file is saved under the name <i>S7_OPC.txt</i>.</p> <p>Generation of the binary database file.</p> <p>This is done via the <i>File</i> → <i>Generate Binary DB under</i> menu. In this sample, the file is named <i>S7_OPC.ldb</i>.</p> <p>The program <i>COML S7</i> can now be exited.</p>  <p>S7_OPC.ldb</p>
4	<p>Activation of the <i>S7 Protocol</i> for the communication processor <i>CP 1413</i> using the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>

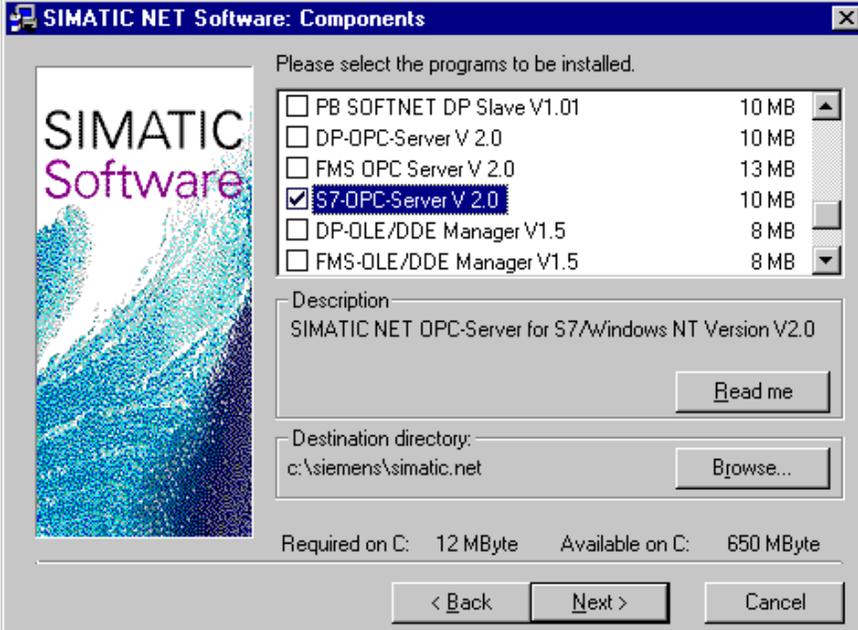
Step	A: Activating the S7 Protocol
5	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>In this program, select the entry of the communication processor <i>CP 1413</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>Via the <i>Properties</i> button, the properties dialog box of the communication processor <i>CP 1413</i> is opened.</p> 

Step	A: Activating the S7 Protocol
6	<p>The properties dialog box of the communication processor <i>CP 1413</i> will be displayed.</p> <p>In the S7 Protocol tab, select the check-box <i>Activate S7</i>. This enables the input field <i>SAPI S7 Database</i> below. In this field, specify the path to the previously created database file <i>S7_OPC.ldb</i>. You can use the <i>Browse</i> button to do this.</p>  <p>The screenshot shows a dialog box titled "Properties - CP1413" with three tabs: "Ethernet(MAC)-Address", "S7 Protocol", and "Mode". The "S7 Protocol" tab is active. It contains a "Database" section with a checked checkbox labeled "Activate S7". Below this is a text field labeled "SAPI-S7 Database" containing the path "C:\SINEC\ComS7.nt\S7_OPC.ldb". To the right of this field is a "Browse..." button. Below the text field is a "Description" section with the text "To de-/activate S7 database, click checkbox 'Activate S7'". At the bottom of the dialog are four buttons: "OK", "Cancel", "Standard", and "Help".</p>

Step	A: Activating the S7 Protocol
7	<p>In the <i>Operating Status</i> tab, click on the <i>Restart</i> button to restart the communication processor. The settings made will become effective.</p> <p>Close the properties dialog box of the communication processor <i>CP 1413</i> by clicking on <i>OK</i>. The program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>.</p> 

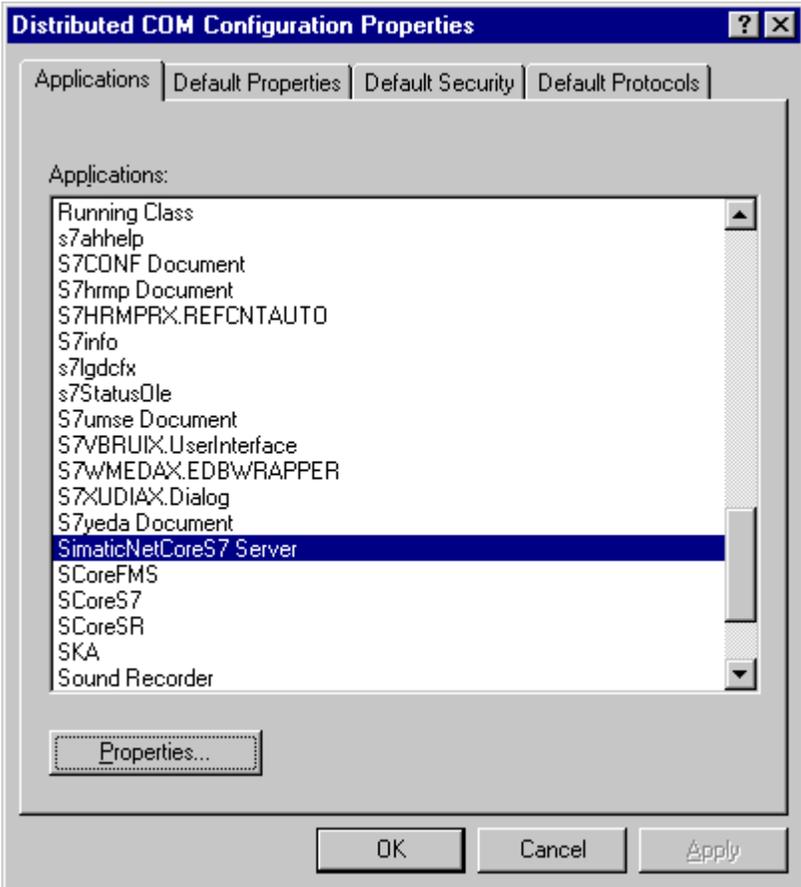
B: Installing the S7 OPC Server

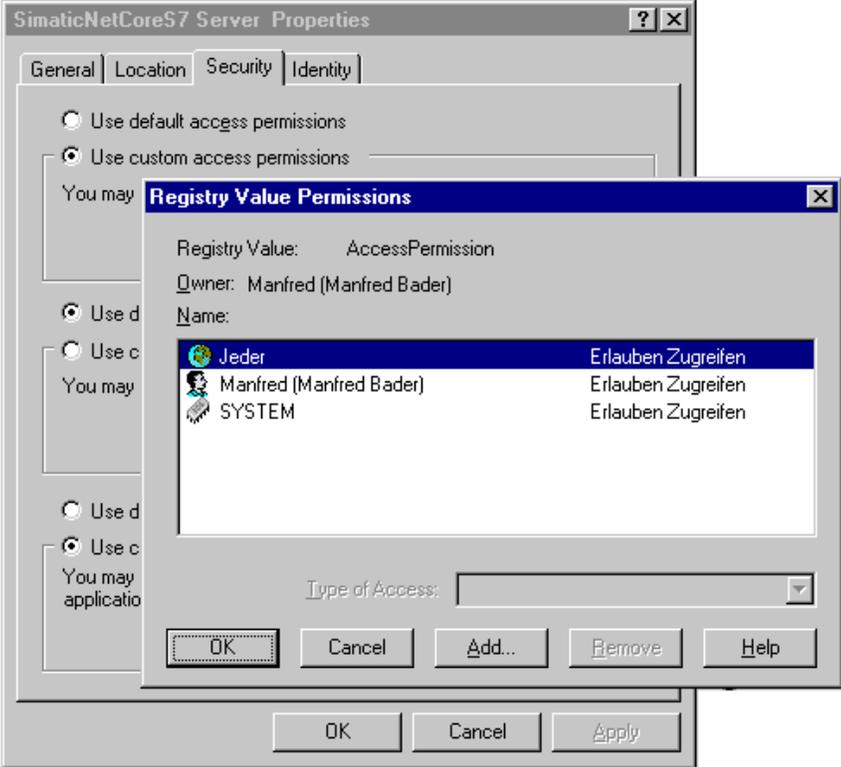
Step	B: Installing the S7 OPC Server
1	<p>Install the <i>S7 OPC Server</i> from the <i>SIMATIC NET</i> CD-ROM.</p> <p>After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> 

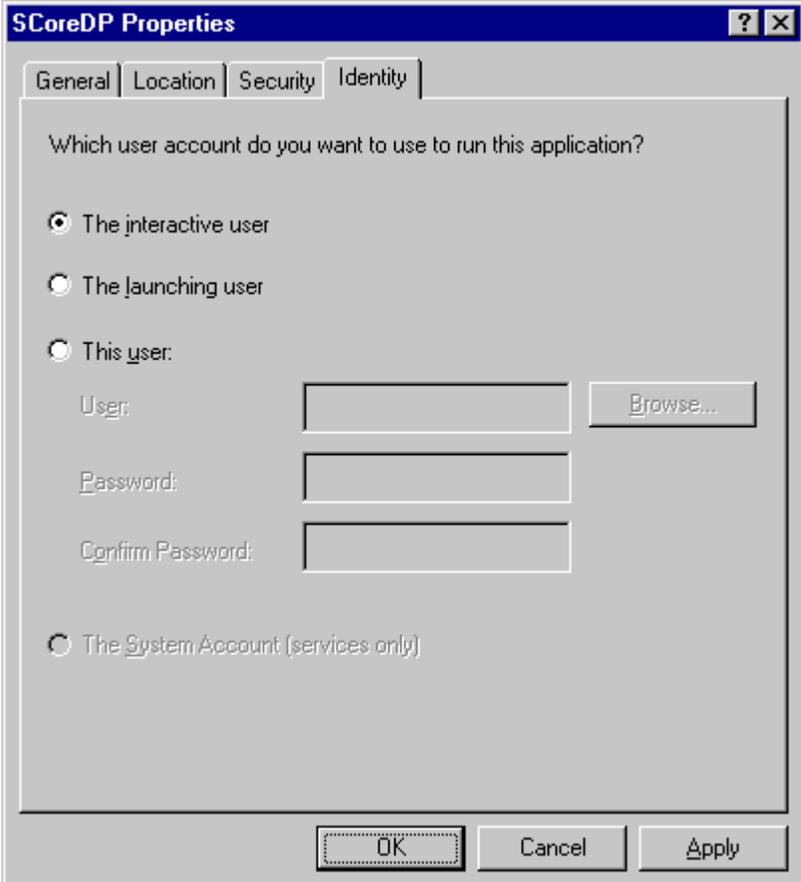
Step	B: Installing the S7 OPC Server
	<p>Follow the instructions of the installation program. On the <i>Components</i> page, select the check-box <i>S7 OPC Server</i>. Finish the installation. After the installation, a restart of the computer is required.</p> 

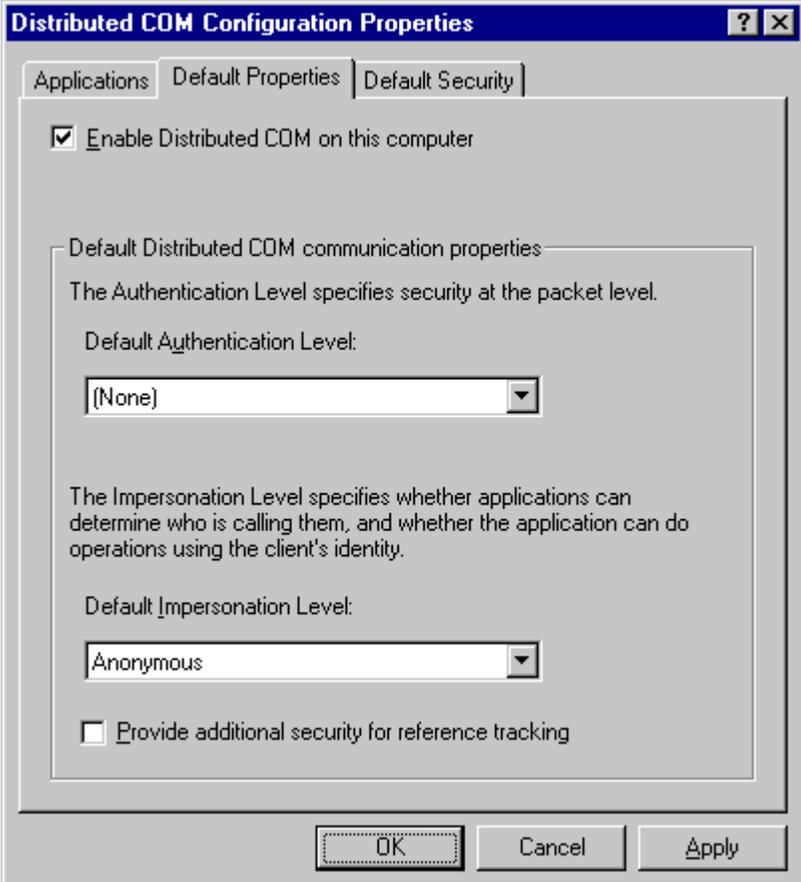
C: Setting the DCOM Configuration

Step	C: Setting the DCOM Configuration
1	<p>Setting the DCOM configuration for the S7 OPC Server.</p> <p>The DCOM configuration is set via the program <i>DCOM Configuration Properties</i>. This program is started via <i>Start</i> → <i>Run</i> and then entering the program file name <i>dcomcnfg.exe</i>.</p> 

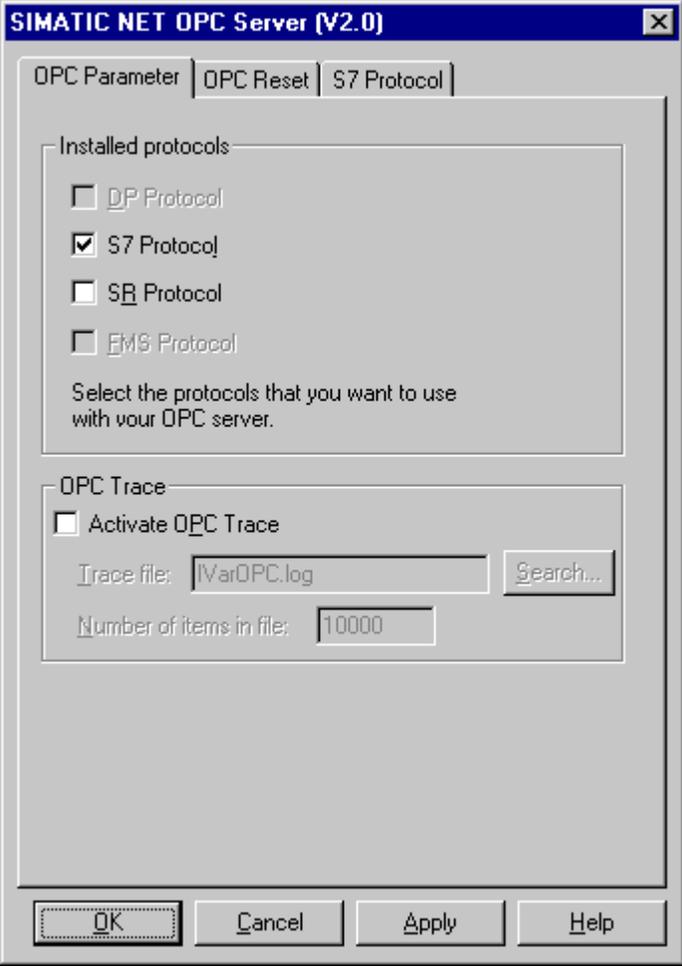
Step	C: Setting the DCOM Configuration
2	<p>The program <i>DCOM Configuration Properties</i> will be displayed.</p> <p>In the <i>Applications</i> tab, select the entry of the <i>S7 OPC Server</i>. This is the entry <i>SimaticNetCoreS7 Server</i>.</p> <p>Clicking on the <i>Properties</i> button will open its properties dialog box.</p>  <p>The screenshot shows the 'Distributed COM Configuration Properties' dialog box with the 'Applications' tab selected. The 'Applications' list contains the following entries: Running Class, s7ahhelp, S7CONF Document, S7hrmp Document, S7HRMPRX.REFCNTAUTO, S7info, s7lgdcfx, s7StatusOle, S7umse Document, S7VBRUIX.UserInterface, S7WMEDAX.EDBWRAPPER, S7XUDIAX.Dialog, S7yeda Document, SimaticNetCoreS7 Server (highlighted), SCoreFMS, SCoreS7, SCoreSR, SKA, and Sound Recorder. A 'Properties...' button is located below the list. At the bottom of the dialog are 'OK', 'Cancel', and 'Apply' buttons.</p>

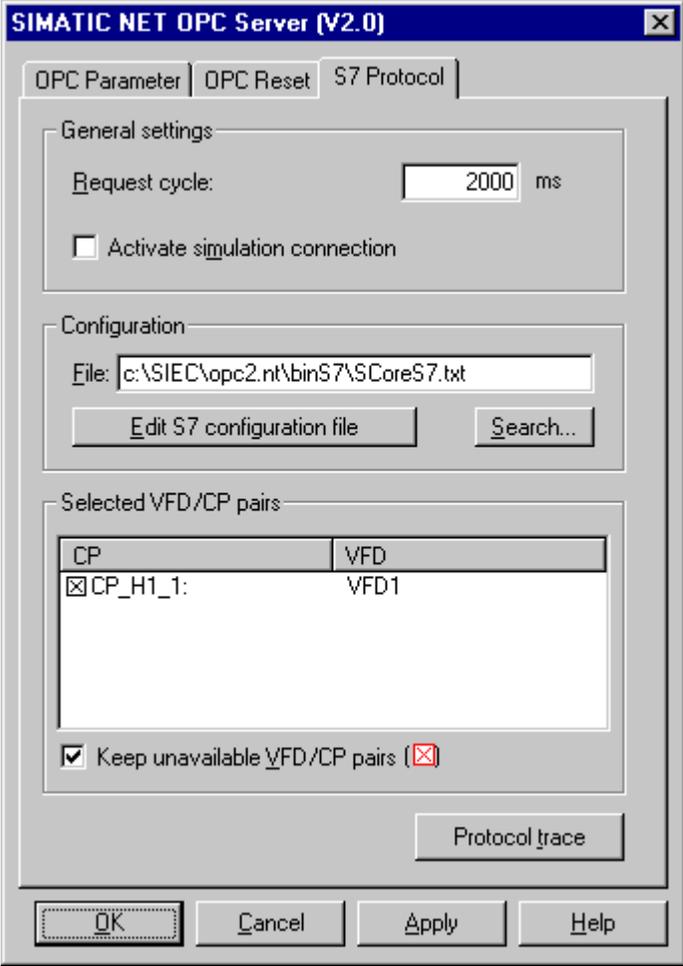
Step	C: Setting the DCOM Configuration								
3	<p>The dialog box SimaticNetCoreS7 Server Properties will be displayed.</p> <p>In the <i>Security</i> tab, specify who has access to the <i>S7 OPC Server</i>. To do so, click on the radio-button <i>Use custom access permissions</i>. By clicking on the now enabled <i>Edit</i> button, set the access permissions. Among other things, the <i>System</i> must be accessible.</p> <p>During the configuration phase it makes sense to give access permissions to everybody to rule out problems due to insufficient access rights. After the successful commissioning of the communication, you can still limit the access rights of certain users if necessary.</p>  <p>The screenshot shows the 'SimaticNetCoreS7 Server Properties' dialog box with the 'Security' tab selected. The 'Use custom access permissions' radio button is selected. A 'Registry Value Permissions' dialog box is overlaid on top, showing the following details:</p> <ul style="list-style-type: none"> Registry Value: AccessPermission Owner: Manfred (Manfred Bader) Name: Jeder <p>The permissions table in the dialog box is as follows:</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Permissions</th> </tr> </thead> <tbody> <tr> <td>Jeder</td> <td>Erlauben Zugreifen</td> </tr> <tr> <td>Manfred (Manfred Bader)</td> <td>Erlauben Zugreifen</td> </tr> <tr> <td>SYSTEM</td> <td>Erlauben Zugreifen</td> </tr> </tbody> </table> <p>The 'Type of Access' dropdown is currently empty. Buttons for 'OK', 'Cancel', 'Add...', 'Remove', and 'Help' are visible at the bottom of the dialog box.</p>	Name	Permissions	Jeder	Erlauben Zugreifen	Manfred (Manfred Bader)	Erlauben Zugreifen	SYSTEM	Erlauben Zugreifen
Name	Permissions								
Jeder	Erlauben Zugreifen								
Manfred (Manfred Bader)	Erlauben Zugreifen								
SYSTEM	Erlauben Zugreifen								

Step	C: Setting the DCOM Configuration
4	<p>In the Identity tab, the radio-button The interactive user is selected.</p> <p>The dialog box <i>SimaticNetCoreS7 Server Properties</i> can be closed by clicking on <i>OK</i>. The program <i>DCOM Configuration Properties</i> can also be closed by clicking on <i>OK</i>.</p>  <p>The screenshot shows a dialog box titled "SCoreDP Properties" with a blue title bar and standard window controls (minimize, maximize, close). The "Identity" tab is selected, showing a question: "Which user account do you want to use to run this application?". There are four radio button options: "The interactive user" (which is selected), "The launching user", "This user:" (which has three text input fields for "User:", "Password:", and "Confirm Password:" and a "Browse..." button), and "The System Account (services only)". At the bottom of the dialog are three buttons: "OK", "Cancel", and "Apply".</p>

Step	C: Setting the DCOM Configuration
5	<p>In the <i>Default Properties</i> tab, the general properties of the DCOM communication are defined.</p> <p>DCOM must be activated on the computer. Via the <i>Default Authentication Level</i> list box, the desired security at the packet level can be defined. Via the <i>Default Impersonation Level</i> list box, you can specify if accessing clients can be identified.</p> <p>During the configuration phase it makes sense to choose the lowest security level for both settings. This rules out problems caused by these settings from the beginning.</p> <p>The program <i>DCOM Configuration Properties</i> can also be exited by clicking on <i>OK</i>.</p> 

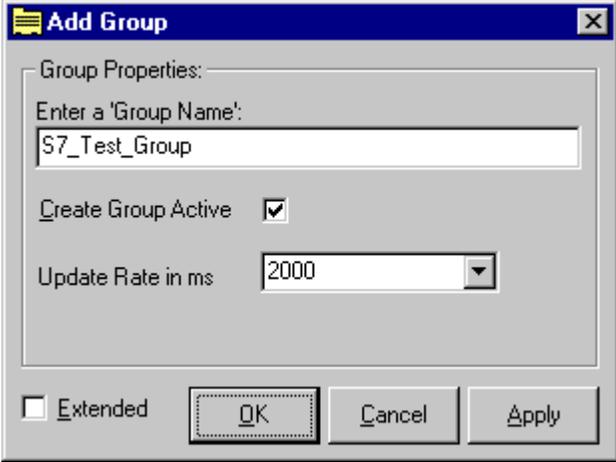
D: Configuring the S7 OPC Server

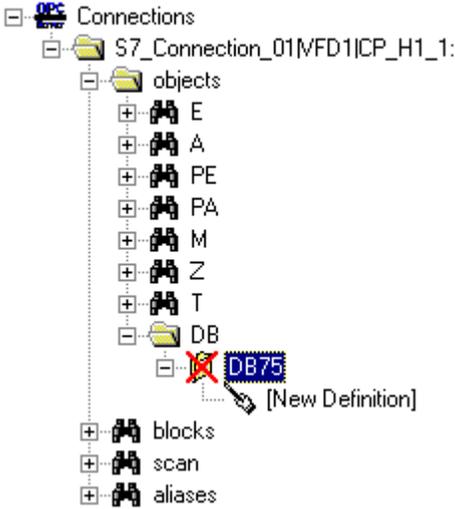
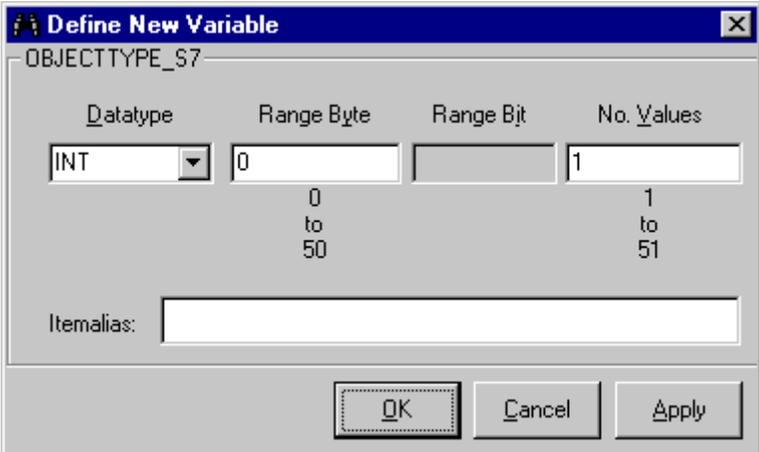
Step	D: Configuring the S7 OPC Server
1	<p>Configuration of the <i>S7 OPC Server</i> via the program <i>SIMATIC NET OPC Server</i>. This program is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC NET</i> → <i>OPC Server</i> → <i>OPC Settings</i>.</p>  <p>SIMATIC NET OPC-Server 2.0</p>
2	<p>The program <i>SIMATIC NET OPC Server</i> will be displayed. In the <i>OPC Parameters</i> tab, specify which protocols are to be supported by the <i>OPC Server</i>. In this sample, only the support for the <i>S7 Protocol</i> is needed. The check-box <i>SR Protocol</i> can be deselected.</p> 

Step	D: Configuring the S7 OPC Server
3	<p>In the <i>S7 Protocol</i> tab, additional settings for the communication with the <i>SIMATIC S7</i> can be made.</p> <p>As the scan cycle, this sample uses <i>2000 ms</i>. In the <i>Select CP/VFD Pairs</i> area, define which access points are to be used by the <i>S7 OPC Server</i> for the communication. In this sample, the access point <i>CP_H1_1</i>: is selected.</p> <p>The program <i>SIMATIC NET OPC Server</i> can be exited by clicking on <i>OK</i>.</p> 

E: Testing the S7 OPC Server

Step	E: Testing the S7 OPC Server
1	<p>Testing of the <i>S7 OPC Server</i> with the program <i>OPC Scout</i>.</p> <p>This program is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC NET</i> → <i>OPC Server</i> → <i>OPC Scout</i>.</p>  <p>OPC Scout</p>

Step	E: Testing the S7 OPC Server
2	<p>The program <i>OPC Scout</i> will be displayed.</p> <p>The left window lists all available OPC servers. The <i>Local Server(s)</i> list includes the entry of the <i>S7 OPC Server</i>. This is the entry <i>OPC.SimaticNET</i>. Via a  on the entry <i>OPC.SimaticNET</i>, a connection to the <i>S7 OPC Server</i> will be established.</p> 
3	<p>The dialog box <i>Add Group</i> will be displayed.</p> <p>Via this dialog box, a new group can be created in the <i>S7 OPC Server</i>. Such a group is used to carry out the exchange of data between an OPC server and an OPC client. The group to be created must be given a name. The update cycle of this group is set to 2000 ms. Clicking on OK creates the group in the OPC Server.</p> 
4	<p>The new group will be listed as a sub-entry to the <i>S7 OPC Server</i> entry in the left window. At this time, the group is still empty. Now, the data to be requested from the OPC server is defined. The data provided by an OPC server is called an Item.</p> <p>Via a  on the group in the left window, the required items can be specified.</p>
5	<p>The dialog box <i>OPC Navigator</i> will be displayed.</p> <p>From this dialog box, all items provided by the server are accessible. Via a  on the entry of the connection <i>S7_Connection_01</i> and then a  on the displayed entry <i>objects</i>, all object types available in the PLC will be displayed.</p>

Step	E: Testing the S7 OPC Server
	<p>These object types also include data blocks. Via a  on the entry <i>DB</i>, the accessible data blocks are displayed. In this sample, only <i>DB75</i> is accessible.</p> <p>Via a  on the entry (<i>New Definition</i>), the required items can be defined.</p> 
6	<p>The dialog box <i>Define New Tag</i> will be displayed.</p> <p>From this dialog box, a new item can be created. In this sample, the first item to be created corresponds to the first of the five tags created for the STEP7 program in the <i>DB75</i>.</p> <p>In the <i>Data Type</i> field, the type of this item is set to <i>INT</i>. This corresponds to a Signed 16-Bit value. In the <i>Range Byte</i> field, the Byte number <i>0</i> is entered. This corresponds to the Byte number of the tag in the data block. In the <i>No. Values</i> field, <i>1</i> is entered. Close the dialog box by clicking on <i>OK</i>.</p> 

Step	E: Testing the S7 OPC Server																														
7	<p>The column in the middle will now display the newly defined item.</p> <p>For the remaining four tags of the <i>DB75</i>, define the corresponding items as described above. However, use the corresponding Byte number of the respective tag.</p> <p>To insert the just defined items into the group, select them and move them to the list on the right via the arrow button. By clicking on the <i>OK</i> button, they will be inserted into the group.</p> <div style="border: 1px solid black; padding: 2px; margin: 5px 0;">Name</div> <ul style="list-style-type: none"> ◇ DB75,INT000,1 ◇ DB75,INT002,1 ◇ DB75,INT004,1 ◇ DB75,INT006,1 ◇ DB75,INT008,1 																														
8	<p>The items inserted will be displayed in the right window of the program <i>OPC Scout</i>.</p> <p>In the <i>Value</i> column, the current tag values will be displayed.</p> <p>The program <i>OPC Scout</i> can be exited. You also have the option to save the just created project.</p> <table border="1"> <thead> <tr> <th></th> <th>Item Names</th> <th>Value</th> <th>Format</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT000,1</td> <td>0</td> <td>Original</td> <td>integer 16</td> </tr> <tr> <td>2</td> <td>[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT002,1</td> <td>12</td> <td>Original</td> <td>integer 16</td> </tr> <tr> <td>3</td> <td>[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT004,1</td> <td>12</td> <td>Original</td> <td>integer 16</td> </tr> <tr> <td>4</td> <td>[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT006,1</td> <td>7230</td> <td>Original</td> <td>integer 16</td> </tr> <tr> <td>5</td> <td>[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT008,1</td> <td>7978</td> <td>Original</td> <td>integer 16</td> </tr> </tbody> </table>		Item Names	Value	Format	Type	1	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT000,1	0	Original	integer 16	2	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT002,1	12	Original	integer 16	3	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT004,1	12	Original	integer 16	4	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT006,1	7230	Original	integer 16	5	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT008,1	7978	Original	integer 16
	Item Names	Value	Format	Type																											
1	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT000,1	0	Original	integer 16																											
2	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT002,1	12	Original	integer 16																											
3	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT004,1	12	Original	integer 16																											
4	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT006,1	7230	Original	integer 16																											
5	[S7:S7_Connection_01MFD1 CP_H1_1:]DB75,INT008,1	7978	Original	integer 16																											

5.4 Creation of the WinCC Project WinCC_S7_OPC

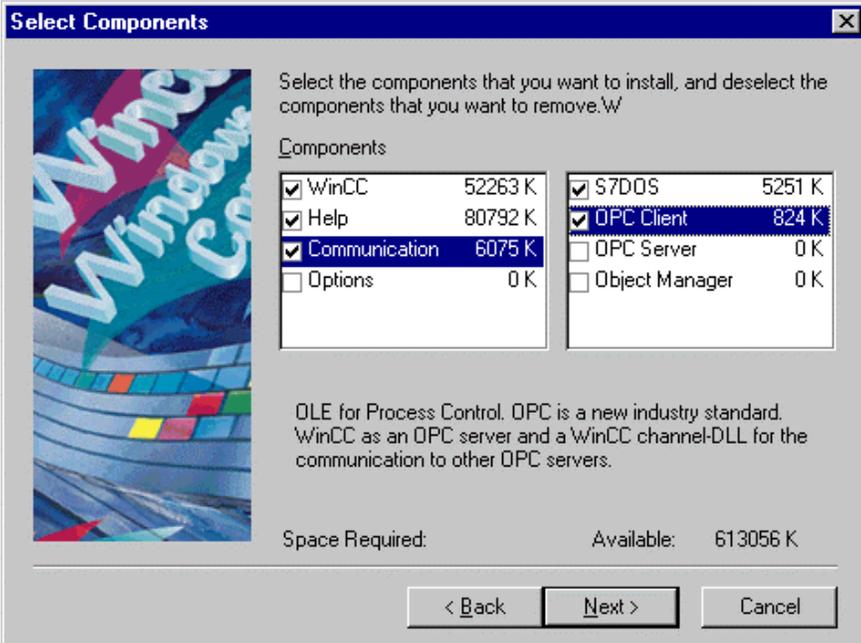
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S7_OPC*.

Overview of the Configuration Steps

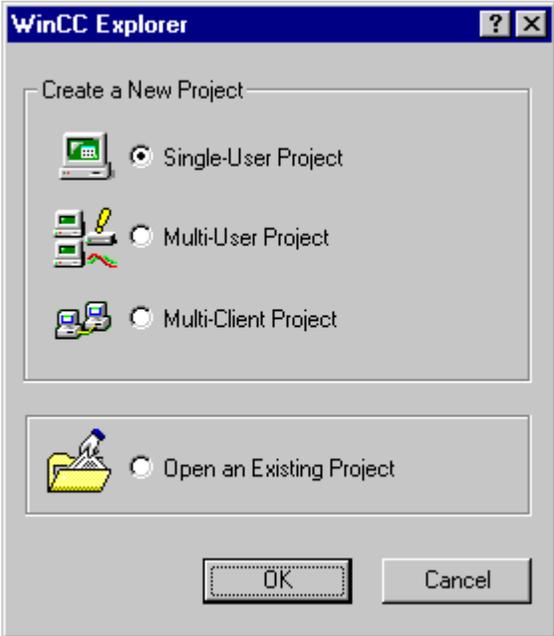
The following lists the configuration steps necessary to create the WinCC project *WinCC_S7_OPC*:

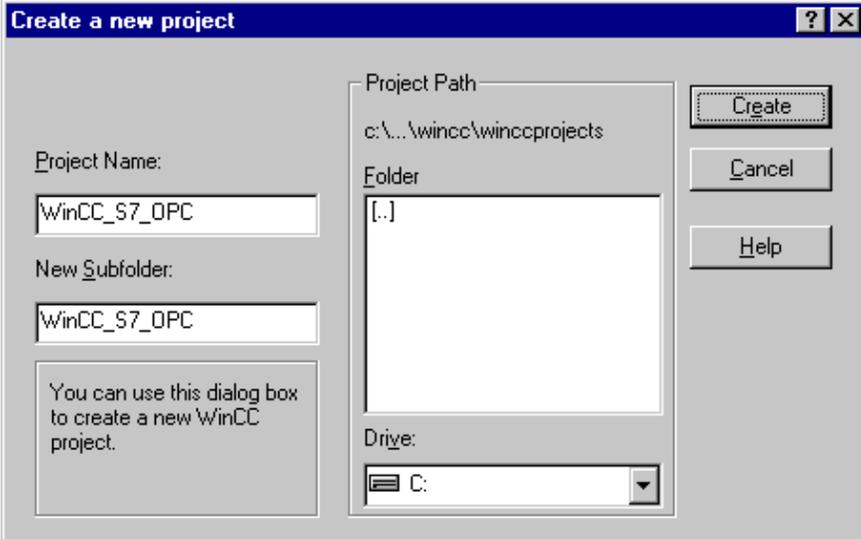
- A: Installing the OPC Client
- B: Creating the WinCC Project
- C: Creating the Connection
- D: Conventional Configuration
- E: Creating the WinCC Screen

A: Installing the OPC Client

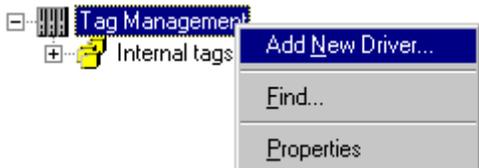
Step	A: Installing the OPC Client																
1	<p>During the installation of WinCC, the <i>OPC Client</i> can be installed as an option. If the OPC client has not been installed yet, it can also be installed afterwards without any problems.</p>  <p>Select Components</p> <p>Select the components that you want to install, and deselect the components that you want to remove.</p> <p>Components</p> <table border="1"> <tbody> <tr> <td><input checked="" type="checkbox"/> WinCC</td> <td>52263 K</td> <td><input checked="" type="checkbox"/> S7DOS</td> <td>5251 K</td> </tr> <tr> <td><input checked="" type="checkbox"/> Help</td> <td>80792 K</td> <td><input checked="" type="checkbox"/> OPC Client</td> <td>824 K</td> </tr> <tr> <td><input checked="" type="checkbox"/> Communication</td> <td>6075 K</td> <td><input type="checkbox"/> OPC Server</td> <td>0 K</td> </tr> <tr> <td><input type="checkbox"/> Options</td> <td>0 K</td> <td><input type="checkbox"/> Object Manager</td> <td>0 K</td> </tr> </tbody> </table> <p>OLE for Process Control. OPC is a new industry standard. WinCC as an OPC server and a WinCC channel-DLL for the communication to other OPC servers.</p> <p>Space Required: Available: 613056 K</p> <p>< Back Next > Cancel</p>	<input checked="" type="checkbox"/> WinCC	52263 K	<input checked="" type="checkbox"/> S7DOS	5251 K	<input checked="" type="checkbox"/> Help	80792 K	<input checked="" type="checkbox"/> OPC Client	824 K	<input checked="" type="checkbox"/> Communication	6075 K	<input type="checkbox"/> OPC Server	0 K	<input type="checkbox"/> Options	0 K	<input type="checkbox"/> Object Manager	0 K
<input checked="" type="checkbox"/> WinCC	52263 K	<input checked="" type="checkbox"/> S7DOS	5251 K														
<input checked="" type="checkbox"/> Help	80792 K	<input checked="" type="checkbox"/> OPC Client	824 K														
<input checked="" type="checkbox"/> Communication	6075 K	<input type="checkbox"/> OPC Server	0 K														
<input type="checkbox"/> Options	0 K	<input type="checkbox"/> Object Manager	0 K														

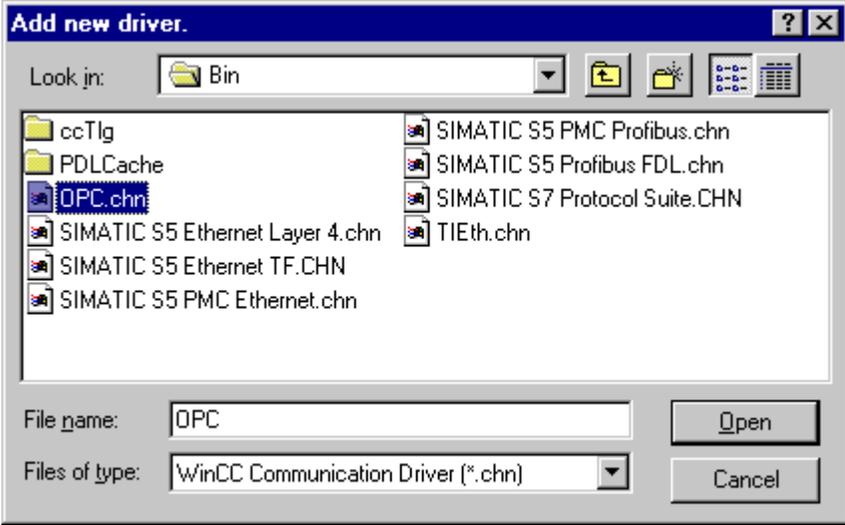
B: Creating the WinCC Project

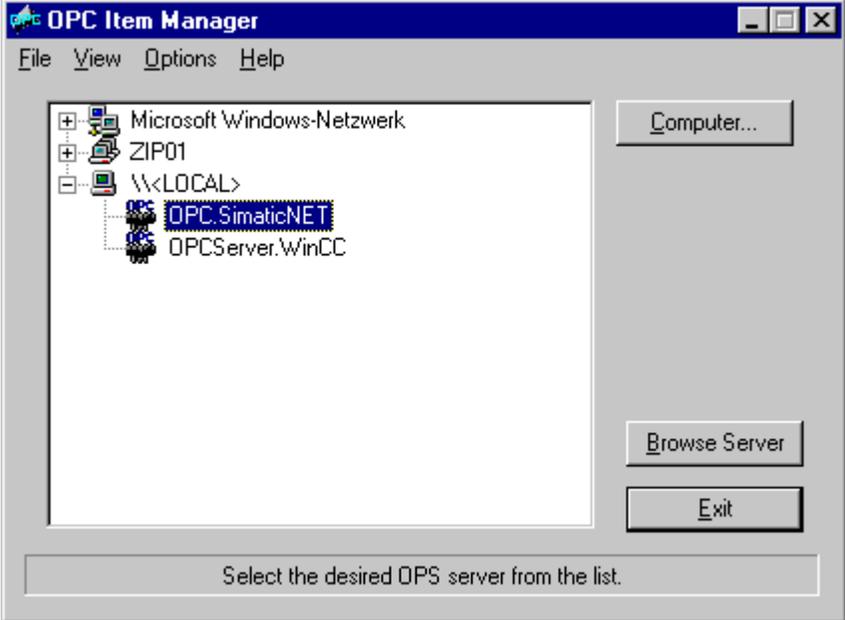
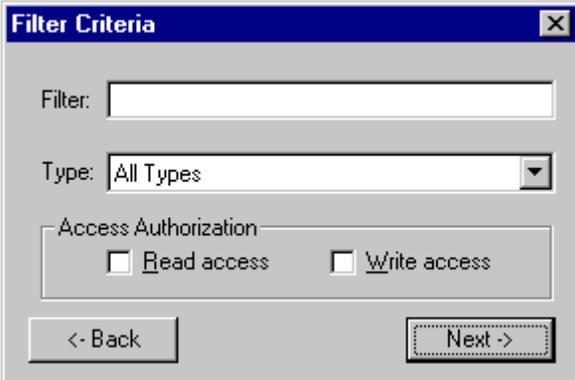
Step	B: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>The <i>WinCC Explorer</i> will be displayed.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

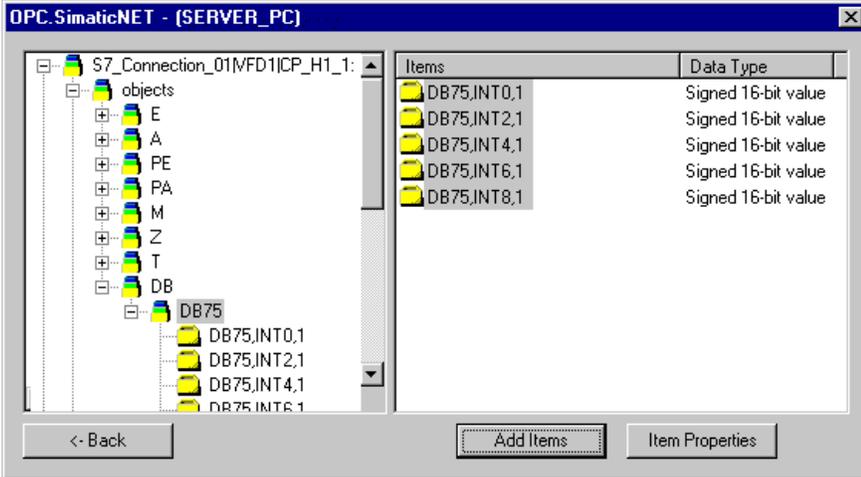
Step	B: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S7_OPC</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

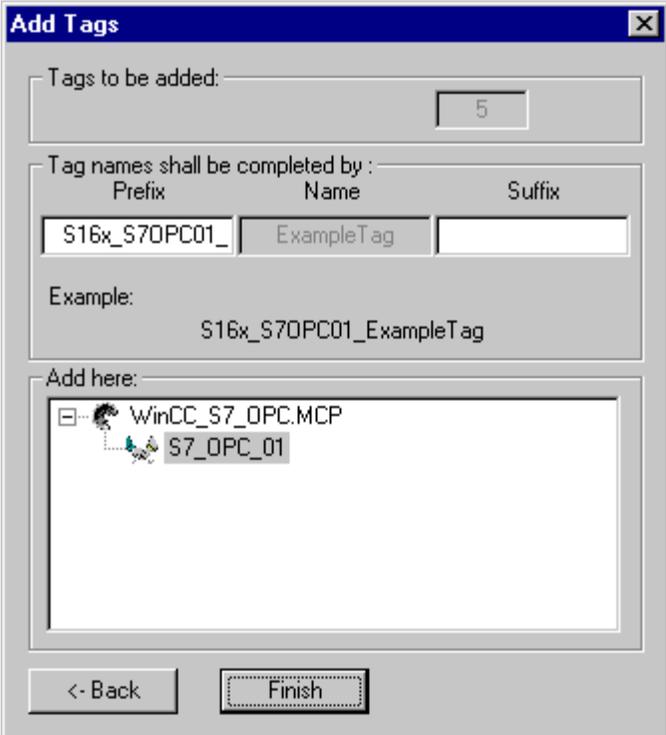
C: Creating the Connection

Step	C: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

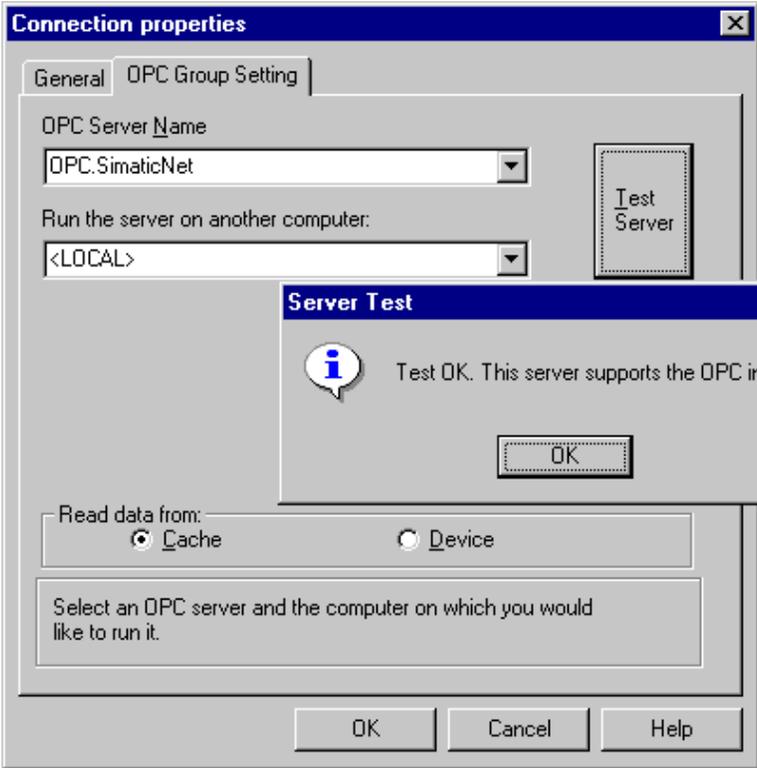
Step	C: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. This sample requires the communication driver <i>OPC</i>. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added communication driver <i>OPC</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The communication driver <i>OPC</i> contains one channel unit.</p> <p>The creation of a connection to a certain OPC server and the selection of the items required by this server can be carried out via the OPC Item Manager. The OPC Item Manager is started via R on the channel unit OPC Groups (OPCHN Unit #1) and then selecting System Parameters from the pop-up menu.</p> 

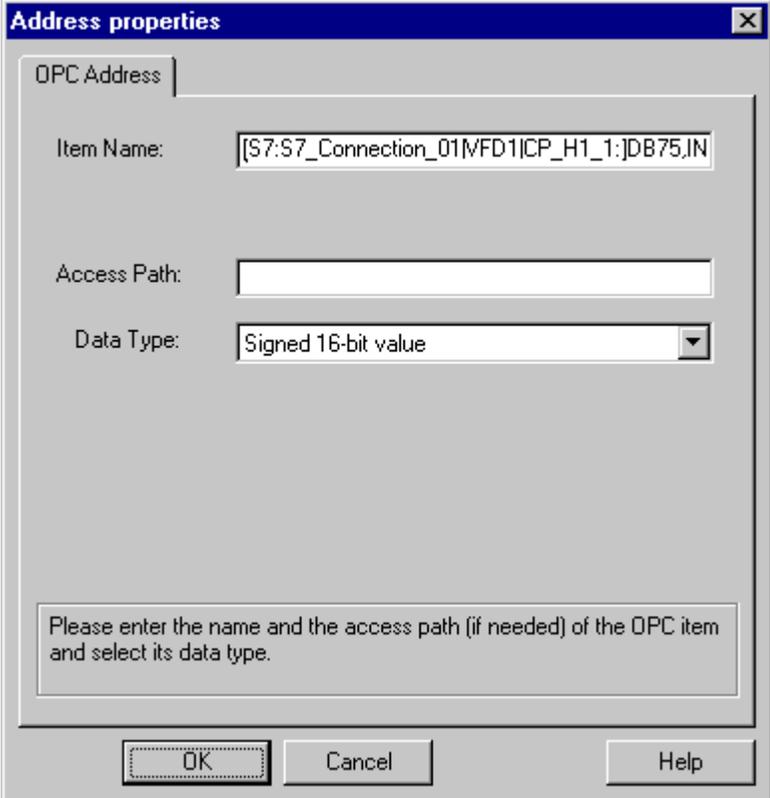
Step	C: Creating the Connection
4	<p>The <i>OPC Item Manager</i> will be displayed.</p> <p>The desired OPC server can be selected from here. This server can be located on the local computer or on another computer accessible by the network. In this sample, the selected OPC server is located on the local computer.</p> <p>Via a  on the <i>LOCAL</i> entry, all OPC servers available on the local computer will be listed. Select the entry <i>OPC.SimaticNET</i> of the <i>S7 OPC Server</i>. Clicking on the button <i>Browse Server</i> displays a selection dialog box for selecting the items available from the <i>S7 OPC Server</i>.</p> 
5	<p>The dialog box <i>Filter Criteria</i> will be displayed.</p> <p>Using this dialog box, the type of the desired items can be specified more exactly. If you want to display all available items, no settings are required. The dialog box can be closed by clicking on <i>Continue-></i>.</p> 

Step	C: Creating the Connection
6	<p>A dialog box for selecting the desired items will be displayed.</p> <p>As a sub-entry to the group <i>DB</i>, this sample only contains <i>DB75</i>. The group <i>DB75</i> contains the five items defined in the previous section with the <i>OPC Scout</i>. These items represent the five tags in the PLC.</p> <p>These five items of the <i>DB75</i> must be selected in the right window. By clicking on the button <i>Add Items</i>, they will be inserted into the WinCC project.</p> 
7	<p>This requires the creation of a new connection into which these items can be inserted as WinCC tags.</p> <p>This connection can be created automatically by the <i>OPC Item Manager</i>. The dialog box <i>New Connection</i> will be displayed. In this dialog box, only the name of the new connection must be entered. In this sample, the name <i>S7_OPC_01</i> is used. Close the dialog box by clicking on <i>OK</i>.</p> 

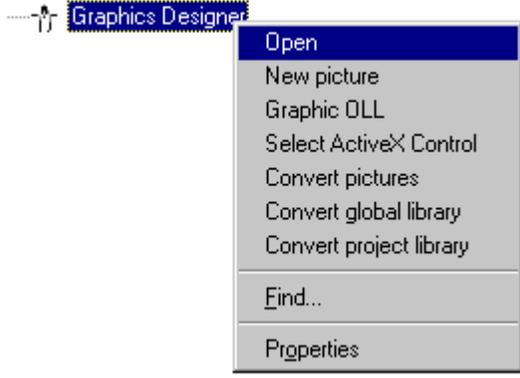
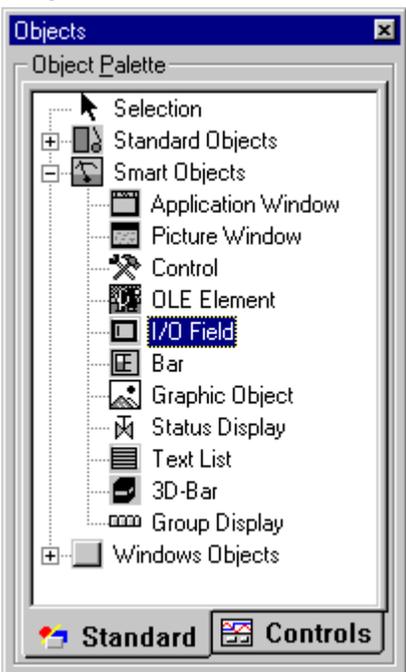
Step	C: Creating the Connection																		
8	<p>The dialog box <i>Add Tags</i> will be displayed.</p> <p>In this dialog box, the connection is defined to which the tags are added. In this sample, the tags are added to the connection <i>S7_OPC_01</i> created previously. This connection is selected from the field <i>Add Here</i> at the bottom.</p> <p>Optionally, a <i>Prefix</i> and a <i>Suffix</i> can be added to the tag names used by the <i>OPC Item Manager</i>. In this sample, the <i>prefix S16x_S7OPC01_</i> is placed in front of the tag names.</p> <p>Clicking on the <i>Finish</i> button creates the WinCC tags.</p> <p>The dialog box for the selection of the desired items can be exited via the <i><-Back</i> button. The <i>OPC Item Manager</i> can be exited via the <i>Close</i> button.</p> 																		
9	<p>The following graphic lists the WinCC tags created by the <i>OPC Item Manager</i>.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S7OPC01_DB75_INT0_1</td> <td>Sig...</td> <td>"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT0,1", "", 2</td> </tr> <tr> <td> S16x_S7OPC01_DB75_INT2_1</td> <td>Sig...</td> <td>"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT2,1", "", 2</td> </tr> <tr> <td> S16x_S7OPC01_DB75_INT4_1</td> <td>Sig...</td> <td>"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT4,1", "", 2</td> </tr> <tr> <td> S16x_S7OPC01_DB75_INT6_1</td> <td>Sig...</td> <td>"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT6,1", "", 2</td> </tr> <tr> <td> S16x_S7OPC01_DB75_INT8_1</td> <td>Sig...</td> <td>"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT8,1", "", 2</td> </tr> </tbody> </table>	Name	Type	Parameters	 S16x_S7OPC01_DB75_INT0_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT0,1", "", 2	 S16x_S7OPC01_DB75_INT2_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT2,1", "", 2	 S16x_S7OPC01_DB75_INT4_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT4,1", "", 2	 S16x_S7OPC01_DB75_INT6_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT6,1", "", 2	 S16x_S7OPC01_DB75_INT8_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT8,1", "", 2
Name	Type	Parameters																	
 S16x_S7OPC01_DB75_INT0_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT0,1", "", 2																	
 S16x_S7OPC01_DB75_INT2_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT2,1", "", 2																	
 S16x_S7OPC01_DB75_INT4_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT4,1", "", 2																	
 S16x_S7OPC01_DB75_INT6_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT6,1", "", 2																	
 S16x_S7OPC01_DB75_INT8_1	Sig...	"S7:[S7_Connection_01\MFD1ICP_H1_1]:DB75.INT8,1", "", 2																	

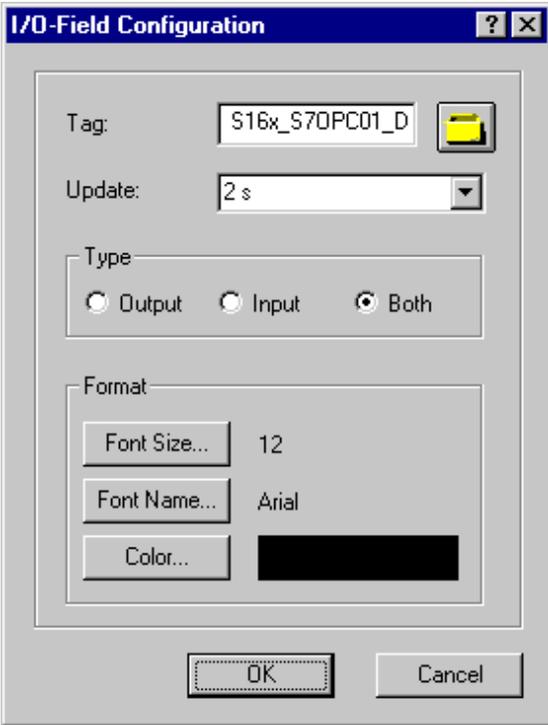
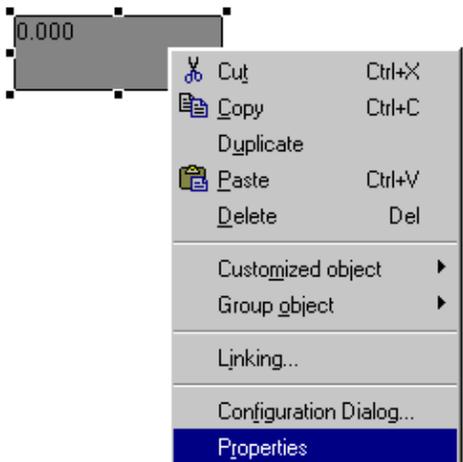
D: Conventional Configuration

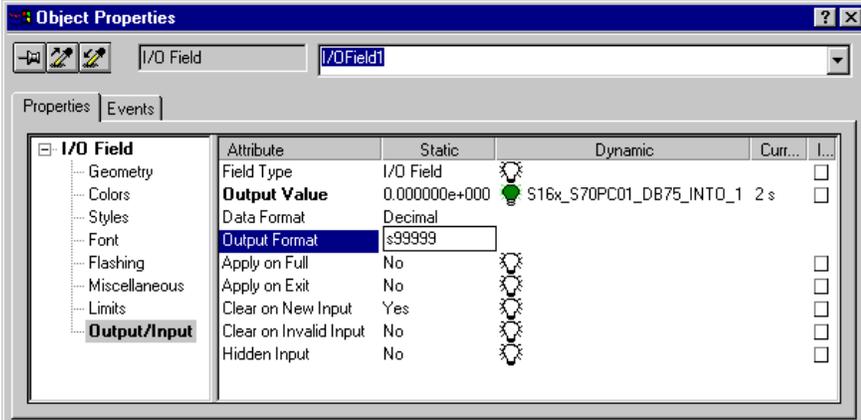
Step	D: Conventional Configuration
1	<p>In addition to the procedure described above for the automatic creation of a connection for the <i>OPC</i> communication driver, there is also the option to create the connection using the conventional method. The actions required are described in this step.</p> <p>A new connection is created via a  on the channel unit of the communication driver <i>OPC</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> <p>The dialog box <i>Connection Properties</i> will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered.</p> <p>In the <i>OPC Connection</i> tab, specify the OPC server to be used. In the <i>OPC Server Name</i> field, enter the name of the OPC server to be used and in the field below, enter the name of the computer on which the OPC server is located.</p> <p>Clicking on the <i>Test Server</i> button allows you to check, if a connection to the desired OPC server can be established.</p> <p>Clicking on the <i>OK</i> button creates the new connection.</p> 
2	<p>In addition to the procedure described above for the automatic creation of the tags, there is also the option to create the tags using the conventional method. The actions required are described in this step.</p> <p>A new tag is created via a  on the entry of the appropriate connection (in this sample, this is the connection <i>S7_OPC_01</i>) and then selecting <i>New Tag</i> from the pop-up menu.</p> <p>The dialog box <i>Tag Properties</i> will be displayed.</p>

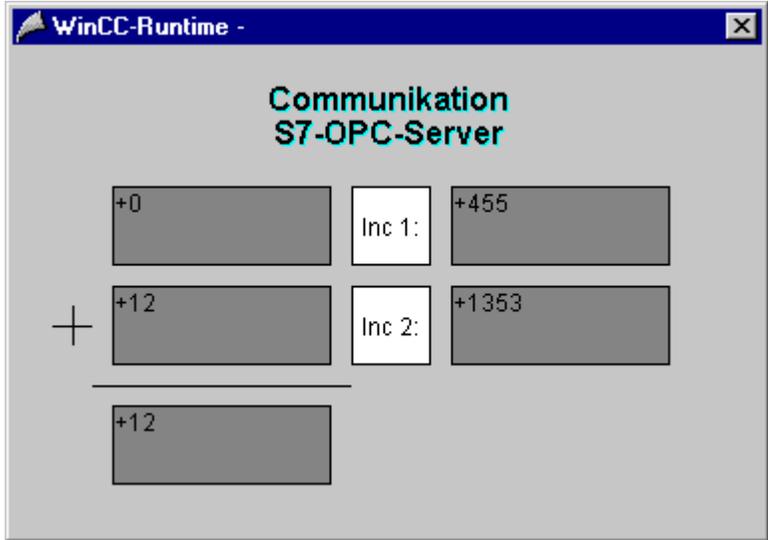
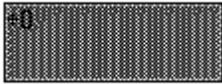
Step	D: Conventional Configuration
	<p>In this dialog box, the name of the tag and its data type is defined. The address of the tag is set via the <i>Select</i> button.</p> <p>The dialog box <i>Address Properties</i> will be displayed.</p> <p>In the <i>Item Name</i> field, specify the name of the desired item from the OPC server. This name contains the address information. The syntax of this address information is explained by means of the first tag to be created within the framework of this sample. Its <i>Item Name</i> is <code>[S7:S7_Connection_01 VFD1 CP_H1_1:]DB75,INT0,1</code></p> <ul style="list-style-type: none"> • <i>S7</i> specifies the OPC server type used (<i>FMS</i> and <i>DP</i> are other examples of available OPC servers from SIMATIC NET). • <i>S7_Connection_01</i> is the name of the S7 connection. • <i>VFD1</i> is the VFD name (Virtual Field Device). • <i>CP_H1_1</i>: is the access point used. • <i>DB75</i> indicates the data block number. • <i>INT0</i> indicates that it is a Signed 16-Bit Value with a start address of 0. • <i>1</i> indicates that it is a single tag as opposed to an array consisting of multiple tags. <p>The required syntax must be strictly adhered to.</p> 

E: Creating the WinCC Screen

Step	E: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	E: Creating the WinCC Screen
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S7OPC01_DB75_INT0_1</i> via the button displayed below.</p>  <p>Leave the <i>Update</i> of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p>  <p>The <i>I/O-Field Configuration</i> dialog box shows the following settings: Tag: S16x_S7OPC01_D (with a yellow folder icon) Update: 2 s Type: <input type="radio"/> Output <input type="radio"/> Input <input checked="" type="radio"/> Both Format: Font Size...: 12 Font Name...: Arial Color...: Black Buttons: OK, Cancel</p>
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p>  <p>The image shows a grey rectangular <i>I/O Field</i> containing the text "0.000". A context menu is open over it, listing the following options: Cut (Ctrl+X) Copy (Ctrl+C) Duplicate Paste (Ctrl+V) Delete (Del) Customized object Group object Linking... Configuration Dialog... Properties (highlighted)</p>

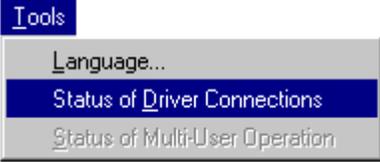
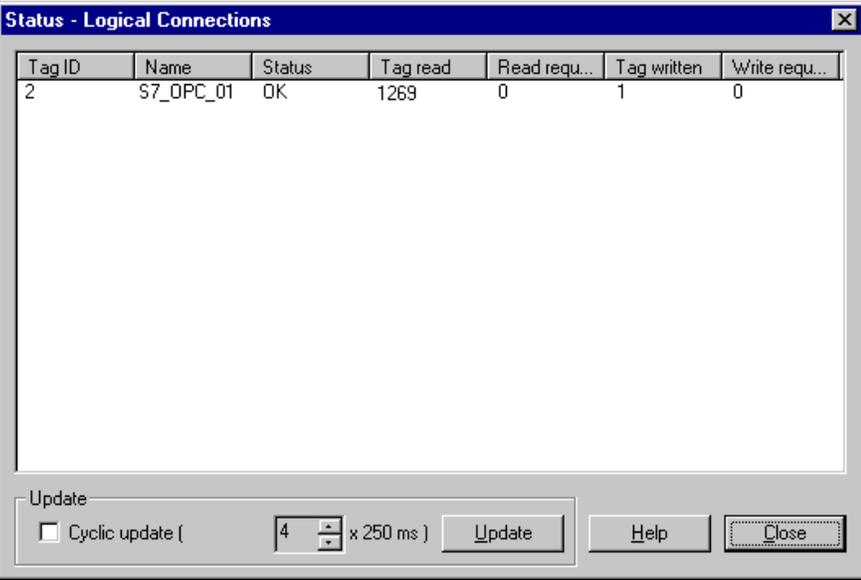
Step	E: Creating the WinCC Screen																																																		
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p>  <p>The screenshot shows the 'Object Properties' dialog box with the 'Properties' tab selected. The 'Output/Input' property is expanded in the left-hand tree view. The main table shows the following properties:</p> <table border="1"> <thead> <tr> <th>Attribute</th> <th>Static</th> <th>Dynamic</th> <th>Curr...</th> <th>I...</th> </tr> </thead> <tbody> <tr> <td>Field Type</td> <td>I/O Field</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Output Value</td> <td>0.000000e+000</td> <td> S16x_S70PC01_DB75_INT0_1 2 s</td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Data Format</td> <td>Decimal</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Output Format</td> <td>s99999</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Apply on Full</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Apply on Exit</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Clear on New Input</td> <td>Yes</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Clear on Invalid Input</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Hidden Input</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>	Attribute	Static	Dynamic	Curr...	I...	Field Type	I/O Field			<input type="checkbox"/>	Output Value	0.000000e+000	 S16x_S70PC01_DB75_INT0_1 2 s		<input type="checkbox"/>	Data Format	Decimal				Output Format	s99999				Apply on Full	No			<input type="checkbox"/>	Apply on Exit	No			<input type="checkbox"/>	Clear on New Input	Yes			<input type="checkbox"/>	Clear on Invalid Input	No			<input type="checkbox"/>	Hidden Input	No			<input type="checkbox"/>
Attribute	Static	Dynamic	Curr...	I...																																															
Field Type	I/O Field			<input type="checkbox"/>																																															
Output Value	0.000000e+000	 S16x_S70PC01_DB75_INT0_1 2 s		<input type="checkbox"/>																																															
Data Format	Decimal																																																		
Output Format	s99999																																																		
Apply on Full	No			<input type="checkbox"/>																																															
Apply on Exit	No			<input type="checkbox"/>																																															
Clear on New Input	Yes			<input type="checkbox"/>																																															
Clear on Invalid Input	No			<input type="checkbox"/>																																															
Hidden Input	No			<input type="checkbox"/>																																															
6	<p>Creation of four additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining I/O fields.</p>																																																		
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_3_S7OPC_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p>  <p>The screenshot shows a toolbar with a 'Runtime' button, which is a lightbulb icon with a play symbol inside. A mouse cursor is pointing at the button, and a label 'Runtime' is positioned below it.</p>																																																		

Step	E: Creating the WinCC Screen
	<p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the I/O fields. They can be changed by entering values in the individual <i>I/O Fields</i>.</p> <div>  </div> <p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p> <div>  </div>

5.5 Diagnosis of the Communication Connection

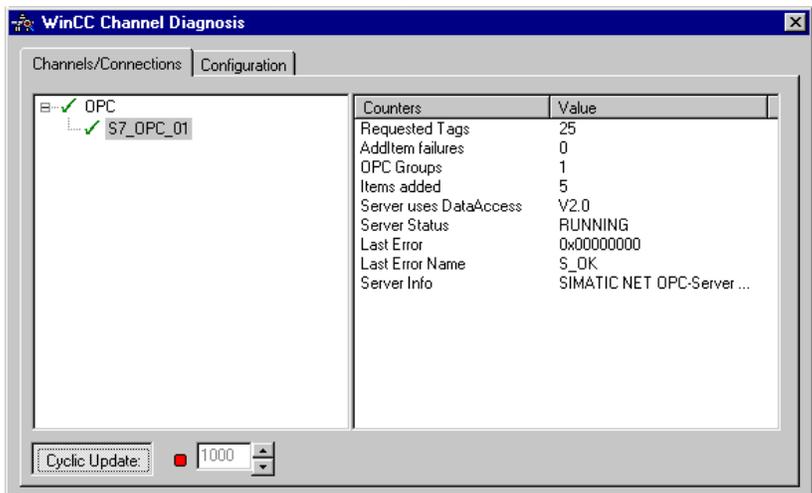
The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S7_OPC* and the SIMATIC S7 station.

WinCC Explorer

Step	WinCC Explorer														
1	<p>Diagnosis of the communication connection from the <i>WinCC Explorer</i>. Switch the project <i>WinCC_S7_OPC</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below.</p>  <p>The created WinCC screen <i>com_3_S7OPC_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>														
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 														
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed. This dialog box lists all configured connections. For this sample, only the connection <i>S7_OPC_01</i> will be displayed. The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p>  <table border="1"> <thead> <tr> <th>Tag ID</th> <th>Name</th> <th>Status</th> <th>Tag read</th> <th>Read requ...</th> <th>Tag written</th> <th>Write requ...</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>S7_OPC_01</td> <td>OK</td> <td>1269</td> <td>0</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>Update <input type="checkbox"/> Cyclic update (4 x 250 ms) <input type="button" value="Update"/> <input type="button" value="Help"/> <input type="button" value="Close"/></p>	Tag ID	Name	Status	Tag read	Read requ...	Tag written	Write requ...	2	S7_OPC_01	OK	1269	0	1	0
Tag ID	Name	Status	Tag read	Read requ...	Tag written	Write requ...									
2	S7_OPC_01	OK	1269	0	1	0									

Step	WinCC Explorer										
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>. The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S7_OPC_01</td> <td>OPC.SimaticNet; <LOCAL>; 0,00; 0; 0; 1</td> </tr> </tbody> </table> <p>Status: OK</p> <p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S7OPC01_01</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> </tbody> </table> <p>Process value: 34 Quality: c0 Last Change: 7/1/99 2:50:18 PM</p>	Name	Parameters	S7_OPC_01	OPC.SimaticNet; <LOCAL>; 0,00; 0; 0; 1	Name	Type	Parameters	S16x_S7OPC01_01	Signed 16-bit value	DB75,DW0
Name	Parameters										
S7_OPC_01	OPC.SimaticNet; <LOCAL>; 0,00; 0; 0; 1										
Name	Type	Parameters									
S16x_S7OPC01_01	Signed 16-bit value	DB75,DW0									

Channel Diagnosis

Step	Channel Diagnosis																				
1	<p>Diagnosis of the communication connection via the program <i>WinCC Channel Diagnosis</i>. Start this program via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Channel Diagnosis</i>.</p>  <p>Channel Diagnosis</p>																				
2	<p>The program <i>WinCC Channel Diagnosis</i> will be displayed. The <i>Channels/Connections</i> tab displays detailed information about the status of each configured connection. By default, the display is updated every second. The update cycle can be changed in the input field located at the bottom.</p>  <p>The screenshot shows the 'WinCC Channel Diagnosis' window with the 'Channels/Connections' tab selected. It lists the OPC connection 'S7_OPC_01' with a status of 'OK'. A 'Counters' table is visible, and at the bottom, there is a 'Cyclic Update' field set to 1000.</p> <table border="1"> <thead> <tr> <th>Counters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Requested Tags</td> <td>25</td> </tr> <tr> <td>Additem failures</td> <td>0</td> </tr> <tr> <td>OPC Groups</td> <td>1</td> </tr> <tr> <td>Items added</td> <td>5</td> </tr> <tr> <td>Server uses DataAccess</td> <td>V2.0</td> </tr> <tr> <td>Server Status</td> <td>RUNNING</td> </tr> <tr> <td>Last Error</td> <td>0x00000000</td> </tr> <tr> <td>Last Error Name</td> <td>S_OK</td> </tr> <tr> <td>Server Info</td> <td>SIMATIC NET OPC-Server ...</td> </tr> </tbody> </table>	Counters	Value	Requested Tags	25	Additem failures	0	OPC Groups	1	Items added	5	Server uses DataAccess	V2.0	Server Status	RUNNING	Last Error	0x00000000	Last Error Name	S_OK	Server Info	SIMATIC NET OPC-Server ...
Counters	Value																				
Requested Tags	25																				
Additem failures	0																				
OPC Groups	1																				
Items added	5																				
Server uses DataAccess	V2.0																				
Server Status	RUNNING																				
Last Error	0x00000000																				
Last Error Name	S_OK																				
Server Info	SIMATIC NET OPC-Server ...																				

6 Communication to the SIMATIC S7 via PROFIBUS

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder C:\Communication_Manual. You have the option to copy the following components to the hard drive:



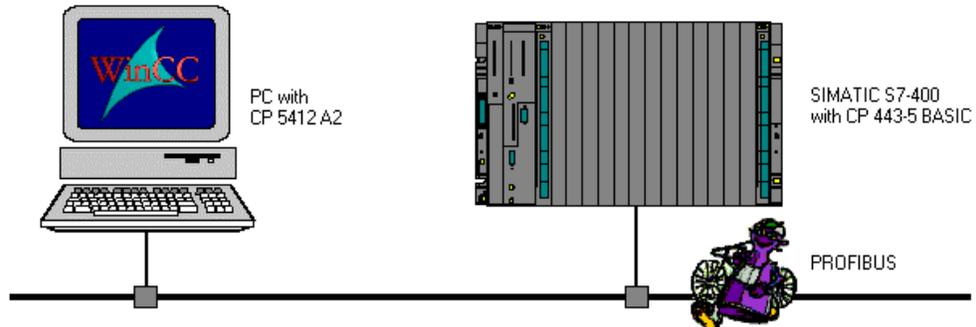
The STEP7 project we will create.



The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a SIMATIC S7 and WinCC. The communication connection will be realized via PROFIBUS. The communication card CP 5412 A2 used in the computer has its own CPU onboard. This will free the CPU of the computer from communication tasks.

Overview of the Structure of the Sample



On the computer side, the connection to the *Industrial Ethernet* network is established via the communication processor *CP 5412 A2*. To install this communication processor in the computer, the driver *PB S7-5412*, located on the *SIMATIC NET* CD-ROM, is needed. In the WinCC project, the communication driver *SIMATIC S7 Protocol Suite* must be installed. Via its channel unit *PROFIBUS*, the connection to the *SIMATIC S7* is configured. The PLC is equipped with a *CPU 416-1* module. The connection to the network is established via the communication processor *CP 443-5 BASIC*. For the configuration of this communication processor with the STEP7 software, the option package *NCM S7 PROFIBUS* is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 5412 A2
- Creation of the STEP7 Project S7_PB
- Creation of the WinCC Project WinCC_S7_PB
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>PB S7-5412</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 5412 A2</i> .
STEP7	STEP7 software with option package <i>NCM S7 PROFIBUS</i> for the creation of the STEP7 project.
WinCC	WinCC with the communication driver <i>SIMATIC S7 Protocol Suite</i> for the creation of the WinCC project.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 5412 A2</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>URI</i>
Power Supply	Power supply <i>PS 407 10A</i> in slot 1 and 2.
CPU Module	CPU module <i>CPU 416-1</i> in slot 3.
Communication Processor	Communication processor <i>CP 443-5 BASIC</i> in slot 4.

6.1 Startup of the Communication Processor CP 5412 A2

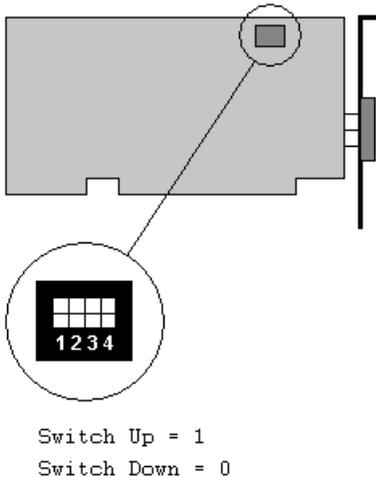
The following description details the configuration steps necessary to successfully start up the communication processor *CP 5412 A2*.

Overview of the Configuration Steps

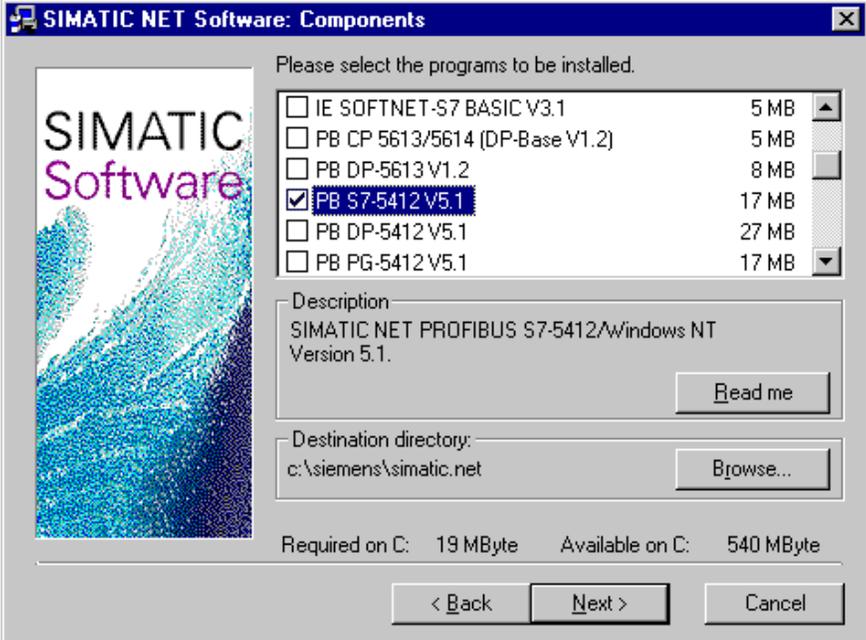
The following lists the configuration steps necessary to start up the communication processor *CP 5412 A2*:

- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Installing the Communication Processor
- D: Assigning the Communication Processor
- E: Testing the Communication Processor

A: Mounting the Communication Processor in the Computer

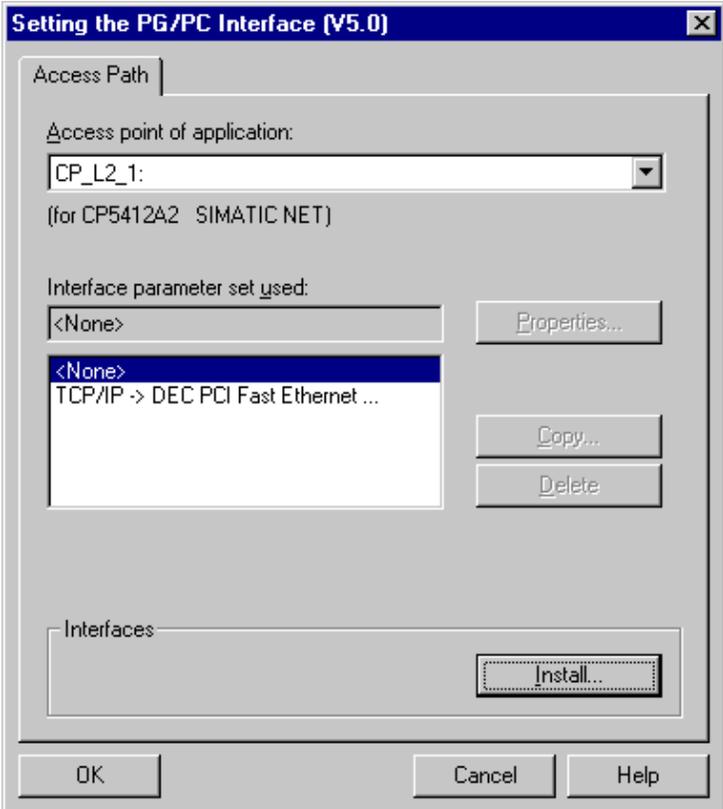
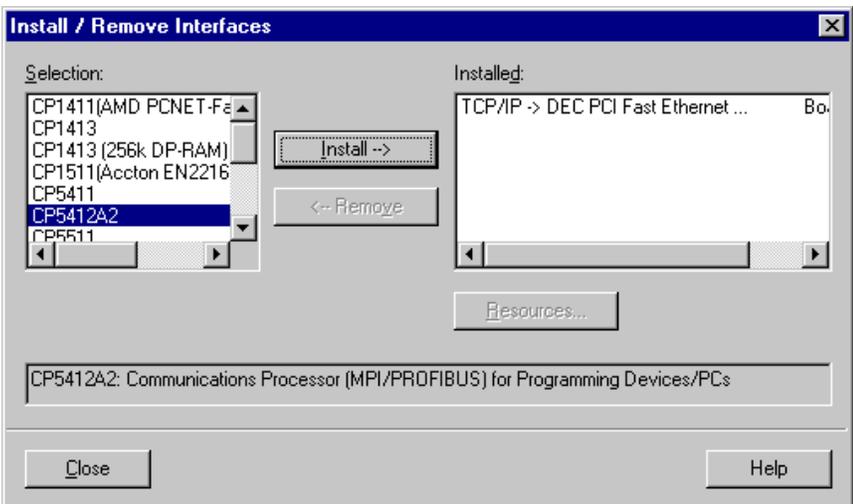
Step	A: Mounting the Communication Processor in the Computer																																		
1	<p>Check the selected jumper settings at the CP 5412 A2.</p> <p>During the installation of the <i>CP 5412 A2</i>, the <i>I/O Range</i> must be specified. The <i>I/O Range</i> is set via <i>jumper</i>s.</p> <p>By default, the <i>I/O Range</i> is set to <i>0240-0243</i>. However, other settings are also possible. The following graphic illustrates the jumper settings necessary for the various <i>I/O Ranges</i>.</p> <div style="display: flex; align-items: center;"> <div style="flex: 1;">  <p style="text-align: center;">Switch Up = 1 Switch Down = 0</p> </div> <div style="flex: 2;"> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="border-bottom: 1px solid black;">I/O Area</th> <th style="border-bottom: 1px solid black;">1-2-3-4</th> </tr> </thead> <tbody> <tr><td>0240-0243</td><td>0 0 0 0</td></tr> <tr><td>0244-0247</td><td>0 0 0 1</td></tr> <tr><td>0248-024B</td><td>0 0 1 0</td></tr> <tr><td>024C-024F</td><td>0 0 1 1</td></tr> <tr><td>0280-0283</td><td>0 1 0 0</td></tr> <tr><td>0284-0287</td><td>0 1 0 1</td></tr> <tr><td>0288-028B</td><td>0 1 1 0</td></tr> <tr><td>028C-028F</td><td>0 1 1 1</td></tr> <tr><td>0300-0303</td><td>1 0 0 0</td></tr> <tr><td>0304-0307</td><td>1 0 0 1</td></tr> <tr><td>0308-030B</td><td>1 0 1 0</td></tr> <tr><td>030C-030F</td><td>1 0 1 1</td></tr> <tr><td>0390-0393</td><td>1 1 0 0</td></tr> <tr><td>0394-0397</td><td>1 1 0 1</td></tr> <tr><td>0398-039B</td><td>1 1 1 0</td></tr> <tr><td>039C-039F</td><td>1 1 1 1</td></tr> </tbody> </table> </div> </div>	I/O Area	1-2-3-4	0240-0243	0 0 0 0	0244-0247	0 0 0 1	0248-024B	0 0 1 0	024C-024F	0 0 1 1	0280-0283	0 1 0 0	0284-0287	0 1 0 1	0288-028B	0 1 1 0	028C-028F	0 1 1 1	0300-0303	1 0 0 0	0304-0307	1 0 0 1	0308-030B	1 0 1 0	030C-030F	1 0 1 1	0390-0393	1 1 0 0	0394-0397	1 1 0 1	0398-039B	1 1 1 0	039C-039F	1 1 1 1
I/O Area	1-2-3-4																																		
0240-0243	0 0 0 0																																		
0244-0247	0 0 0 1																																		
0248-024B	0 0 1 0																																		
024C-024F	0 0 1 1																																		
0280-0283	0 1 0 0																																		
0284-0287	0 1 0 1																																		
0288-028B	0 1 1 0																																		
028C-028F	0 1 1 1																																		
0300-0303	1 0 0 0																																		
0304-0307	1 0 0 1																																		
0308-030B	1 0 1 0																																		
030C-030F	1 0 1 1																																		
0390-0393	1 1 0 0																																		
0394-0397	1 1 0 1																																		
0398-039B	1 1 1 0																																		
039C-039F	1 1 1 1																																		
2	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>For the communication card <i>CP 5412 A2</i>, a free ISA slot in the computer is required. After the installation of the <i>CP 5412 A2</i>, close the computer's case and start the computer.</p>																																		

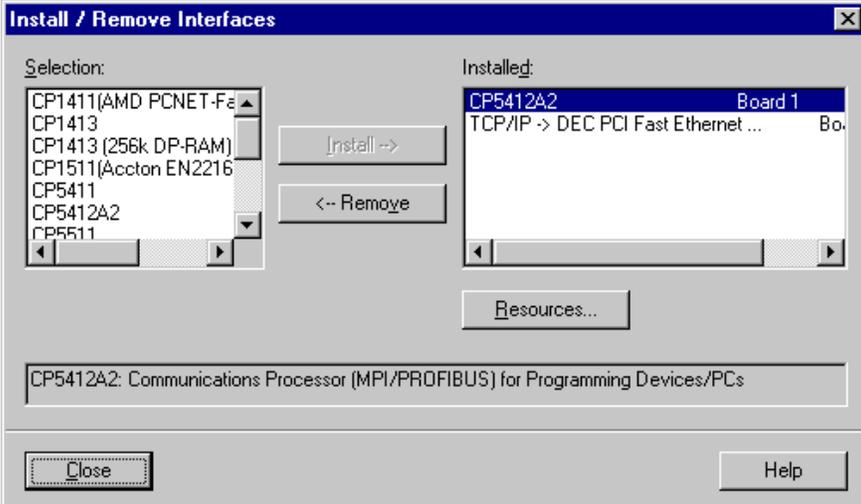
B: Installing the Communication Driver

Step	B: Installing the Communication Driver
1	<p>Install the communication driver <i>PB S7-5412</i> from the <i>SIMATIC NET</i> CD-ROM. After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">  </div> <p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>PB S7-5412</i> to be installed must be selected. Finish the installation.</p> <div style="border: 1px solid black; padding: 5px;">  </div>

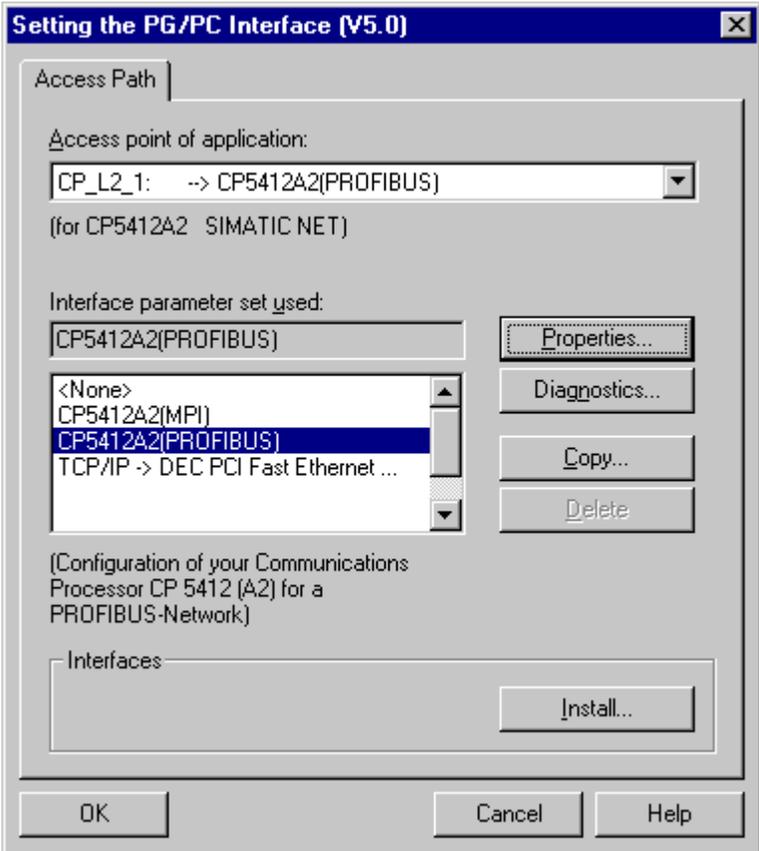
C: Installing the Communication Processor

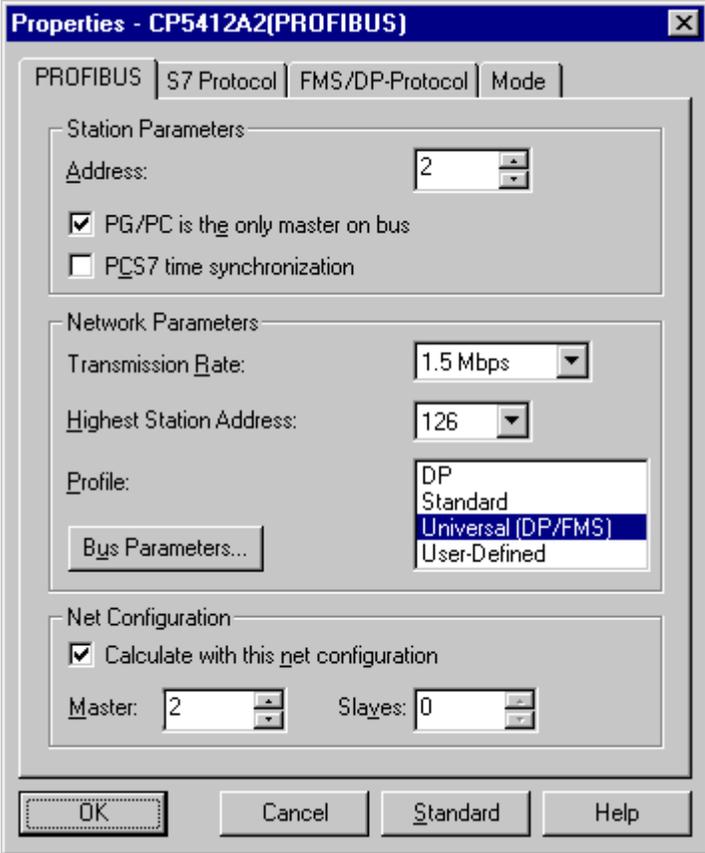
Step	C: Installing the Communication Processor
1	<p>Install the communication processor <i>CP 5412 A2</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Setting the PG/PC Interface</p>

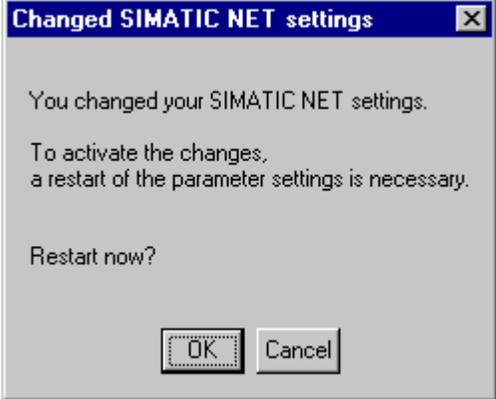
Step	C: Installing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>The dialog box for installing a new interface is opened via the <i>Install</i> button.</p> 
3	<p>The dialog box <i>Install/Remove Modules</i> will be displayed.</p> <p>The <i>Selection</i> field lists all interfaces that can be installed. Among them will be the entry for the <i>CP 5412 A2</i>, if the communication driver has been installed previously as outlined in step B. From the <i>Selection</i> field, select the entry <i>CP 5412 A2</i>. The installation of the communication processor is started by clicking on the <i>Install -></i> button.</p> 

Step	C: Installing the Communication Processor
4	<p>The dialog box <i>Resources - CP 5412 A2</i> will be displayed.</p> <p>The settings for the <i>Memory Range</i>, <i>I/O Range</i> and <i>Interrupt</i> have to be specified.</p> <p>The <i>I/O Range</i> has already been determined via the Jumper Settings at the <i>CP 5412 A2</i>.</p> <p>Make sure that the assigned resources have not already been taken by other modules in the computer. Information about already taken system resources can be obtained from the <i>Resources</i> tab accessed via <i>Start</i> → <i>Programs</i> → <i>Administrative Tools (Common)</i> → <i>Windows NT Diagnostics</i>.</p> <p>Close the <i>Resources</i> tab by clicking on <i>OK</i>.</p> 
5	<p>In the dialog box <i>Install/Remove Modules</i>, the <i>Installed</i> field will now contain the entry for the <i>CP 5412 A2</i>.</p> <p>Exit the dialog box <i>Install/Remove Modules</i> via the <i>Close</i> button.</p> 

D: Assigning the Communication Processor

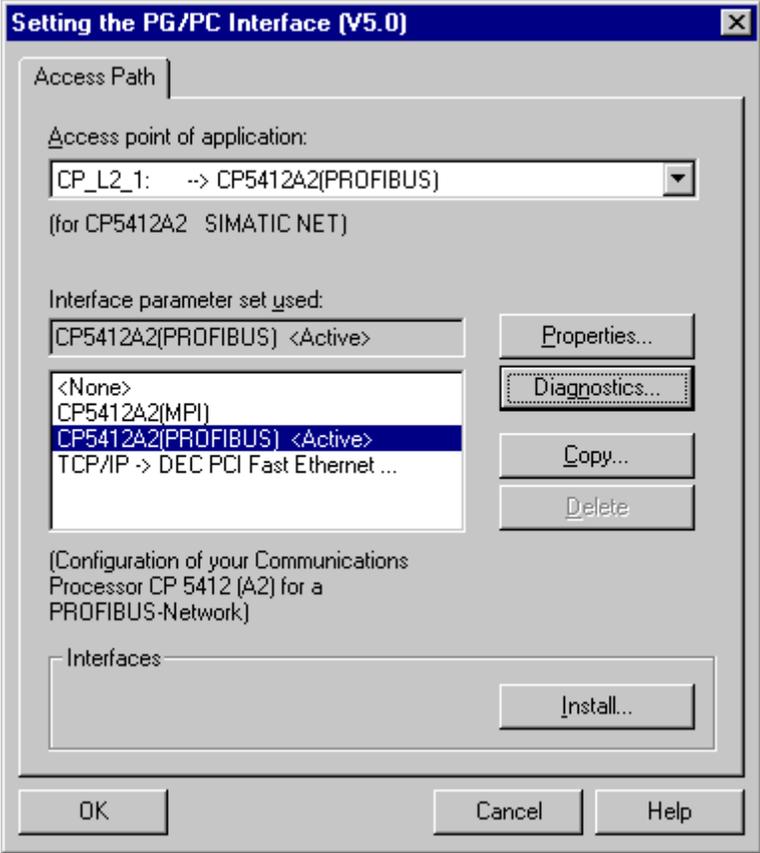
Step	D: Assigning the Communication Processor
1	<p>In the program <i>Setting the PG/PC Interface</i>, assign the access point <i>CP_L2_1</i>: to the just installed interface.</p> <p>The access point <i>CP_L2_1</i>: is the default access point used by WinCC for the communication via the PROFIBUS. It has been created automatically during the installation of the communication driver <i>PB S7-5412</i>.</p> <p>In the field <i>Access Point of the Application</i>, set the entry <i>CP_L2_1</i>:. In the field below, select the entry <i>CP 5412 A2 (PROFIBUS)</i>. This completes the assignment between the access point and the communication processor.</p> 

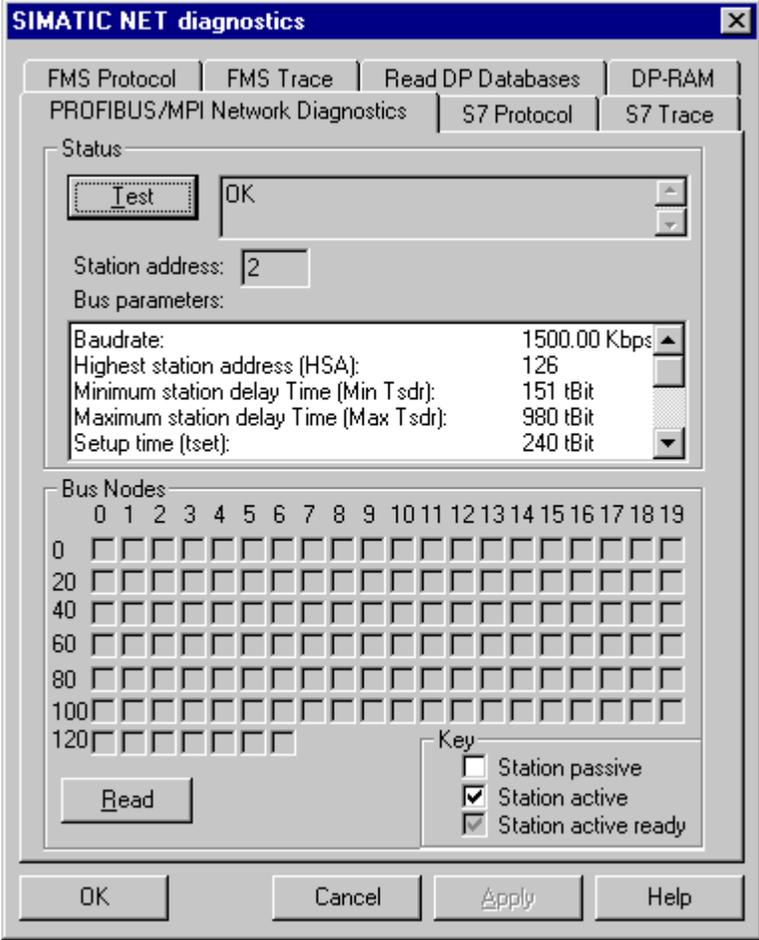
Step	D: Assigning the Communication Processor
2	<p>Setting the properties of the communication processor <i>CP 5412 A2</i>.</p> <p>The dialog box for setting the properties is opened via the <i>Properties</i> button of the <i>Setting the PG/PC Interface</i> program.</p> <p>The dialog box <i>Properties - CP 5412 (PROFIBUS)</i> will be displayed.</p> <p>In the <i>PROFIBUS</i> tab, station and network related parameters are set.</p> <p>In this sample, the <i>Local Station Address</i> of the communication processor is set to 2.</p> <p>For the <i>PROFIBUS Network</i>, a <i>Baud Rate</i> of <i>1.5 MBit/s</i> is selected. The <i>Highest Station Address</i> is set to the maximum value of 126. As the <i>Profile</i>, <i>Universal (DP/FMS)</i> is selected.</p> <p>The network settings just made must be uniform for all stations in the <i>PROFIBUS network</i>.</p> <p>Close the properties dialog box of the <i>CP 5412 A2</i> by clicking on <i>OK</i>.</p> 

Step	D: Assigning the Communication Processor
3	<p>Exit the program <i>Setting the PG/PC Interface</i> via the <i>OK</i> button.</p> <p>A dialog box will be displayed requesting the restart of the <i>CP 5412 A2</i>. Acknowledge this dialog box by clicking on <i>OK</i>, which will result in the restart of the communication processor <i>CP 5412 A2</i>.</p> <p>This completes the installation of the communication processor.</p> 

E: Testing the Communication Processor

Step	E: Testing the Communication Processor
1	<p>Test the communication processor <i>CP 5412 A2</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>

Step	E: Testing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface to be checked. In this case, select the entry <i>CP 5412 A2 (PROFIBUS)</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The check for a proper installation is activated by clicking on the <i>Diagnostics</i> button.</p> 

Step	E: Testing the Communication Processor
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>In the <i>PROFIBUS/MPI Network Diagnostics</i> tab, the diagnosis is started via the <i>Test</i> button. The result of the diagnosis will be displayed immediately following.</p> <p>If the result of the diagnosis is positive (correct installation), the dialog box can be exited with <i>OK</i>. In this case, the program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>. The configuration of the communication to the S7 via <i>PROFIBUS</i> is continued in the following section.</p> <p>However, if the result of the diagnosis is negative (incorrect installation), the error must be localized and corrected. Troubleshooting procedures are described in the section <i>Is the Communication Module in the Computer operational?</i>.</p> 

6.2 Creation of the STEP7 Project S7_PB

The following description details the configuration steps necessary to create and start up the STEP7 project *S7_PB*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to create the STEP7 project *S7_PB*:

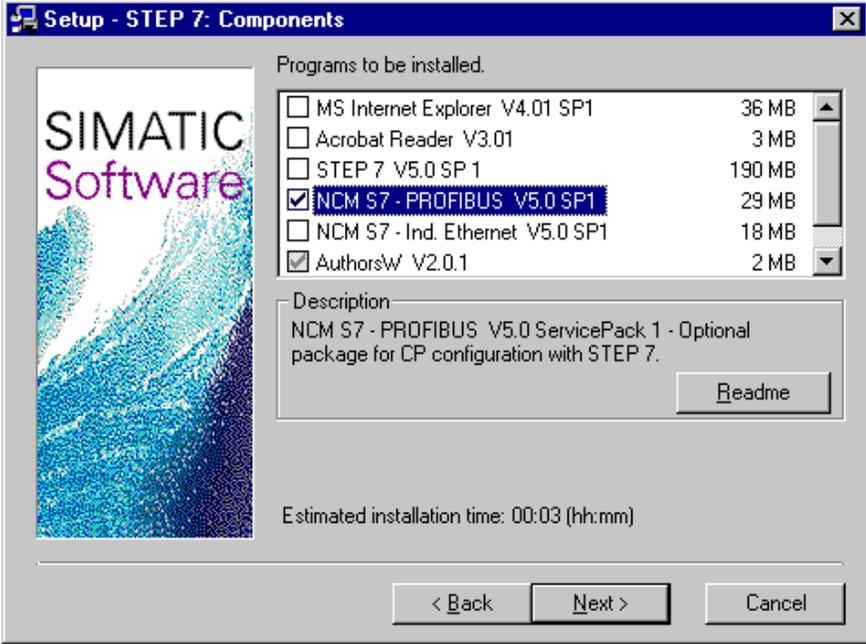
- A: Installing the Hardware
- B: Installing the Option Package
- C: Creating the STEP7 Project
- D: Configuring the Hardware
- E: Loading the Hardware Configuration
- F: Testing the Hardware Configuration
- G: Creating the STEP7 Program
- H: Testing the STEP7 Program

A: Installing the Hardware

Step	A: Installing the Hardware
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 407 10A</i>, the CPU module <i>CPU 416-1</i> and the communication processor <i>CP 443-5 BASIC</i>.</p> <p>Establishing the connection from the programming device to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 5412 A2</i> in the computer to the communication processor <i>CP 443-5 BASIC</i> in the PLC.</p>

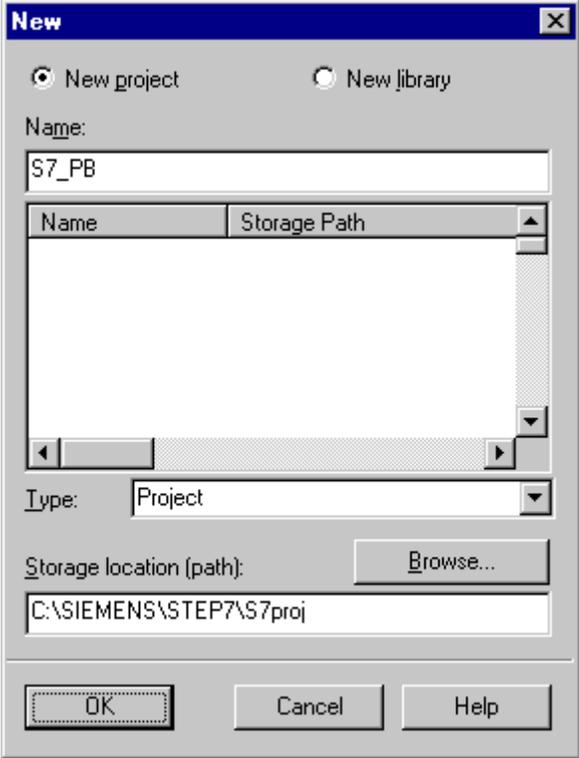
B: Installing the Option Package

Step	B: Installing the Option Package
1	<p>If the option package NCM S7 PROFIBUS has not been installed during the installation of STEP7, install it now from the STEP7 CD-ROM. This option package is required for the configuration of the communication processor CP 443-5 BASIC via the STEP7 software.</p> <p>After inserting the <i>STEP7</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <div style="text-align: center;">  <i>setup.exe</i> </div>

Step	B: Installing the Option Package
2	<p>This starts the installation program.</p> <p>Follow the instructions of the installation program. On the <i>Components</i> page, select the check-box <i>NCM S7-PROFIBUS</i>. Finish the installation.</p> 

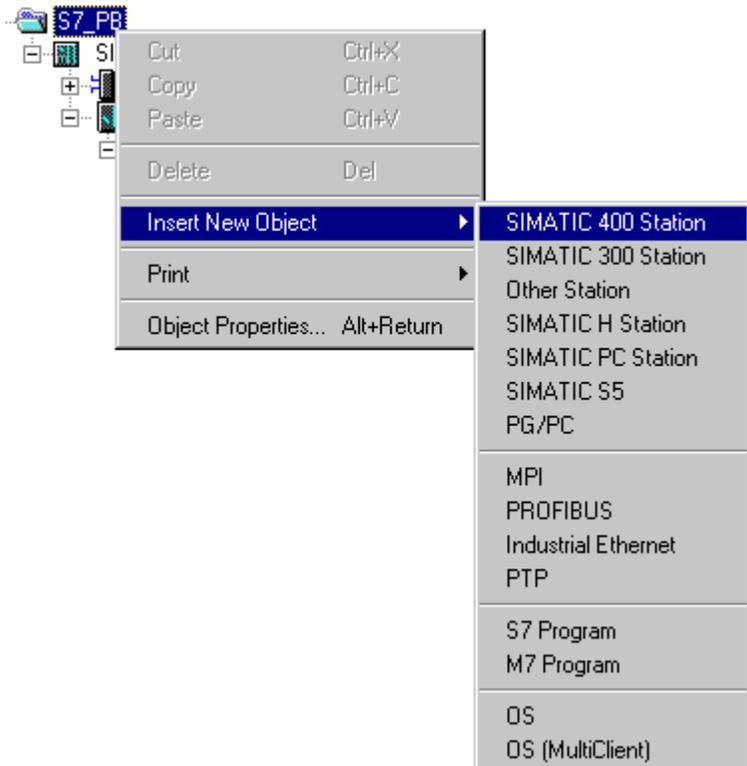
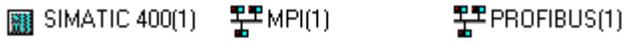
C: Creating the STEP7 Project

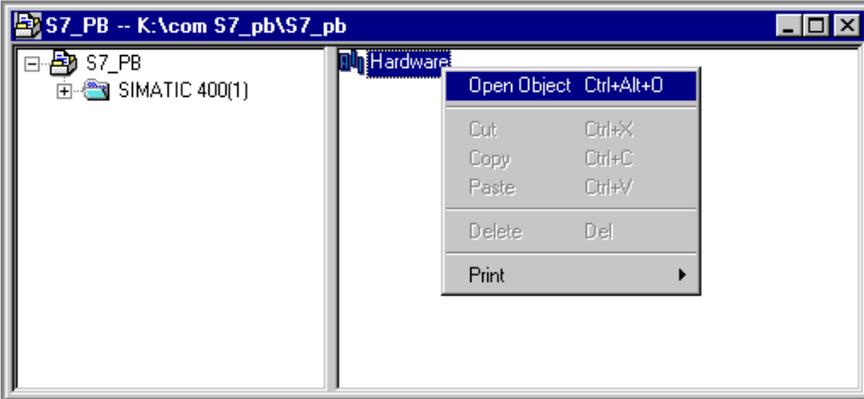
Step	C: Creating the STEP7 Project
1	<p>Create a new STEP7 project in the <i>SIMATIC Manager</i>.</p> <p>It is started via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC Manager</i>.</p>  <p>SIMATIC Manager</p>
2	<p>This displays the <i>SIMATIC Manager</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the parameters of a new STEP7 project will be opened.</p> <p>The <i>New</i> dialog box will be displayed.</p> <p>The radio-button <i>New Project</i> must be selected. In the <i>Name</i> field, the name of the new project to be created is entered. The names of the STEP7 projects created within the framework of this manual all start with <i>S7</i>. They also include a reference to the communication type used. The project of this sample has the name <i>S7_PB</i>.</p>

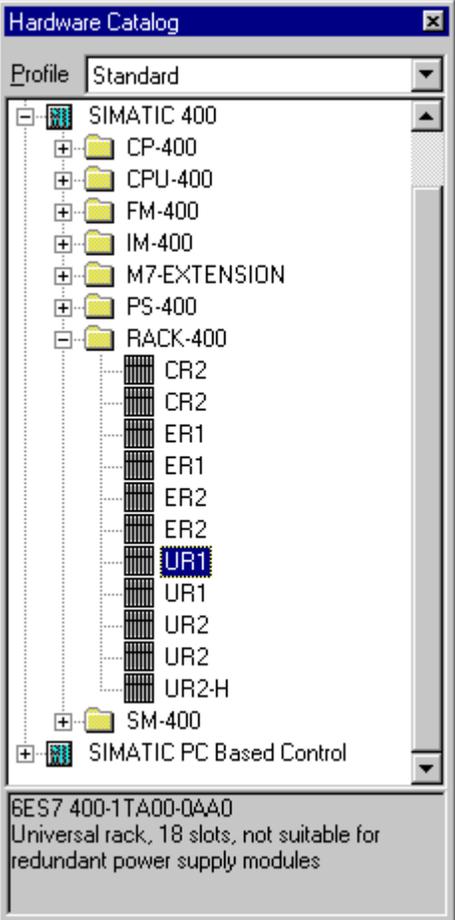
Step	C: Creating the STEP7 Project
	<p>By default, projects are stored in the <i>C:\SIEMENS\STEP7\S7proj</i> folder. This can be changed at any time via the <i>Browse</i> button.</p> <p>The <i>New</i> dialog box is closed via the <i>OK</i> button.</p> 

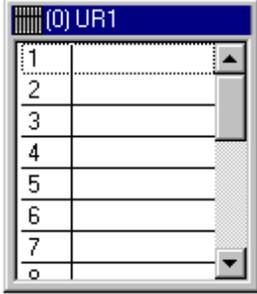
D: Configuring the Hardware

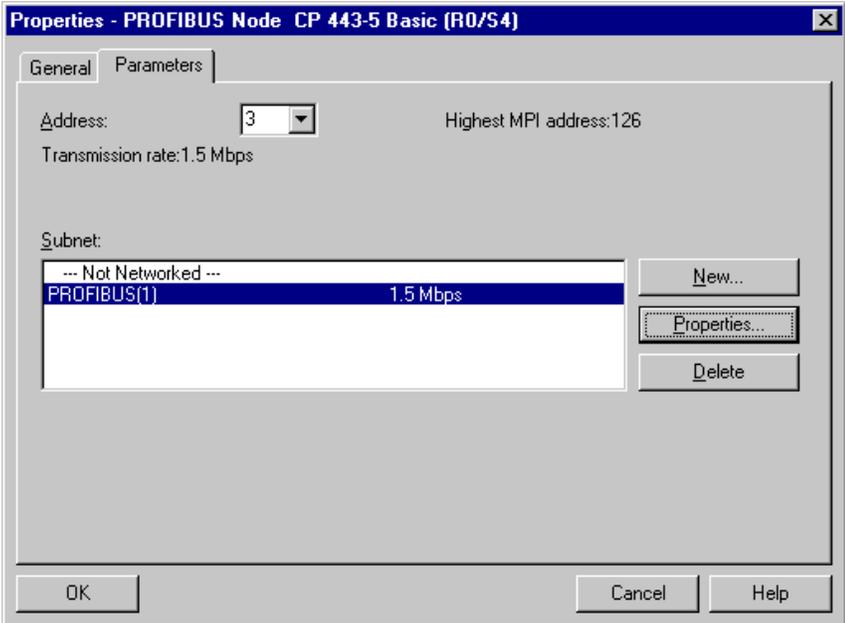
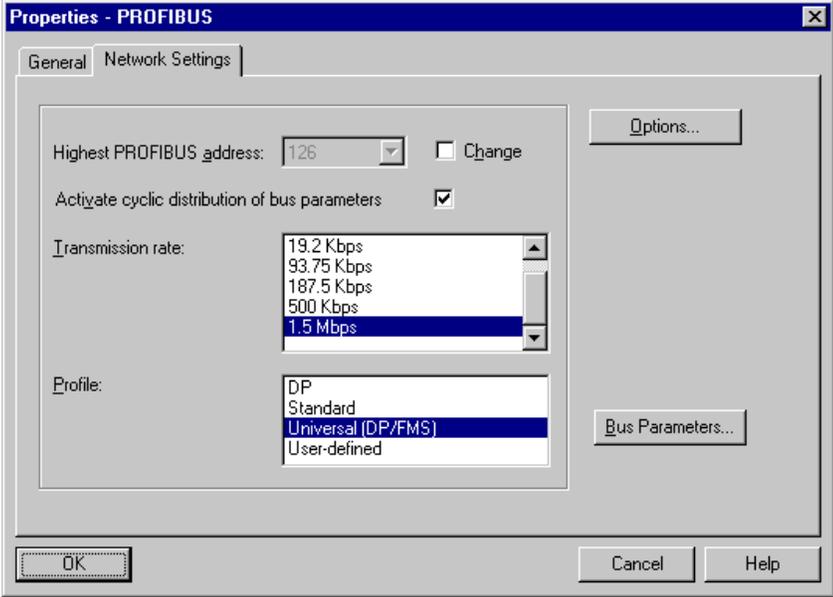
Step	D: Configuring the Hardware
1	<p>The new project will be displayed in the <i>SIMATIC Manager</i>.</p> <p>The hardware for this project must be configured. Two components are needed: One <i>SIMATIC 400-Station</i> and for its networking a <i>PROFIBUS</i>.</p>

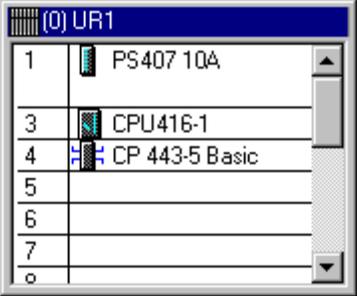
Step	D: Configuring the Hardware
	<p>These components are added to the <i>SIMATIC Manager</i> via a  on the project name <i>S7_PB</i> and then selecting <i>Insert New Object</i> → <i>SIMATIC 400-Station</i> and <i>Insert New Object</i> → <i>PROFIBUS</i> from the pop-up menu.</p> 
2	<p>The just added components will be displayed in the right window of the <i>SIMATIC Manager</i>.</p> 

Step	D: Configuring the Hardware
	<p>By  on the component <i>SIMATIC 400(1)</i> in the right window, the point <i>Hardware</i> will be displayed. By  on the point <i>Hardware</i> or  on it and then selecting <i>Open Object</i> from the pop-up menu, the program <i>HW Config</i> will be started.</p> 
3	<p>The program <i>HW Config</i> will be displayed.</p> <p>This program is used to exactly define the hardware used in the PLC and to configure their properties.</p>  <p>HW Konfig</p>
4	<p>By clicking on the toolbar button of the program <i>HW Config</i> displayed below, the <i>Hardware Catalog</i> is opened. This catalog is used to select the required hardware components.</p>  <p>Catalog</p>

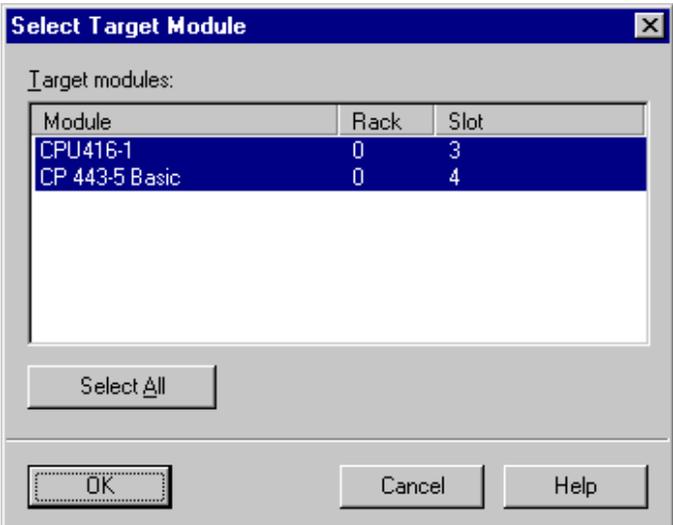
Step	D: Configuring the Hardware
5	<p>The <i>Hardware Catalog</i> will be displayed.</p> <p>The first component selected is the rack. On this rack, all other components will be installed. The rack is inserted into the project via a  or by Dragging Dropping. In this sample, the rack type <i>UR1</i> is used.</p>  <p>The screenshot shows the 'Hardware Catalog' window with the 'Profile' set to 'Standard'. The tree view is expanded to 'SIMATIC 400' > 'RACK-400'. Under 'RACK-400', the 'UR1' component is selected and highlighted in blue. Below the tree view, the selected component's details are displayed: '6ES7 400-1TA00-0AA0' and 'Universal rack, 18 slots, not suitable for redundant power supply modules'.</p>

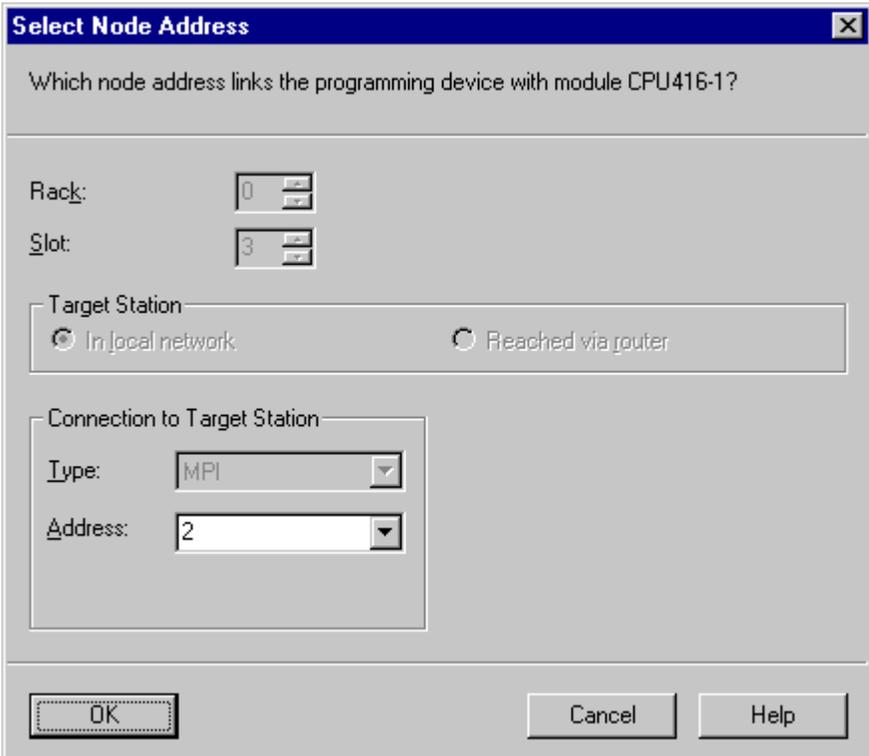
Step	D: Configuring the Hardware
6	<p>The program <i>HW Config</i> will display the currently still empty rack. It received the Rack Number <i>0</i>. During the configuration of the connection in the WinCC project, the rack number is one of the parameters that must be set.</p> 
7	<p>Arrange the other hardware components in the rack. This is done by Dragging Dropping the desired components from the <i>Hardware Catalog</i> to the corresponding slot in the rack.</p> <p>This sample uses the power supply <i>PS 407 10A</i>. It is inserted into slot <i>1</i>. A power supply of this type occupies two slots.</p> <p>As the CPU module, this sample uses a <i>CPU 416-1</i>. This module is inserted into slot <i>3</i>. Another parameter to be set during the configuration of the connection in the WinCC project is the slot number of the CPU module.</p> <p>We also require the communication processor <i>CP 443-5 BASIC</i>. This CP is only available from the <i>Hardware Catalog</i> if the option package <i>NCM S7 PROFIBUS</i> has been installed. After the communication processor <i>CP 443-5 BASIC</i> has been inserted in the rack, its properties dialog box will open.</p>
8	<p>The <i>PROFIBUS Interface</i> properties dialog box of the <i>CP 443-5 BASIC</i> will be displayed.</p> <p>In the <i>Address</i> field of the <i>Parameters</i> tab, enter the desired address of the communication processor. In this sample, the address <i>3</i> is specified. Another parameter to be set during the configuration of the connection in the WinCC project is this Station Address. In the <i>Subnet</i> field below, assign the entry <i>PROFIBUS(1)</i> to the communication processor.</p>

Step	D: Configuring the Hardware
	<p>The properties of <i>PROFIBUS(1)</i> must be defined. Its properties dialog box is opened via the <i>Properties</i> button.</p> 
9	<p>The dialog box <i>Properties - PROFIBUS</i> will be displayed.</p> <p>In the <i>Network Settings</i> tab, the properties of the <i>PROFIBUS Network</i> are defined. The same <i>Network Settings</i> that have used for the installation of the communication processor <i>CP 5412 A2</i> must be used.</p> <p>For the <i>PROFIBUS Network</i>, this sample uses a <i>Baud Rate</i> of <i>1.5 MBit/s</i>. The <i>Highest PROFIBUS Address</i> is set to the maximum value of <i>126</i>. As the <i>Profile</i>, <i>Universal (DP/FMS)</i> is selected. Exit the dialog box by clicking on the <i>OK</i> button. The properties dialog box of the <i>PROFIBUS Interface</i> of the <i>CP 443-5 BASIC</i> is also closed by clicking on <i>OK</i>.</p> 

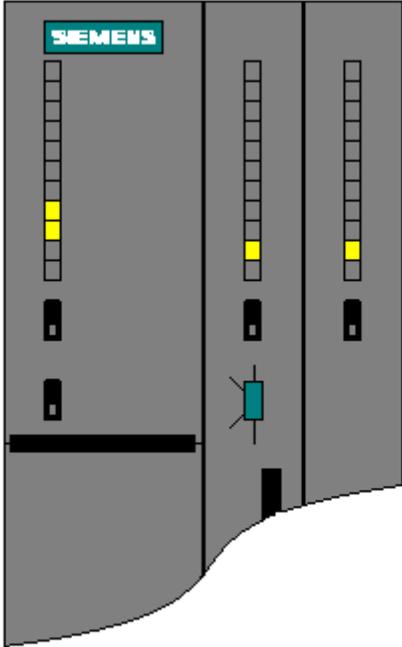
Step	D: Configuring the Hardware
10	<p>The following graphic shows the completed hardware arrangement of the sample.</p> 
11	<p>Save the settings made in the program <i>HW Config</i>. This is done via the toolbar button displayed below.</p> 

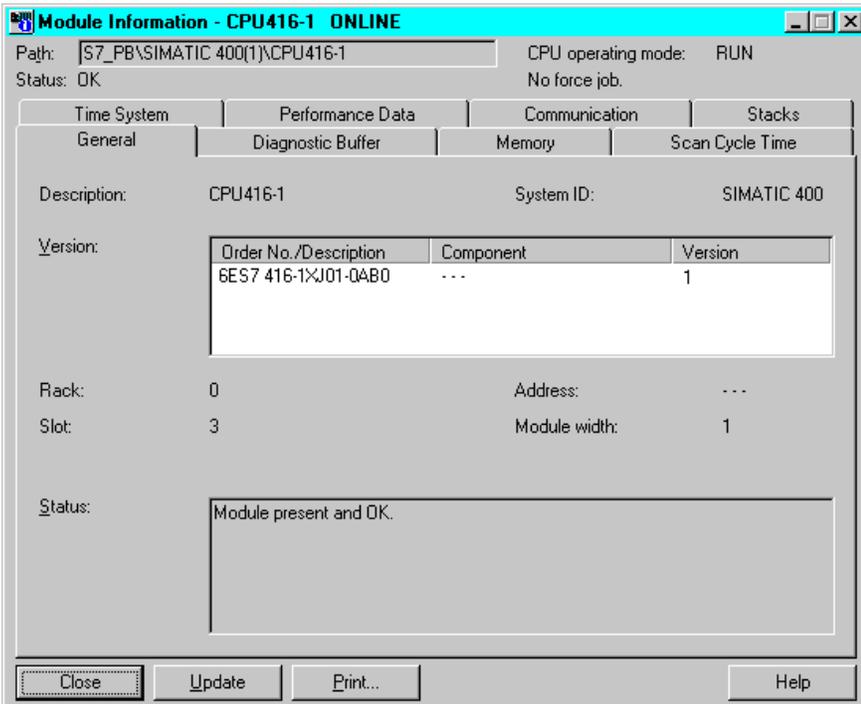
E: Loading the Hardware Configuration

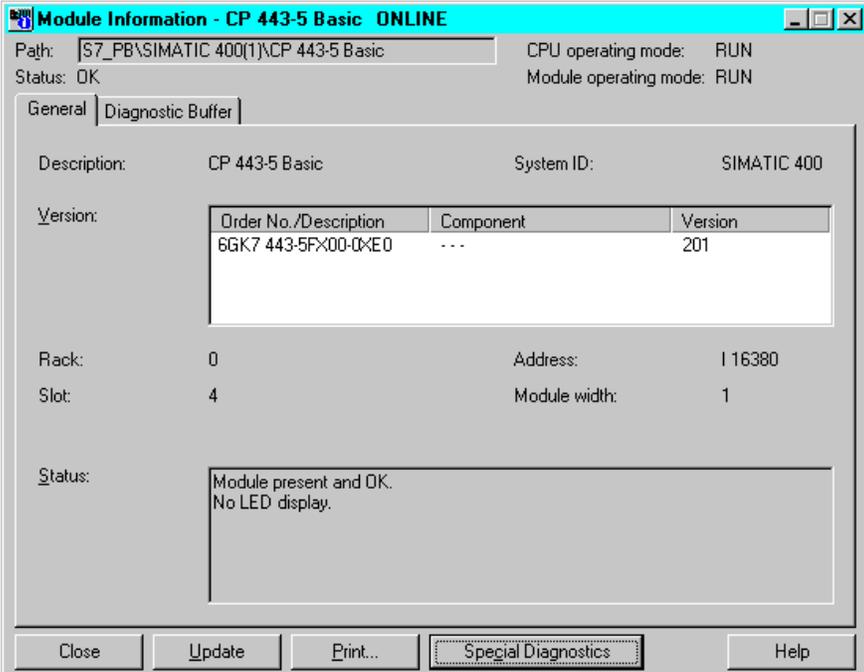
Step	E: Loading the Hardware Configuration
1	<p>The hardware configuration created in the program <i>HW Config</i> must be transferred to the PLC.</p> <p>This is done via the toolbar button displayed below.</p> 
2	<p>A dialog box will be displayed from which the components to be loaded can be selected.</p> <p>For this sample, all displayed components will be selected. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>. Close the dialog box by clicking on <i>OK</i>.</p> 

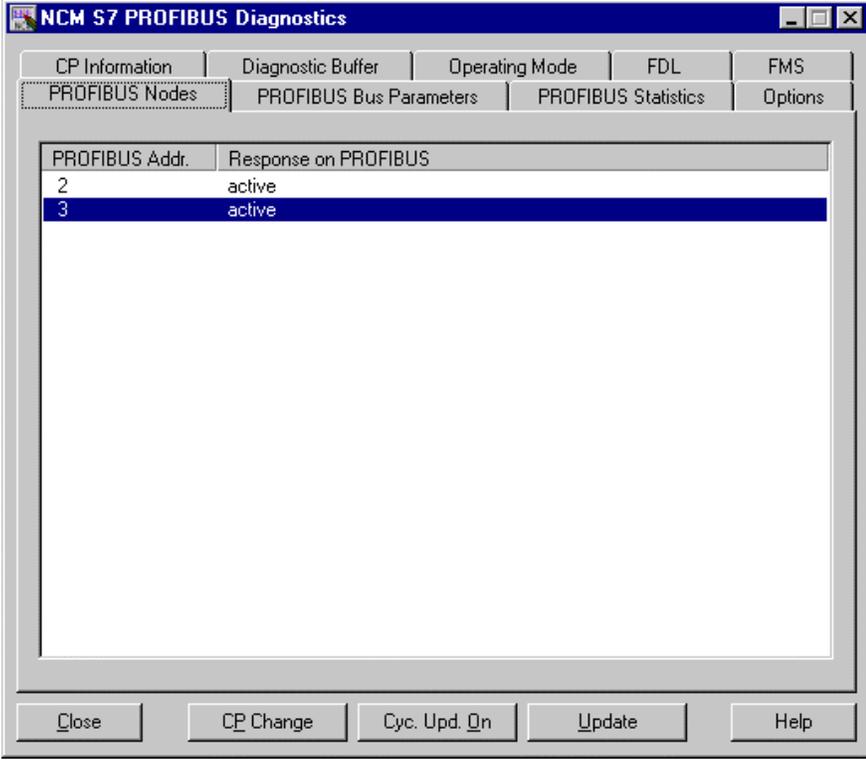
Step	E: Loading the Hardware Configuration
3	<p>Now the dialog box <i>Select Station Address</i> will be displayed.</p> <p>In this dialog box, specify which station address is used by the STEP7 software to communicate with the CPU module. In this sample, the communication is carried out via the MPI interface. The <i>Address</i> of the CPU module is 2.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>The configuration data will now be transferred to the PLC. If necessary, the individual modules are set to the <i>STOP</i> status.</p> <p>The program <i>HW Config</i> can be exited.</p> <p>The newly added components will be displayed by the <i>SIMATIC Manager</i> for the station <i>SIMATIC 400(1)</i>.</p> 

F: Testing the Hardware Configuration

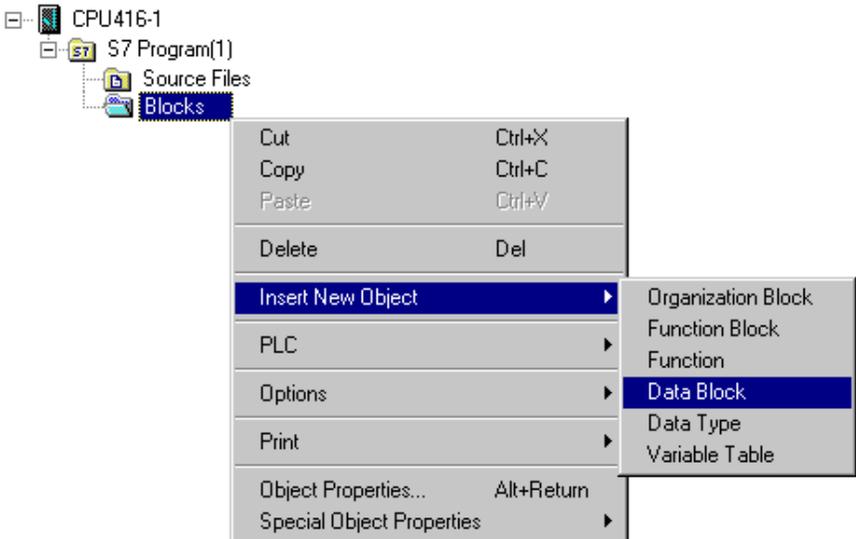
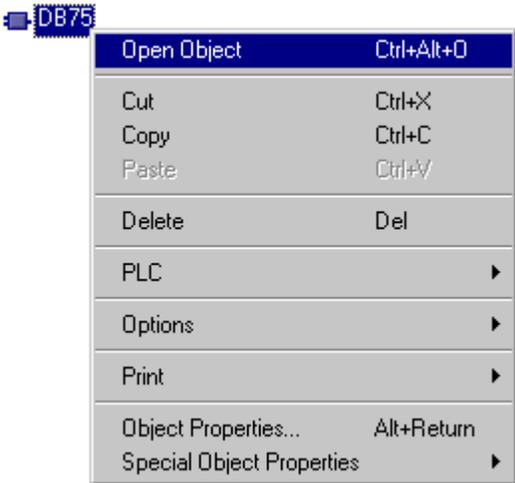
Step	F: Testing the Hardware Configuration
1	<p>Testing of the hardware configuration made.</p> <p>If the key switch of the CPU module is set to RUN or RUN-P and the operating mode switch of the communication processor is set to RUN, only the status LEDs signifying the <i>RUN</i> operating mode should light up.</p> <p>If this is not the case, there is an error. The following steps help you localize this error. However, these steps should still be performed even if the status LEDs show no error. This allows you to recognize uncritical errors and faulty configurations.</p> 

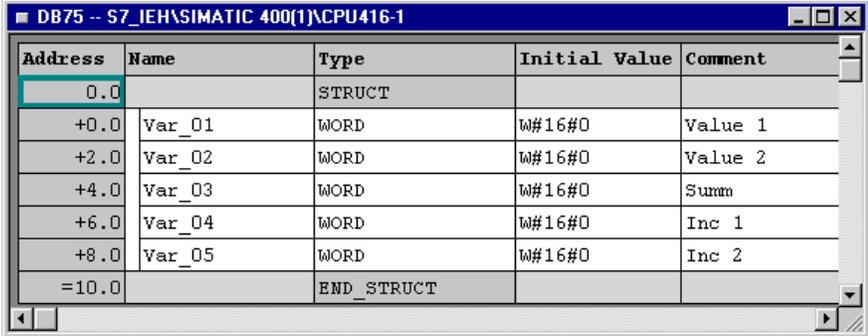
Step	F: Testing the Hardware Configuration
2	<p>Testing the configuration of the CPU module.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the CPU module in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the CPU module will be displayed.</p> <p>The <i>General</i> tab displays various general data of the CPU module. In the <i>Status</i> field, the current module status and any existing errors are displayed.</p> <p>The <i>Diagnosis Buffer</i> tab contains more detailed information about existing errors and how to correct them.</p> <p>The dialog box can be exited via the <i>Close</i> button.</p> 

Step	F: Testing the Hardware Configuration
3	<p>Testing the configuration of the communication processor.</p> <p>This is done via the dialog box <i>Module Status</i> in the <i>SIMATIC Manager</i>. It is opened by a  on the entry of the communication processor in the left window and then selecting <i>Target System</i> → <i>Module Status</i> from the pop-up menu.</p> <p>The dialog box <i>Module Status</i> of the communication processor will be displayed. The <i>General</i> tab displays various general data of the module.</p> <p>A dialog box for a more detailed diagnosis of the communication processor can be accessed via the <i>Special Diagnosis</i> button.</p> 

Step	F: Testing the Hardware Configuration
4	<p>The dialog box <i>NCM S7 PROFIBUS Diagnostics</i> will be displayed.</p> <p>From the <i>PROFIBUS Station</i> tab, a diagnosis of the <i>PROFIBUS Network</i> can be performed.</p> <p>If the physical connection to the communication processor <i>CP 5412 A2</i> has already been established, the list should contain two entries for this example. One entry for the communication processor <i>CP 5412 A2</i> with the address 2 and one entry for the communication processor <i>CP 443-5 BASIC</i> with the address 3.</p> <p>If the physical connection to the communication processor <i>CP 5412 A2</i> has not been established yet, at least the entry for the communication processor <i>CP 443-5 BASIC</i> with the address 3 should be displayed.</p> <p>The dialog box can be exited via the <i>Close</i> button. The Module Status dialog box can also be exited via the <i>Close</i> button.</p> 

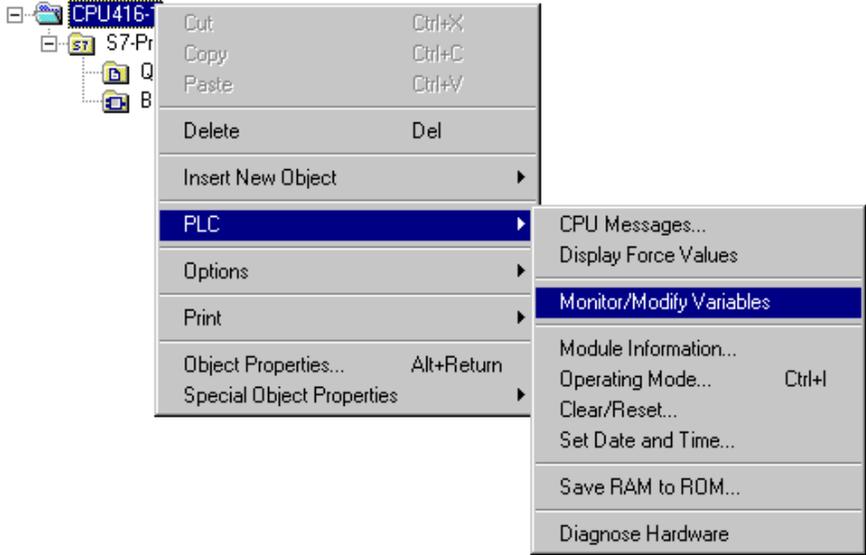
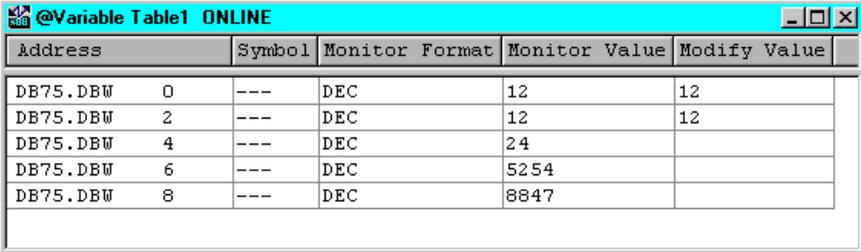
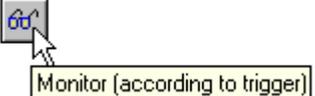
G: Creating the STEP7 Program

Step	G: Creating the STEP7 Program
1	<p>Creation of the <i>S7 Program</i>.</p> <p>This sample project requires the operation block <i>OBI</i> and a data block. <i>OBI</i> is available by default, the required data block must be created. This is done in the <i>SIMATIC Manager</i> via a  on the sub-entry <i>Modules</i> of the entry <i>S7 Program(1)</i> of the configured CPU module and then selecting <i>Insert New Object</i> → <i>Data Block</i> from the pop-up menu.</p> <p>The properties dialog box of the data block will be opened. As the block's Name enter <i>DB75</i> and close the dialog box with <i>OK</i>.</p> 
2	<p>The newly created data block <i>DB75</i> will be displayed in the right window of the project.</p> <p>Via a  on this data block or a  and then selecting <i>Open Object</i> from the pop-up menu, the content of the block can be programmed. This starts the program <i>LAD/STL/SCF</i>.</p> 

Step	G: Creating the STEP7 Program																																								
3	<p>The program <i>LAD/STL/SCF</i> is displayed.</p> <p>Acknowledge the dialog box <i>New Data Block</i> by clicking on <i>OK</i>.</p>  <p>KOP_AWL_FUP</p>																																								
4	<p>Programming the <i>DB75</i>.</p> <p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits.</p> <p>Two additional tags with a length of 16 Bits are created, whose values are cyclically incremented in <i>OBI</i>.</p> <p>The following graphic displays the programmed data block <i>DB75</i>.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Name</th> <th>Type</th> <th>Initial Value</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>0.0</td> <td></td> <td>STRUCT</td> <td></td> <td></td> </tr> <tr> <td>+0.0</td> <td>Var_01</td> <td>WORD</td> <td>W#16#0</td> <td>Value 1</td> </tr> <tr> <td>+2.0</td> <td>Var_02</td> <td>WORD</td> <td>W#16#0</td> <td>Value 2</td> </tr> <tr> <td>+4.0</td> <td>Var_03</td> <td>WORD</td> <td>W#16#0</td> <td>Summ</td> </tr> <tr> <td>+6.0</td> <td>Var_04</td> <td>WORD</td> <td>W#16#0</td> <td>Inc 1</td> </tr> <tr> <td>+8.0</td> <td>Var_05</td> <td>WORD</td> <td>W#16#0</td> <td>Inc 2</td> </tr> <tr> <td>=10.0</td> <td></td> <td>END_STRUCT</td> <td></td> <td></td> </tr> </tbody> </table>	Address	Name	Type	Initial Value	Comment	0.0		STRUCT			+0.0	Var_01	WORD	W#16#0	Value 1	+2.0	Var_02	WORD	W#16#0	Value 2	+4.0	Var_03	WORD	W#16#0	Summ	+6.0	Var_04	WORD	W#16#0	Inc 1	+8.0	Var_05	WORD	W#16#0	Inc 2	=10.0		END_STRUCT		
Address	Name	Type	Initial Value	Comment																																					
0.0		STRUCT																																							
+0.0	Var_01	WORD	W#16#0	Value 1																																					
+2.0	Var_02	WORD	W#16#0	Value 2																																					
+4.0	Var_03	WORD	W#16#0	Summ																																					
+6.0	Var_04	WORD	W#16#0	Inc 1																																					
+8.0	Var_05	WORD	W#16#0	Inc 2																																					
=10.0		END_STRUCT																																							
5	<p>Save the block and load it into the PLC. This is done via the toolbar button displayed below. Note that loading to the CPU module is only possible while the operating mode switch is set to <i>STOP</i> or <i>RUN-P</i>.</p>  <p>Download</p>																																								
6	<p>Programming the <i>OBI</i>.</p> <p>Open the block in the program <i>LAD/STL/SCF</i>.</p> <p>First, two values in the <i>DB75</i> are added and then stored again in <i>DB75</i>.</p> <p>Netzwerk 1: Addition</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Adding two 16-Bit Values The result is stored in another 16-Bit Value</p> </div> <table border="1"> <tbody> <tr> <td>OPN</td> <td>DB</td> <td>75</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>0</td> </tr> <tr> <td>L</td> <td>DBW</td> <td>2</td> </tr> <tr> <td>+I</td> <td></td> <td></td> </tr> <tr> <td>T</td> <td>DBW</td> <td>4</td> </tr> </tbody> </table> <p>Next, a value in the <i>DB75</i> is incremented every second.</p>	OPN	DB	75	L	DBW	0	L	DBW	2	+I			T	DBW	4																									
OPN	DB	75																																							
L	DBW	0																																							
L	DBW	2																																							
+I																																									
T	DBW	4																																							

Step	G: Creating the STEP7 Program
	<p>Network 2: Second Cycle</p> <p>Generation of a second cycle at M 0.0</p> <pre> AN M 0.0 L S5T#1S SD T 1 A T 1 = M 0.0 </pre> <p>Network 3: Counting in a second cycle</p> <p>Counting a value in a second cycle At 10000, reset to 0</p> <pre> AN M 0.0 JC M001 L DBW 6 L 1 +I T DBW 6 L 10000 <I JC M001 L 0 T DBW 6 M001: NOP 0 </pre> <p>Finally, a value in the <i>DB75</i> is incremented every time the <i>OBI</i> run.</p> <p>Network 4: Counting in the cycle time</p> <p>Counting a value each time the OB is executed At 10000, reset to 0</p> <pre> L DBW 8 L 1 +I T DBW 8 L 10000 <I JC M002 L 0 T DBW 8 M002: NOP 0 </pre>
7	<p>Save the block <i>OBI</i> and load it into the PLC. This is done via the corresponding buttons on the toolbar.</p> <p>This completes the creation of the STEP7 project and it can now be run. Exit the program <i>LAD/STL/SCF</i>.</p>

H: Testing the STEP7 Program

Step	H: Testing the STEP7 Program																																				
1	<p>Testing the program with the STEP7 software.</p> <p>For this purpose, a tag table is created. This is done in the <i>SIMATIC Manager</i> via a  on the entry of the configured CPU module and then selecting <i>Target System</i> → <i>Monitor/Control Tag</i> from the pop-up menu.</p> 																																				
2	<p>An editor for creating and using a tag table will be displayed.</p> <p>The following shows a completed tag table. In this table, enter all tags created in the <i>DB75</i>.</p>  <table border="1"> <thead> <tr> <th>Address</th> <th>Symbol</th> <th>Monitor</th> <th>Format</th> <th>Monitor Value</th> <th>Modify Value</th> </tr> </thead> <tbody> <tr> <td>DB75.DBW 0</td> <td>---</td> <td>DEC</td> <td></td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 2</td> <td>---</td> <td>DEC</td> <td></td> <td>12</td> <td>12</td> </tr> <tr> <td>DB75.DBW 4</td> <td>---</td> <td>DEC</td> <td></td> <td>24</td> <td></td> </tr> <tr> <td>DB75.DBW 6</td> <td>---</td> <td>DEC</td> <td></td> <td>5254</td> <td></td> </tr> <tr> <td>DB75.DBW 8</td> <td>---</td> <td>DEC</td> <td></td> <td>8847</td> <td></td> </tr> </tbody> </table>	Address	Symbol	Monitor	Format	Monitor Value	Modify Value	DB75.DBW 0	---	DEC		12	12	DB75.DBW 2	---	DEC		12	12	DB75.DBW 4	---	DEC		24		DB75.DBW 6	---	DEC		5254		DB75.DBW 8	---	DEC		8847	
Address	Symbol	Monitor	Format	Monitor Value	Modify Value																																
DB75.DBW 0	---	DEC		12	12																																
DB75.DBW 2	---	DEC		12	12																																
DB75.DBW 4	---	DEC		24																																	
DB75.DBW 6	---	DEC		5254																																	
DB75.DBW 8	---	DEC		8847																																	
3	<p>Monitoring the current tag values.</p> <p>By clicking on the toolbar button displayed below, the current values of the corresponding tags in the PLC are displayed in the column <i>Status Value</i>.</p>  <p>Controlling the tag values.</p> <p>Values can be entered in the column <i>Control Value</i>. By clicking on the toolbar button displayed below, these values will be written to the corresponding tags in the PLC.</p>																																				

Step	H: Testing the STEP7 Program
	<p>Note that tags can only be controlled while the operating mode switch of the CPU module is set to <i>RUN-P</i>.</p>  <p>The image shows a mouse cursor clicking on a button labeled 'Modify (according to trigger)'. The button is part of a software interface, likely for configuring tags in a PLC project.</p>
4	<p>The created tag table can now be saved.</p> <p>In this sample, the table is saved under the name <i>VAT1</i>. After checking the program in the PLC, the tag table can be closed. This concludes the configuration of the STEP7 project and the <i>SIMATIC Manager</i> can be exited.</p>  <p>The image shows a small icon of a tag table with the name 'VAT1' next to it.</p>

6.3 Creation of the WinCC Project WinCC_S7_PB

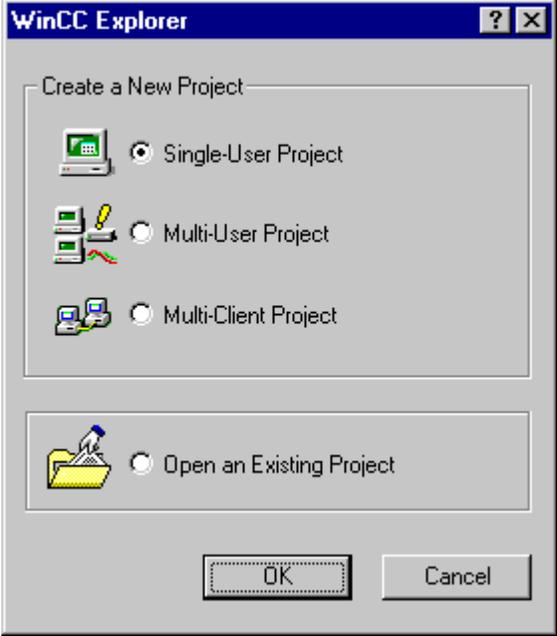
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S7_PB*.

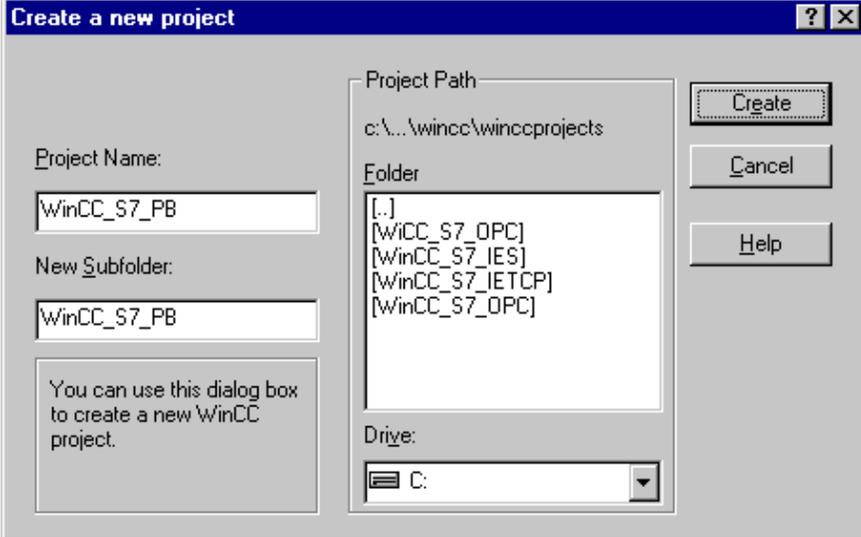
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_S7_PB*:

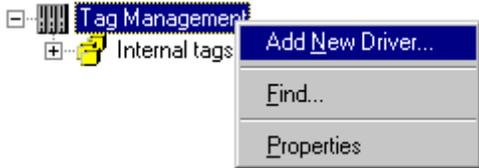
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Tags
- D: Creating the WinCC Screen

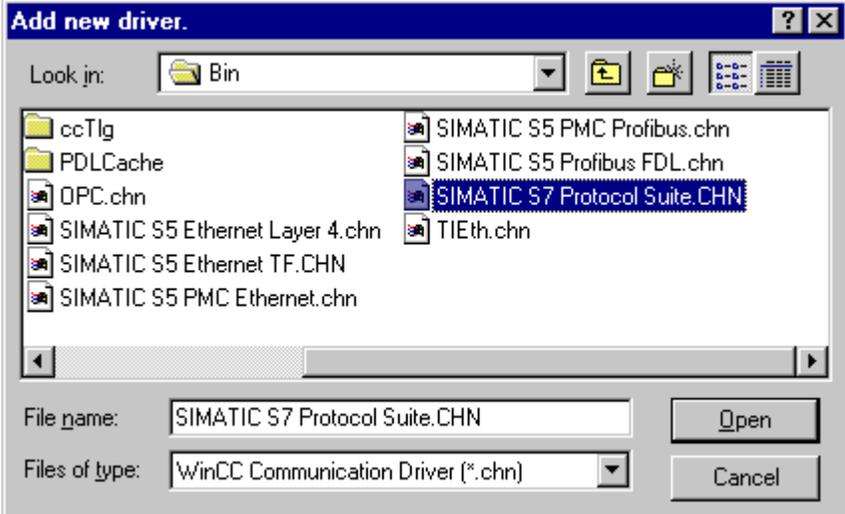
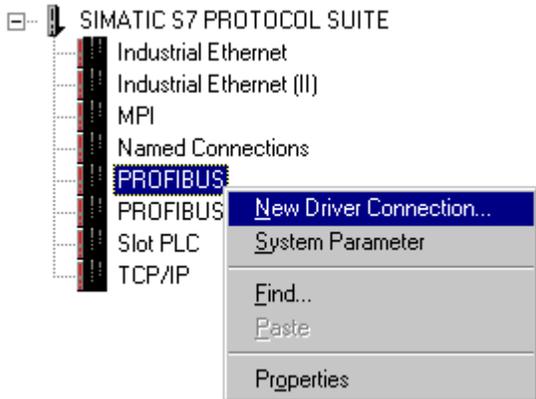
A: Creating the WinCC Project

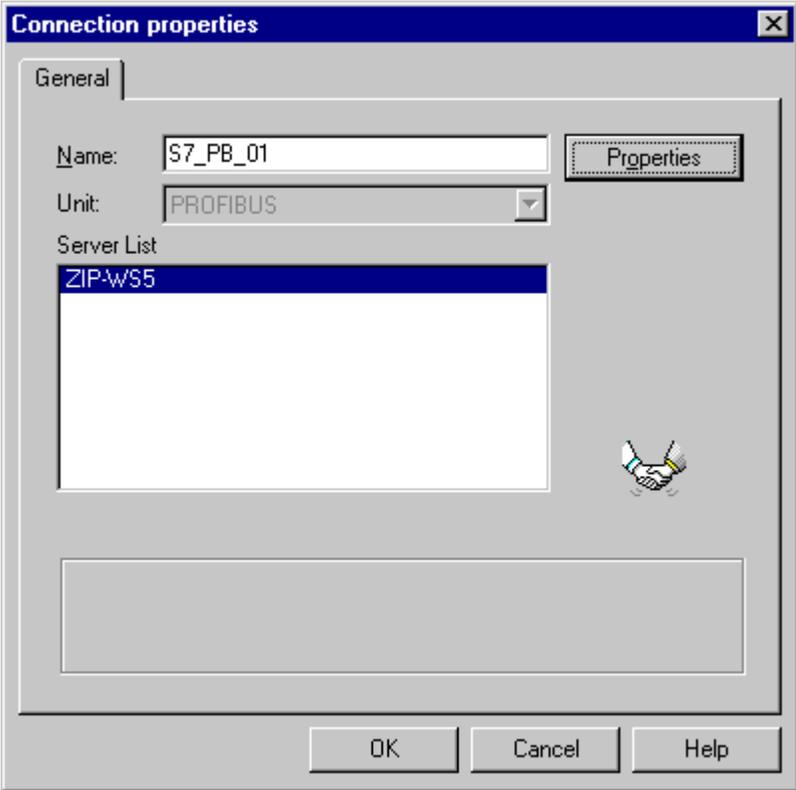
Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>This will display the <i>WinCC Explorer</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

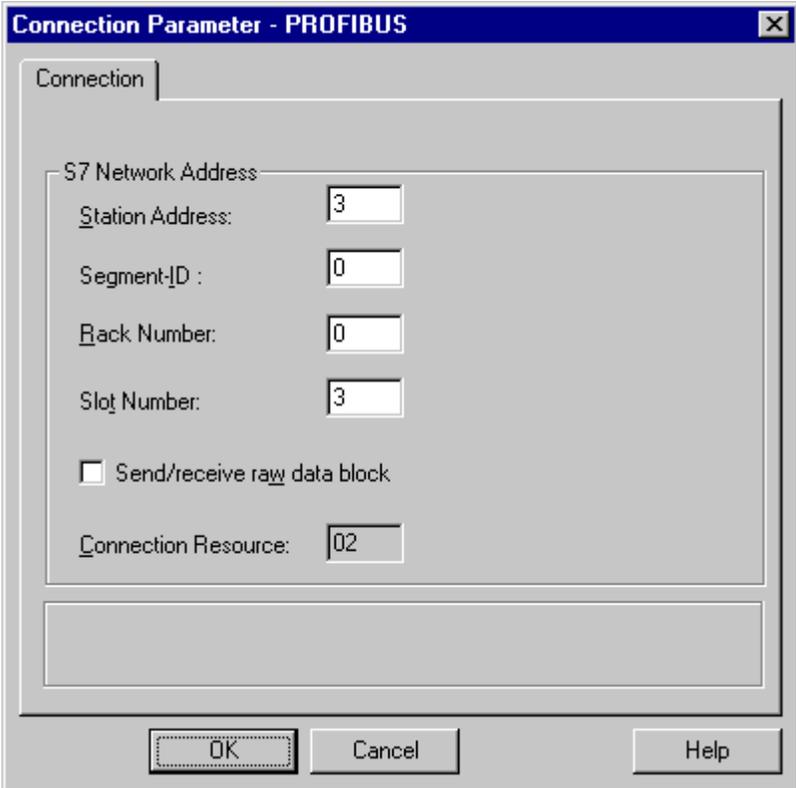
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S7_PB</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

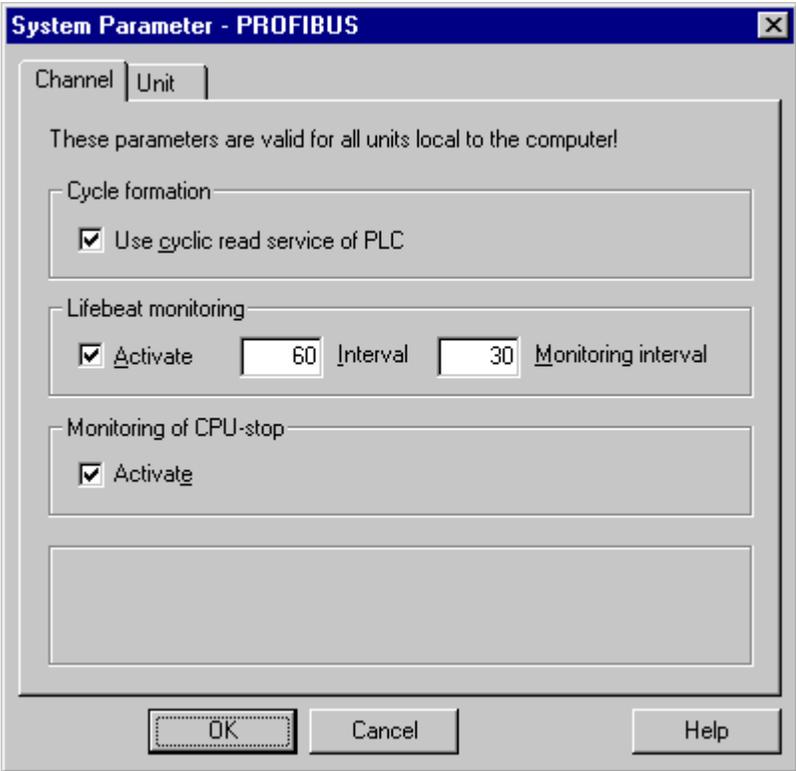
B: Creating the Connection

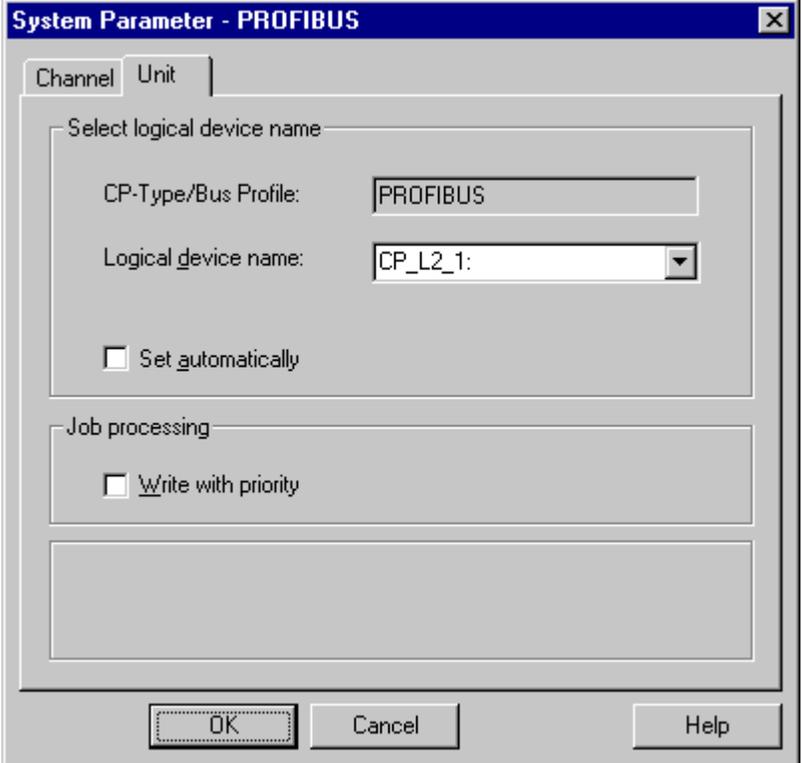
Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. For the communication to the <i>SIMATIC S7</i>, the driver <i>SIMATIC S7 Protocol Suite</i> is required. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added driver <i>SIMATIC S7 Protocol Suite</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The driver contains eight different channel units. To operate a computer with two <i>CP 1413</i> communication processors, two channel units for the <i>PROFIBUS</i> are available.</p> <p>In this sample, the channel unit <i>PROFIBUS</i> is used. Create a new connection for this channel unit by  on <i>PROFIBUS</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> 

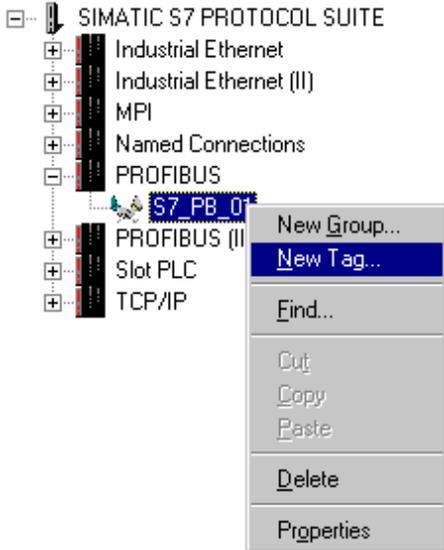
Step	B: Creating the Connection
4	<p>The properties dialog box of the connection will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered. In this sample, this is <i>S7_PB_01</i>.</p> <p>Click on the <i>Properties</i> button to define the connection properties.</p> 

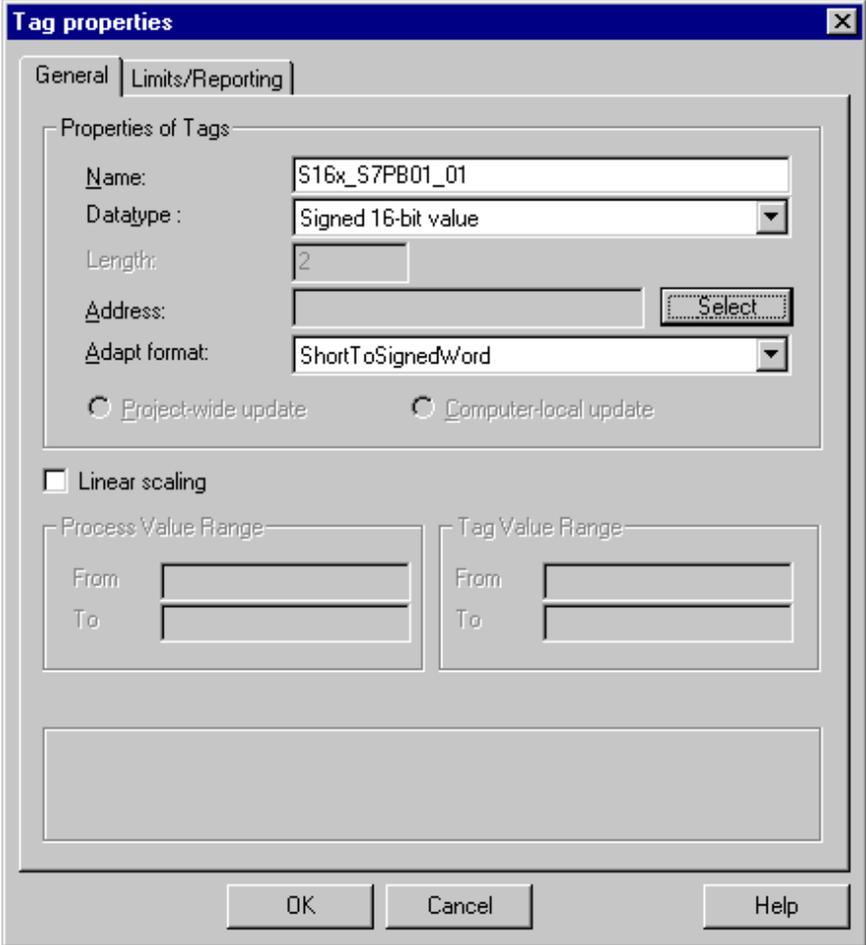
Step	B: Creating the Connection
5	<p>The dialog box Connection Properties will be displayed.</p> <p>In the <i>Station Address</i> field, the address that has been set for the communication processor <i>CP 443-5 BASIC</i> is entered. For this sample, this is the Address 3.</p> <p>Additionally, the Rack Number and Slot Number of the CPU module to be accessed must be entered. Make sure that the values of the CPU module are entered here and not the values of the communication processor.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

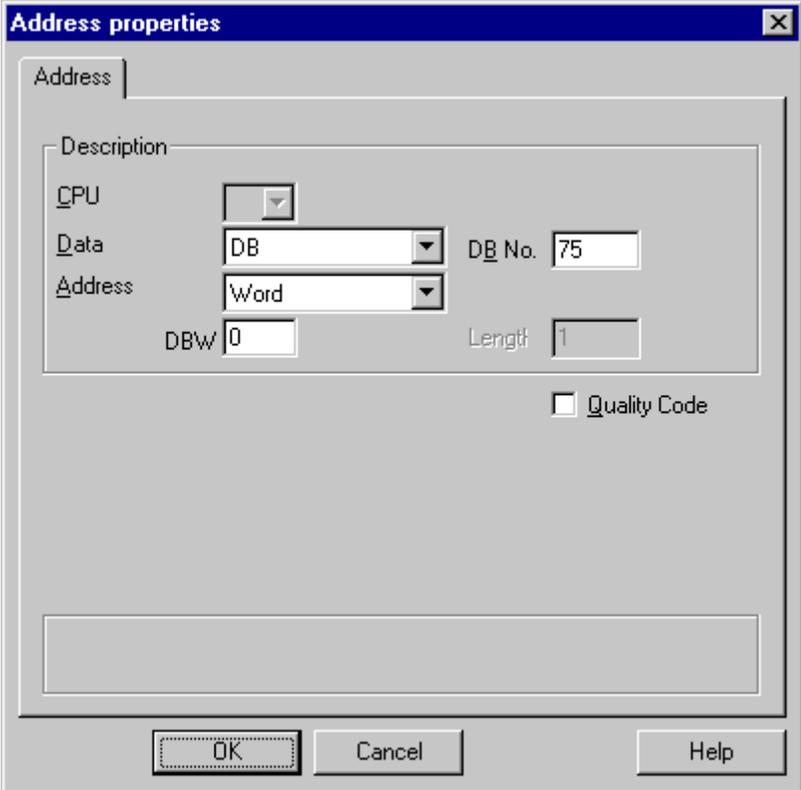
Step	B: Creating the Connection
6	<p>Setting the system parameters of the <i>PROFIBUS</i> channel unit.</p> <p>These settings are made in the <i>System Parameters</i> dialog box, which is accessed via a  on the <i>PROFIBUS</i> entry and then selecting <i>System Parameters</i> from the pop-up menu.</p> <p>In the <i>Channel</i> tab, various settings pertaining to the communication and monitoring a communication can be made. These settings will apply to all channel units of the communication driver.</p> 

Step	B: Creating the Connection
7	<p>In the <i>Device</i> tab, the access point used by the connection to access the PLC is specified.</p> <p>By default, the access point <i>CP_L2_1</i>: is set. Previously, the communication processor <i>CP 5412 A2</i> has been assigned to the access point <i>CP_L2_1</i>: in the program <i>Setting the PG/PC Interface</i>. If you want the access point to be set automatically, make sure that the correct one is being used, especially if multiple communication processors are used.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

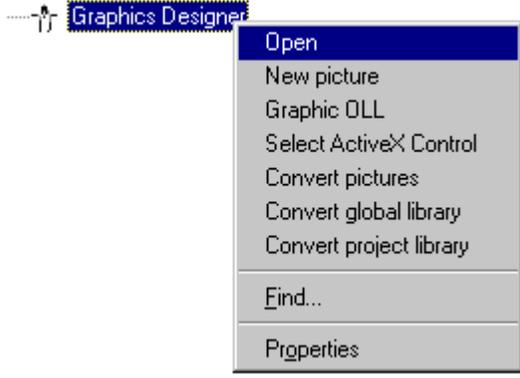
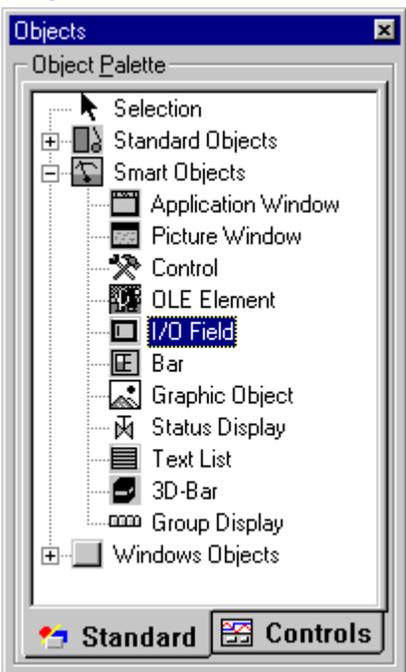
C: Creating the WinCC Tags

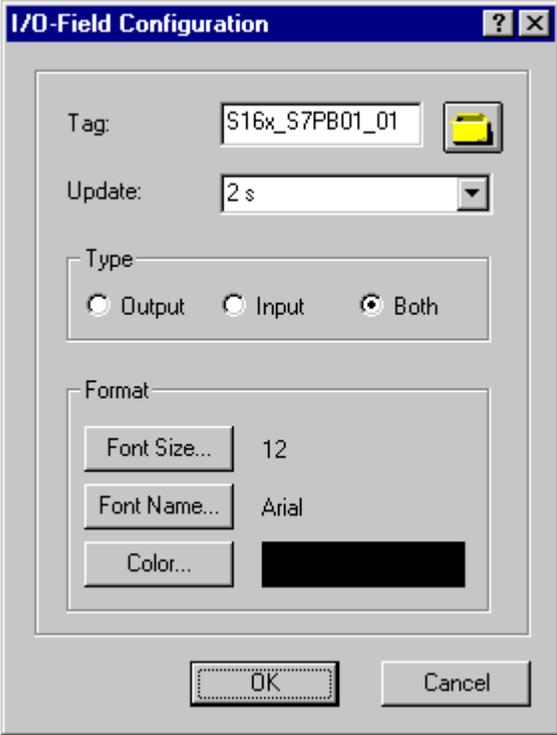
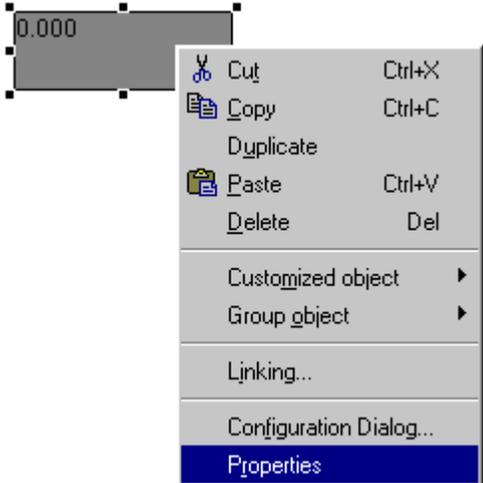
Step	C: Creating the WinCC Tags
1	<p>Creation of the WinCC tags required for the sample.</p> <p>This is done via a  on the newly created connection <i>S7_PB_01</i> and then selecting <i>New Tag</i> from the pop-up menu.</p>  <p>The screenshot shows a tree view under 'SIMATIC S7 PROTOCOL SUITE'. The tree includes: Industrial Ethernet, Industrial Ethernet (II), MPI, Named Connections, PROFIBUS, S7_PB_01 (highlighted), PROFIBUS (II), Slot PLC, and TCP/IP. A context menu is open over 'S7_PB_01', with 'New Tag..' selected. Other menu items include 'New Group...', 'Find...', 'Cut', 'Copy', 'Paste', 'Delete', and 'Properties'.</p>

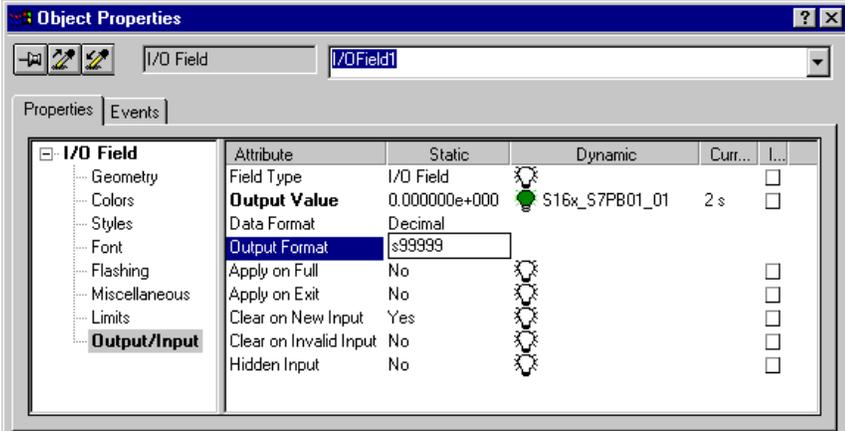
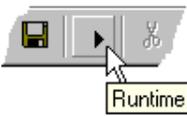
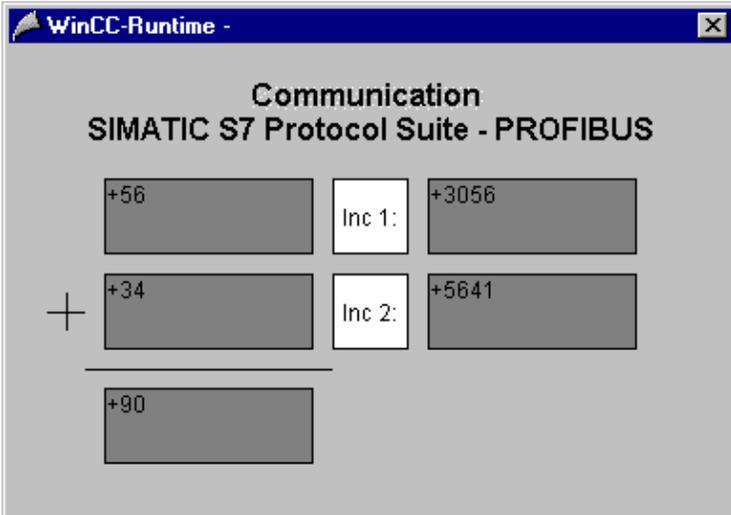
Step	C: Creating the WinCC Tags
2	<p>The properties dialog box of the tag will be displayed.</p> <p>In the sample, the <i>Name</i> of the first tag is <i>S16x_S7PB01_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type. Click on the <i>Select</i> button to set the <i>Address</i> of the new tag.</p> 

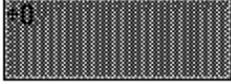
Step	C: Creating the WinCC Tags																		
3	<p>The dialog box <i>Address Properties</i> will be displayed.</p> <p>Set <i>DB</i> as the <i>Data Range</i> and the value <i>75</i> as the <i>DB No.</i>. Set <i>Word</i> in the <i>Address</i> field and the value <i>0</i> in the <i>DBW</i> field. Close the dialog box by clicking on <i>OK</i>. The properties dialog box of the tag is also closed by clicking on <i>OK</i>.</p> <p>The just created tag is addressed in the range of the PLC, where the first of the two values to be added is located.</p> 																		
4	<p>Creation of the remaining WinCC tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S7PB01_01</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> <tr> <td> S16x_S7PB01_02</td> <td>Signed 16-bit value</td> <td>DB75,DW2</td> </tr> <tr> <td> S16x_S7PB01_03</td> <td>Signed 16-bit value</td> <td>DB75,DW4</td> </tr> <tr> <td> S16x_S7PB01_04</td> <td>Signed 16-bit value</td> <td>DB75,DW6</td> </tr> <tr> <td> S16x_S7PB01_05</td> <td>Signed 16-bit value</td> <td>DB75,DW8</td> </tr> </tbody> </table>	Name	Type	Parameters	 S16x_S7PB01_01	Signed 16-bit value	DB75,DW0	 S16x_S7PB01_02	Signed 16-bit value	DB75,DW2	 S16x_S7PB01_03	Signed 16-bit value	DB75,DW4	 S16x_S7PB01_04	Signed 16-bit value	DB75,DW6	 S16x_S7PB01_05	Signed 16-bit value	DB75,DW8
Name	Type	Parameters																	
 S16x_S7PB01_01	Signed 16-bit value	DB75,DW0																	
 S16x_S7PB01_02	Signed 16-bit value	DB75,DW2																	
 S16x_S7PB01_03	Signed 16-bit value	DB75,DW4																	
 S16x_S7PB01_04	Signed 16-bit value	DB75,DW6																	
 S16x_S7PB01_05	Signed 16-bit value	DB75,DW8																	

D: Creating the WinCC Screen

Step	D: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	D: Creating the WinCC Screen
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S7PB01_01</i> via the button displayed below.</p>  <p>Leave the <i>Update</i> of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p>  <p>The <i>I/O-Field Configuration</i> dialog box is shown with the following settings: Tag: S16x_S7PB01_01 (with folder icon) Update: 2 s Type: <input checked="" type="radio"/> Both, <input type="radio"/> Input, <input type="radio"/> Output Format: Font Size... 12, Font Name... Arial, Color... (black)</p>
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p>  <p>The context menu is shown over a field containing the value 0.000. The menu items are: Cut (Ctrl+X) Copy (Ctrl+C) Duplicate Paste (Ctrl+V) Delete (Del) Customized object Group object Linking... Configuration Dialog... Properties</p>

Step	D: Creating the WinCC Screen
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p> 
6	<p>Creation of four additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_S7PB_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p>  <p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the <i>I/O fields</i>. They can be changed by entering values in the individual <i>I/O Fields</i>.</p> 

Step	D: Creating the WinCC Screen
	<p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p> 

6.4 Diagnosis of the Communication Connection

The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S7_PB* and the SIMATIC S7 station.

A diagnosis of the sample according to this description makes only sense, if the checks listed below have been completed successfully.

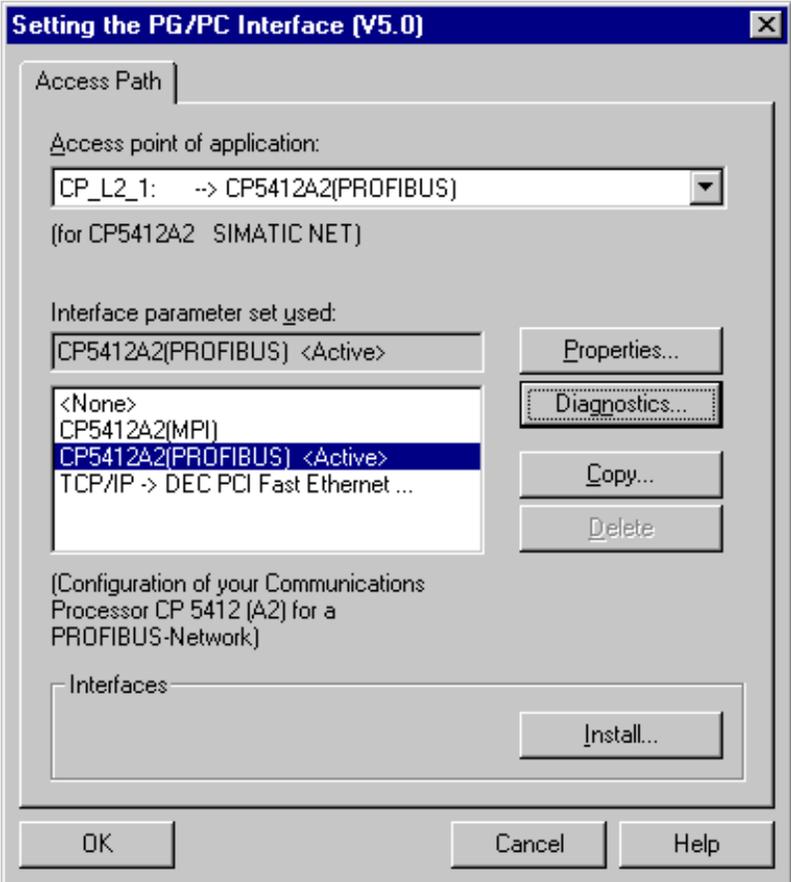
Startup of the Communication Processor CP 5412 A2

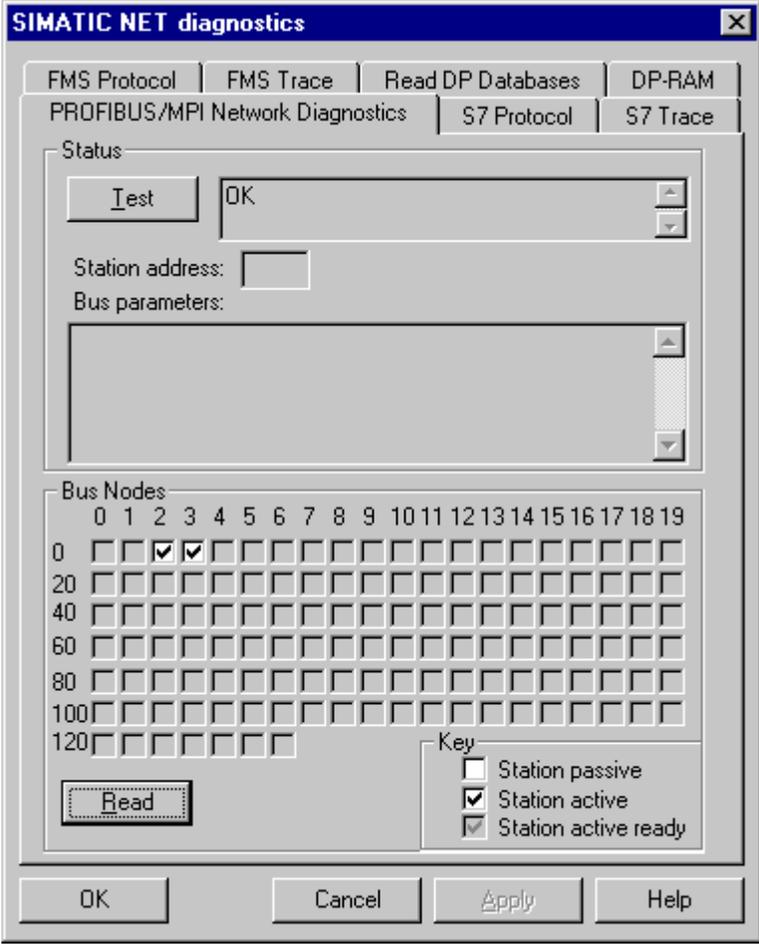
- E: Testing the Communication Processor

Creation of the STEP7 Project *S7_PB*

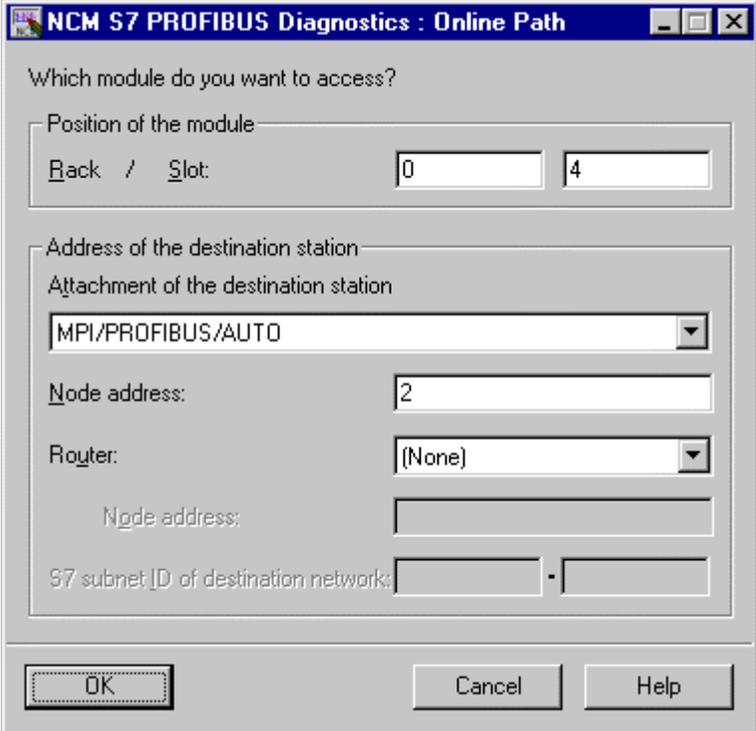
- F: Testing the Hardware Configuration
- H: Testing the STEP7 Program

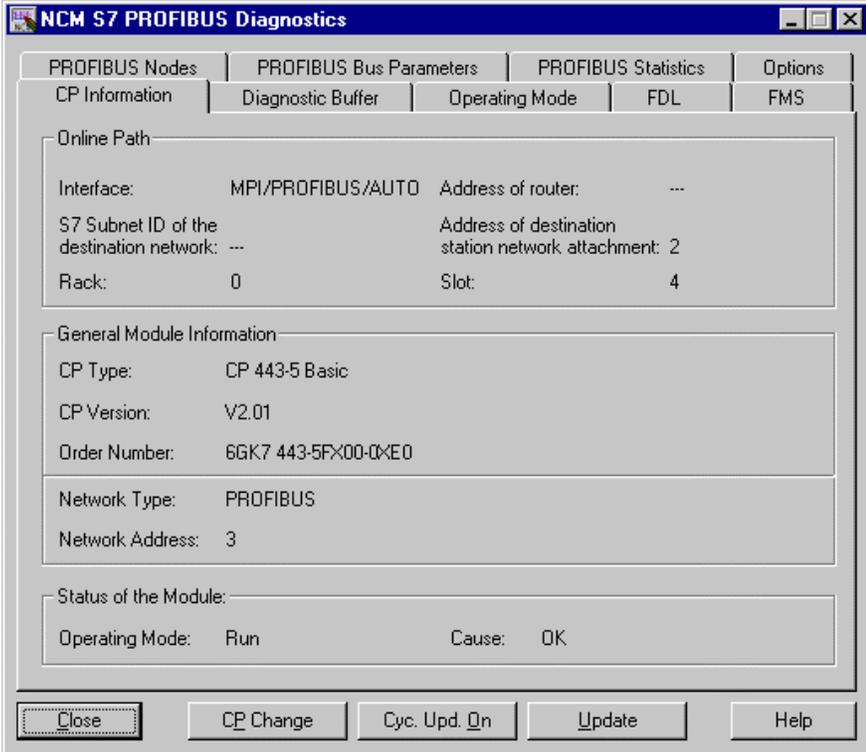
Setting the PG/PC Interface

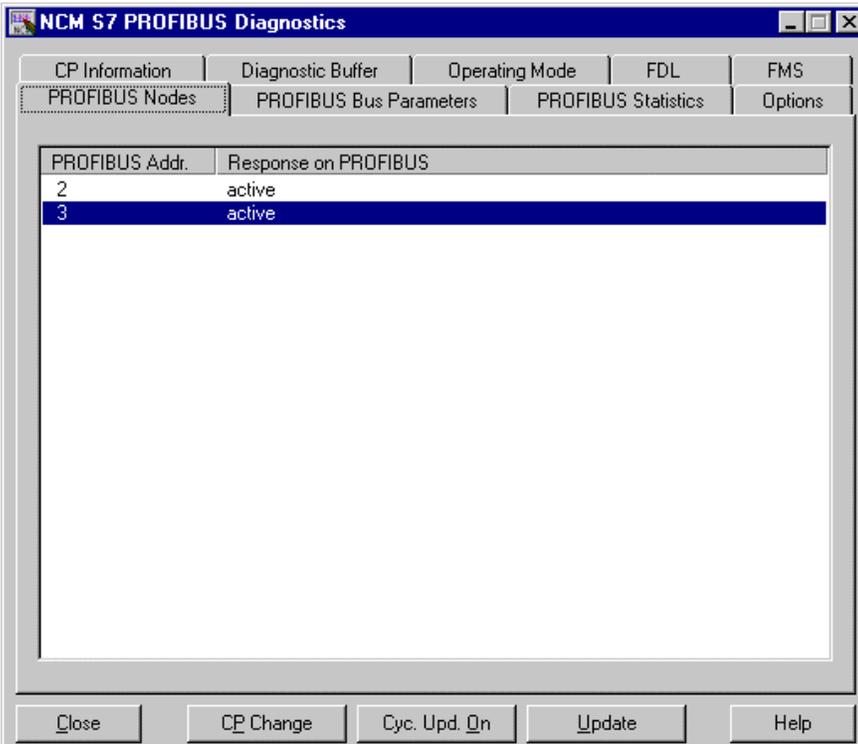
Step	Setting the PG/PC Interface
1	<p>Diagnosis of the communication connection via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface <i>CP 5412 A2 (PROFIBUS)</i>. Make sure that the assignments between access points and the interfaces are not changed. The diagnosis of the communication connection is started by clicking on the <i>Diagnostics</i> button.</p> 

Step	Setting the PG/PC Interface
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>From the <i>PROFIBUS/MPI Network Diagnostics</i> tab, the diagnosis of the communication connection is started by clicking on the <i>Read</i> button. This will display all stations accessible on the bus. For this sample, the address 2 of the communication processor <i>CP 5412 A2</i> as well as the address 3 of the communication processor <i>CP 443-5 BASIC</i> must be marked as occupied.</p> <p>The dialog box can be exited by clicking on <i>OK</i>.</p> 

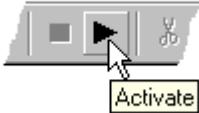
NCM S7 PROFIBUS Diagnosis

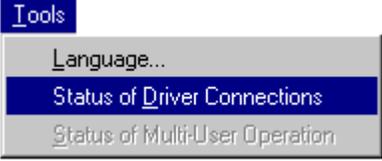
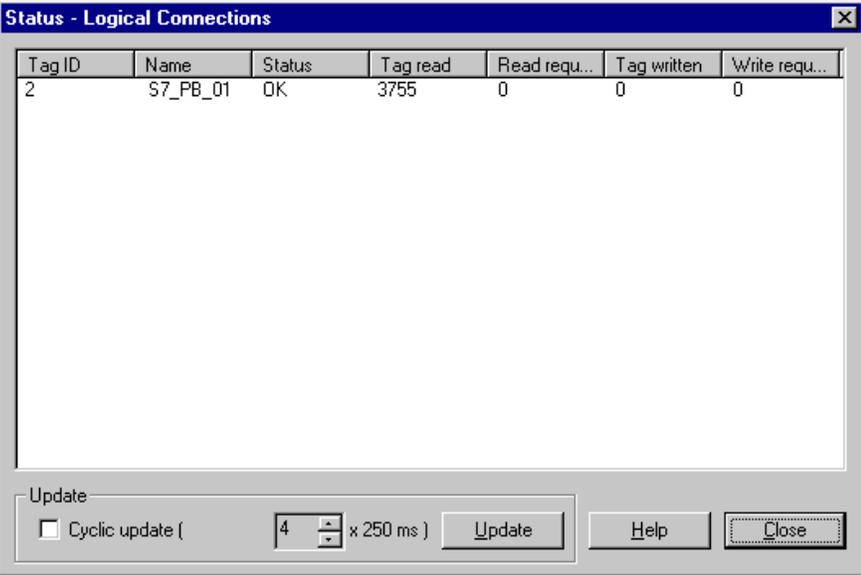
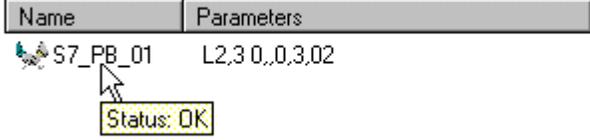
Step	NCM S7 PROFIBUS Diagnosis
1	<p>Diagnosis of the communication connection via the program <i>NCM S7 PROFIBUS Diagnosis</i>.</p> <p>This program is started via <i>Start</i> → <i>Simatic</i> → <i>STEP7</i> → <i>NCM S7 PROFIBUS</i> → <i>PROFIBUS Diagnosis</i>.</p>  <p>NCM Profibus Diagnose</p>
2	<p>A dialog box for specifying the module to be accessed will be displayed.</p> <p>In this sample, the communication processor <i>CP 443-5 BASIC</i> in slot <i>4</i> is being accessed. The target station is accessed via the MPI interface of the CPU module with the address <i>2</i>. Your system might use different settings.</p> <p>Exit the dialog box by clicking on the <i>OK</i> button.</p> 

Step	NCM S7 PROFIBUS Diagnosis
3	<p>The dialog box <i>NCM S7 PROFIBUS Diagnosis</i> will be displayed.</p> <p>The <i>CP Information</i> tab displays general information about the communication processor. Among other things, the <i>Network Address</i> configured with the STEP7 software is displayed.</p> 

Step	NCM S7 PROFIBUS Diagnosis
4	<p>The <i>PROFIBUS Station</i> tab lists all communication stations that can be accessed via the <i>PROFIBUS</i>.</p> <p>In this sample, these are the communication processors <i>CP 5412 A2</i> in the computer with the address 2 and the <i>CP 443-5 BASIC</i> in the PLC with the address 3.</p> 

WinCC Explorer

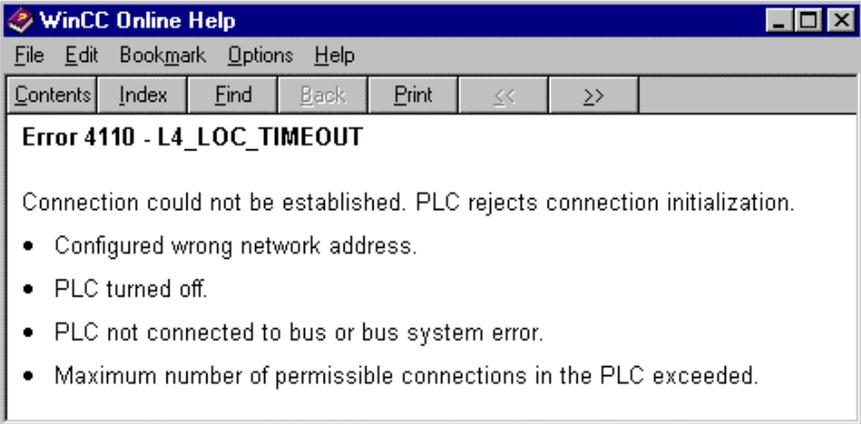
Step	WinCC Explorer
1	<p>Diagnosis of the communication connection from the <i>WinCC Explorer</i>.</p> <p>Switch the project <i>WinCC_S7_PB</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below.</p>  <p>The created WinCC screen <i>com_S7PB_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>

Step	WinCC Explorer
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>S7_PB_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p> 
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>.</p> <p>The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p> 

Step	WinCC Explorer						
	<p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="background-color: #cccccc;">Name</th> <th style="background-color: #cccccc;">Type</th> <th style="background-color: #cccccc;">Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S7PB01_01</td> <td>Signed 16-bit value</td> <td>DB75,DW0</td> </tr> </tbody> </table> <div style="margin-left: 40px; border: 1px solid black; padding: 2px; width: fit-content;"> <p>Process value: 34 Quality: c0 Last Change: 7/1/99 2:50:18 PM</p> </div>	Name	Type	Parameters	S16x_S7PB01_01	Signed 16-bit value	DB75,DW0
Name	Type	Parameters					
S16x_S7PB01_01	Signed 16-bit value	DB75,DW0					

Channel Diagnosis

Step	Channel Diagnosis																																		
1	<p>Diagnosis of the communication connection via the program <i>WinCC Channel Diagnosis</i>.</p> <p>Start this program via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Channel Diagnosis</i>.</p> <div style="text-align: center;">  Channel Diagnosis </div>																																		
2	<p>The program <i>WinCC Channel Diagnosis</i> will be displayed.</p> <p>The <i>Channels/Connections</i> tab displays detailed information about the status of each configured connection. By default, the display is updated every second. The update cycle can be changed in the input field located at the bottom.</p> <div style="border: 1px solid gray; padding: 5px;"> <p>WinCC Channel Diagnosis</p> <p>Channels/Connections Configuration</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Counters</th> <th style="width: 40%;">Value</th> </tr> </thead> <tbody> <tr><td>State</td><td>ready</td></tr> <tr><td>Error Code</td><td>none</td></tr> <tr><td>Error Count</td><td>0</td></tr> <tr><td>Unit</td><td>PROFIBUS</td></tr> <tr><td>Device</td><td>CP_L2_1:</td></tr> <tr><td>PDU Size</td><td>480</td></tr> <tr><td>Request Counter</td><td>6</td></tr> <tr><td>Response Counter</td><td>28</td></tr> <tr><td>Own Cycles</td><td>0</td></tr> <tr><td>AS Cycles</td><td>1</td></tr> <tr><td>Max. AS Cycles</td><td>32</td></tr> <tr><td>ConnectionState</td><td>ready</td></tr> <tr><td>ConnectionEstablishMode</td><td>automatic</td></tr> <tr><td>ForceConnectionState</td><td>up</td></tr> <tr><td>ForceConnectionAddress</td><td>projected</td></tr> <tr><td>ProjectedConnectionAddress</td><td>L2,3 0,,0,3,02</td></tr> </tbody> </table> <p style="margin-top: 5px;">Cyclic Update: <input type="checkbox"/> 1000</p> </div>	Counters	Value	State	ready	Error Code	none	Error Count	0	Unit	PROFIBUS	Device	CP_L2_1:	PDU Size	480	Request Counter	6	Response Counter	28	Own Cycles	0	AS Cycles	1	Max. AS Cycles	32	ConnectionState	ready	ConnectionEstablishMode	automatic	ForceConnectionState	up	ForceConnectionAddress	projected	ProjectedConnectionAddress	L2,3 0,,0,3,02
Counters	Value																																		
State	ready																																		
Error Code	none																																		
Error Count	0																																		
Unit	PROFIBUS																																		
Device	CP_L2_1:																																		
PDU Size	480																																		
Request Counter	6																																		
Response Counter	28																																		
Own Cycles	0																																		
AS Cycles	1																																		
Max. AS Cycles	32																																		
ConnectionState	ready																																		
ConnectionEstablishMode	automatic																																		
ForceConnectionState	up																																		
ForceConnectionAddress	projected																																		
ProjectedConnectionAddress	L2,3 0,,0,3,02																																		

Step	Channel Diagnosis								
3	<p>If a connection error is detected, the <i>Error Code</i> line in the right window half will display a value specifying the error cause. Detailed information about this error code is displayed by  on the <i>Error Code</i> entry and then selecting <i>Help</i> from the pop-up menu.</p> <table border="1"> <thead> <tr> <th>Counters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>State</td> <td>disconnected</td> </tr> <tr> <td>Error Code</td> <td>4110</td> </tr> <tr> <td>Error Count</td> <td>0</td> </tr> </tbody> </table>	Counters	Value	State	disconnected	Error Code	4110	Error Count	0
Counters	Value								
State	disconnected								
Error Code	4110								
Error Count	0								
4	<p>This opens the Online Help to WinCC containing a description of the corresponding error code. Additionally, possible error causes are also listed.</p> 								

7 Communication to the SIMATIC S5 via Industrial Ethernet

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder `C:\Communication_Manual`. You have the option to copy the following components to the hard drive:



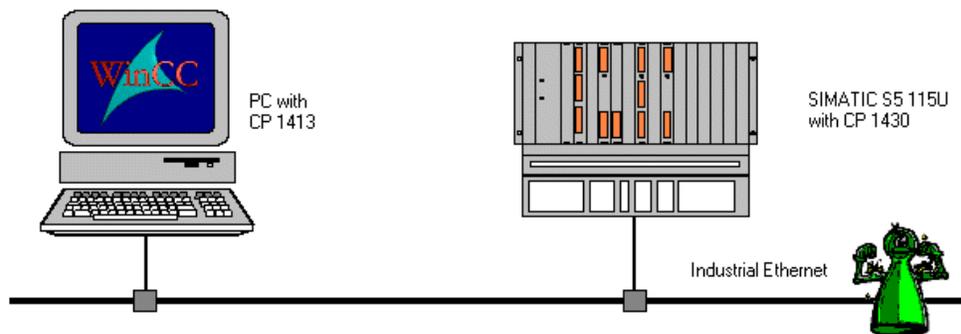
The STEP5 project we will create including the database file of the communication processor CP 1430 TF.



The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a SIMATIC S5 and WinCC. The communication connection is realized via the Industrial Ethernet. The communication card CP 1413 used in the computer has its own CPU onboard. This will free the CPU of the computer from communication tasks.

Overview of the Structure of the Sample



On the computer side, the connection to the *Industrial Ethernet* network is established via the communication processor *CP 1413*. To install this communication processor in the computer, the driver *IE TF-1413*, located on the *SIMATIC NET* CD-ROM, is needed. In the WinCC project, the communication driver *SIMATIC S5 Ethernet Layer 4* must be installed. This communication driver is used to configure the connection to the *SIMATIC S5*.

The PLC SIMATIC S5 115U is equipped with the CPU module CPU 944. The connection to the network is established via the communication processor CP 1430 TF. For the configuration of this communication processor, the communication package SINEC NCM for COMs is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 1413
- Creation of the STEP5 Project S5_IHst
- Creation of the WinCC Project WinCC_S5_IHst
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>IE TF-1413</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 1413</i> .
STEP5	STEP5 software for the creation of the STEP5 project. Communication package <i>SINEC NCM for COMs</i> for the configuration of the communication processor <i>CP 1430 TF</i> .
WinCC	WinCC with communication driver <i>SIMATIC S5 Ethernet Layer 4</i> for the creation of the WinCC project and for the configuration of the connection to the PLC.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 1413</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>CR 700-3</i> .
Power Supply	Power supply <i>PS 951</i> .
CPU Module	CPU module <i>CPU 944</i> .
Communication Processor	Communication processor <i>CP 1430 TF</i> .

7.1 Startup of the Communication Processor CP 1413

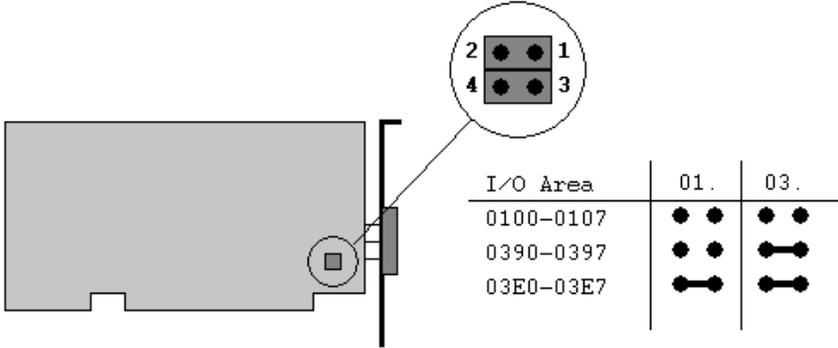
The following description details the configuration steps necessary to successfully start up the communication processor *CP 1413*.

Overview of the Configuration Steps

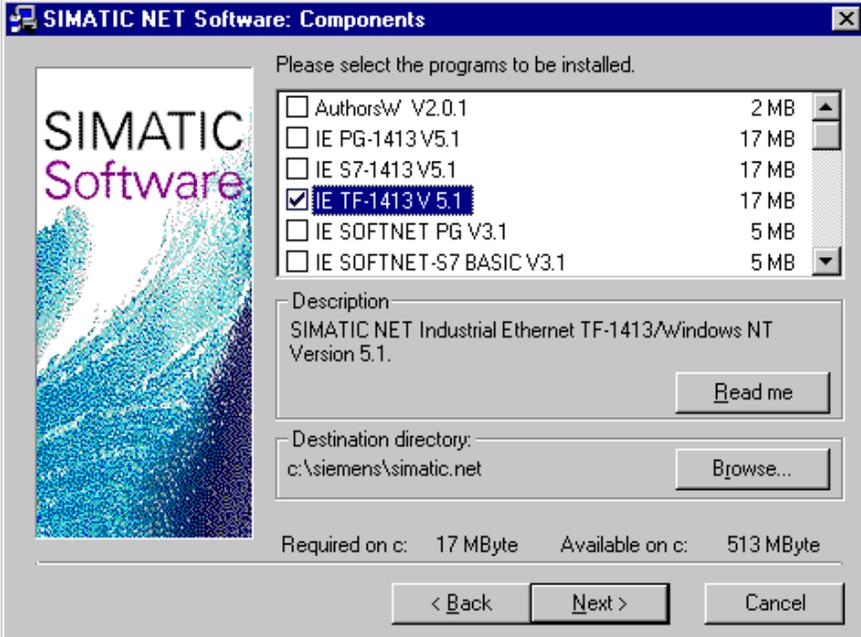
The following lists the configuration steps necessary to start up the communication processor *CP 1413*:

- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Installing the Communication Processor
- D: Assigning the Communication Processor
- E: Testing the Communication Processor

A: Mounting the Communication Processor in the Computer

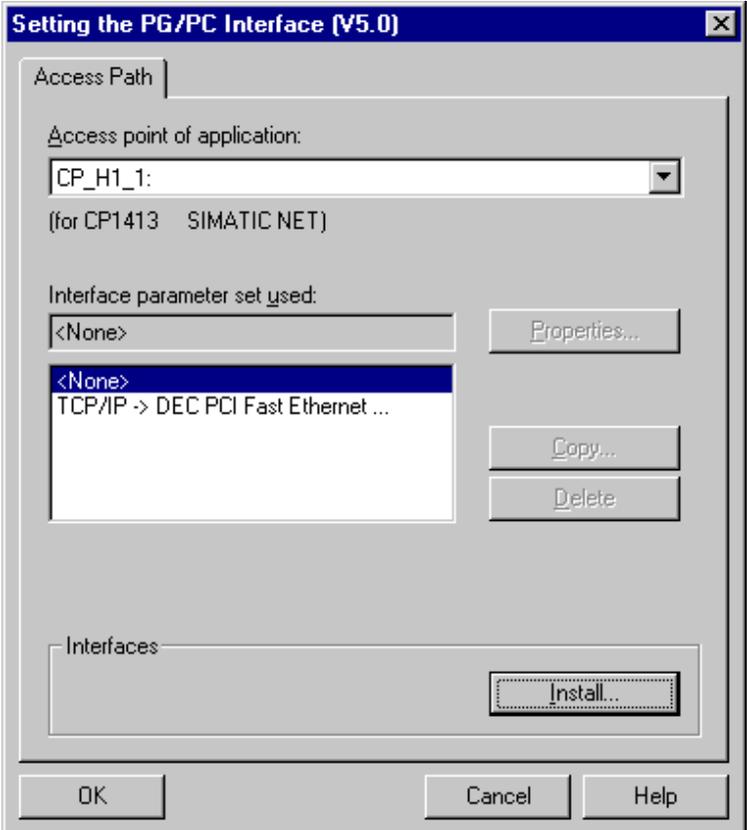
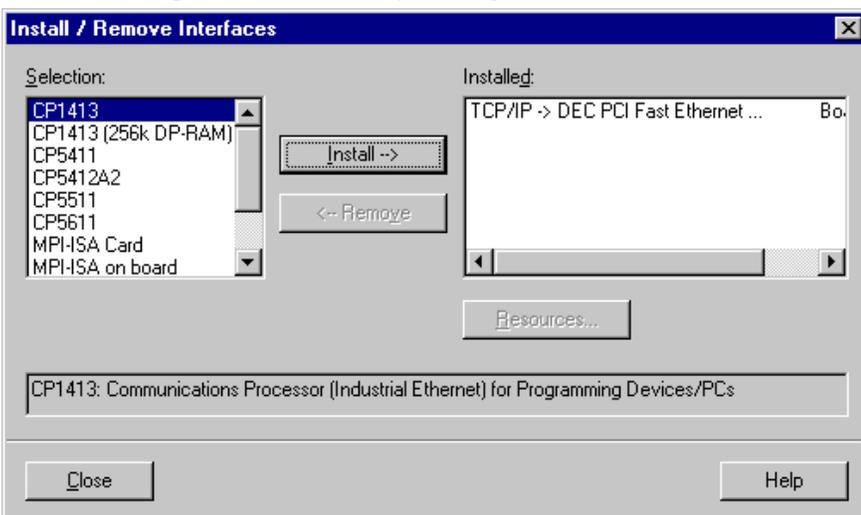
Step	A: Mounting the Communication Processor in the Computer												
1	<p>Check the selected jumper settings at the <i>CP 1413</i>.</p> <p>During the installation of the <i>CP 1413</i>, its <i>I/O Range</i> must be specified. The <i>I/O Range</i> is set via <i>jumper</i>s.</p> <p>By default, the <i>I/O Range</i> is set to <i>03E0-03E7</i>. The settings <i>0100-0117</i> and <i>0390-0397</i> are also possible. The following graphic illustrates the jumper settings necessary for the various <i>I/O Ranges</i>.</p>  <table border="1"> <thead> <tr> <th>I/O Area</th> <th>01.</th> <th>03.</th> </tr> </thead> <tbody> <tr> <td>0100-0107</td> <td>• •</td> <td>• •</td> </tr> <tr> <td>0390-0397</td> <td>• •</td> <td>— —</td> </tr> <tr> <td>03E0-03E7</td> <td>— —</td> <td>— —</td> </tr> </tbody> </table>	I/O Area	01.	03.	0100-0107	• •	• •	0390-0397	• •	— —	03E0-03E7	— —	— —
I/O Area	01.	03.											
0100-0107	• •	• •											
0390-0397	• •	— —											
03E0-03E7	— —	— —											
2	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>For the communication card <i>CP 1413</i>, a free ISA slot in the computer is required. After the installation of the <i>CP 1413</i>, close the computer's case and start the computer.</p>												

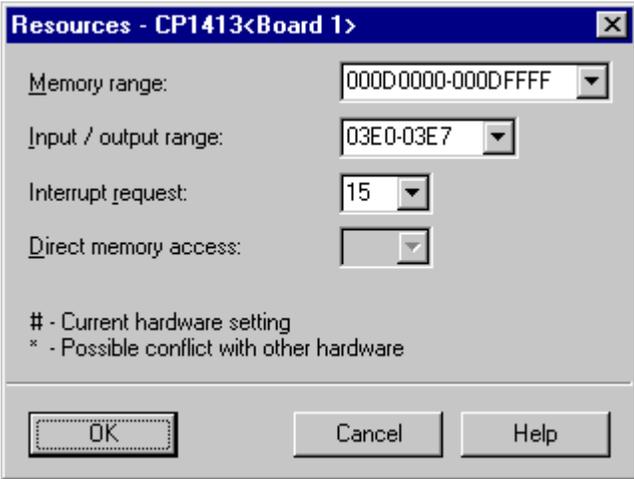
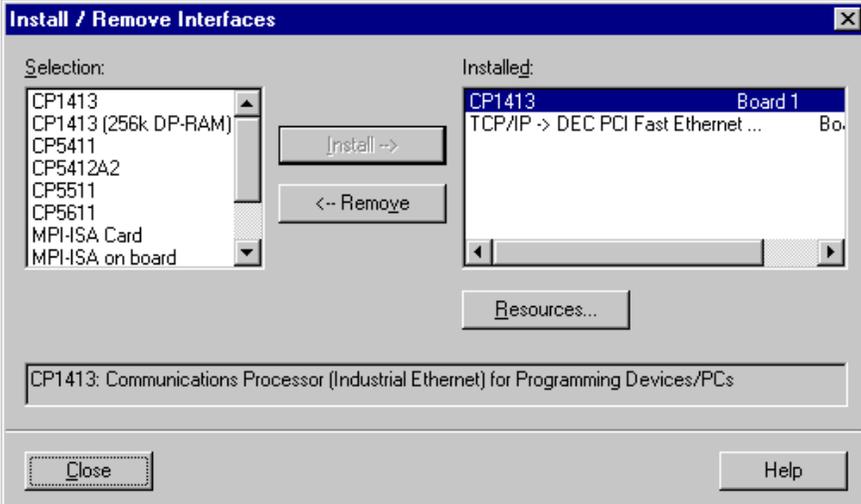
B: Installing the Communication Driver

Step	B: Installing the Communication Driver
1	<p>Installation of the communication driver <i>IE TF-1413</i> from the <i>SIMATIC NET</i> CD-ROM.</p> <p>After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="border: 1px solid gray; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">SIMATIC NET Software Installieren</p> </div> <p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>IE TF-1413</i> to be installed must be selected. Finish the installation.</p> <div style="border: 1px solid gray; padding: 5px; margin: 10px 0;">  </div>

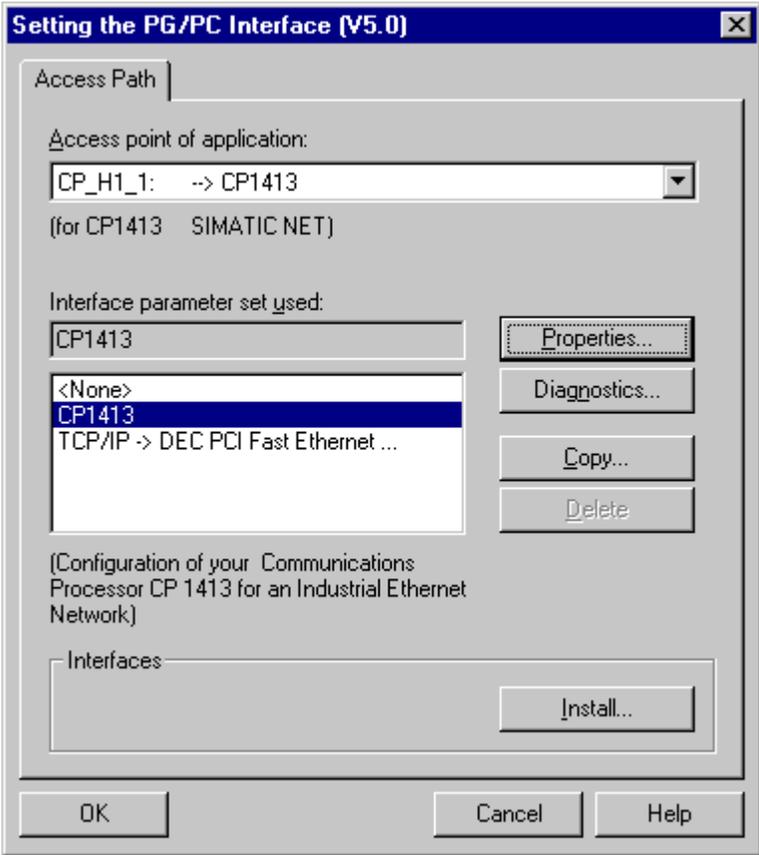
C: Installing the Communication Processor

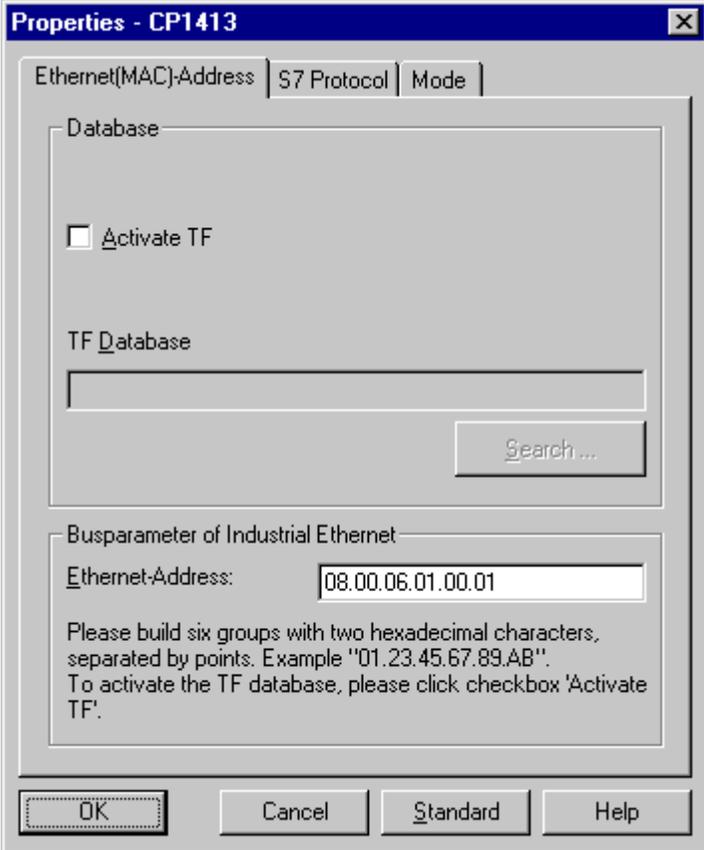
Step	C: Installing the Communication Processor
1	<p>Install the communication processor <i>CP 1413</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Setting the PG/PC Interface</p>

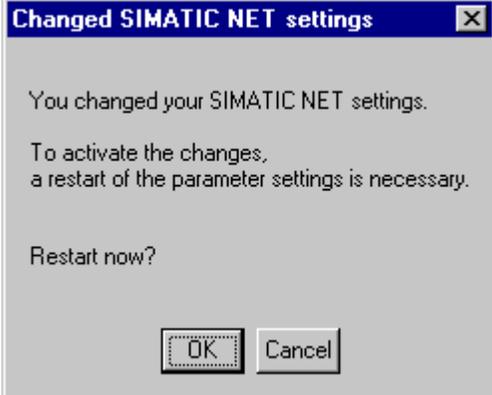
Step	C: Installing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>The dialog box for installing a new interface is opened via the <i>Install</i> button.</p> 
3	<p>The dialog box <i>Install/Remove Modules</i> will be displayed. The <i>Selection</i> field lists all interfaces that can be installed. Among them will be the entry <i>CP 1413</i>, if the communication driver has been installed previously as outlined in step B.</p> <p>From the <i>Selection</i> field, select the entry <i>CP 1413</i>. The installation of the communication processor is started by clicking on the <i>Install -></i> button.</p> 

Step	C: Installing the Communication Processor
4	<p>The dialog box <i>Resources - CP 1413</i> will be displayed.</p> <p>The settings for the <i>Memory Range</i>, <i>I/O Range</i> and <i>Interrupt</i> have to be specified.</p> <p>The <i>I/O Range</i> has already been determined via the Jumper Settings at the <i>CP 1413</i>.</p> <p>Make sure that the assigned resources have not already been taken by other modules in the computer. Information about already taken system resources can be obtained from the <i>Resources</i> tab accessed via <i>Start</i> → <i>Programs</i> → <i>Administrative Tools (Common)</i> → <i>Windows NT Diagnostics</i>.</p> <p>Close the <i>Resources</i> tab by clicking on <i>OK</i>.</p> 
5	<p>In the dialog box <i>Install/Remove Modules</i>, the <i>Installed</i> field will now contain the entry for the <i>CP 1413</i>.</p> <p>Exit the dialog box <i>Install/Remove Modules</i> via the <i>Close</i> button.</p> 

D: Assigning the Communication Processor

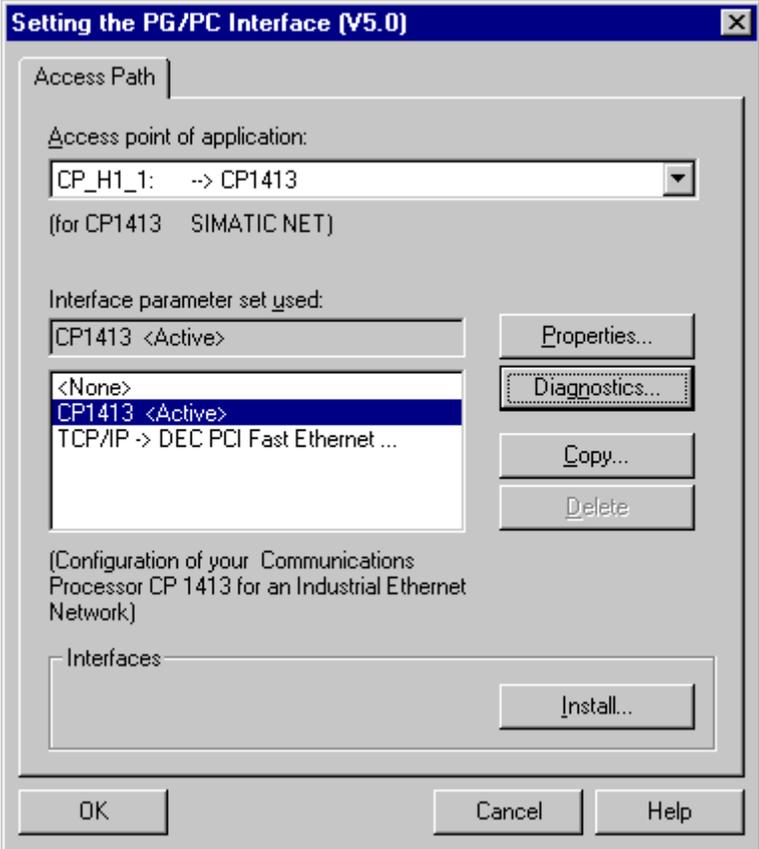
Step	D: Assigning the Communication Processor
1	<p>In the program <i>Setting the PG/PC Interface</i>, assign the access point <i>CP_H1_1</i>: to the just installed interface.</p> <p>The access point <i>CP_H1_1</i>: is the default access point used by WinCC for the communication via the <i>Industrial Ethernet</i>. It has been created automatically during the installation of the communication driver <i>IE TF-1413</i>.</p> <p>In the field <i>Access Point of the Application</i>, set the entry <i>CP_H1_1</i>:. In the field below, select the entry <i>CP1413</i>. This completes the assignment between the access point and the communication processor.</p> 
2	<p>Setting the properties of the communication processor <i>CP 1413</i>.</p> <p>The dialog box for setting the properties is opened via the <i>Properties</i> button of the <i>Setting the PG/PC Interface</i> program.</p> <p>The dialog box <i>Properties - CP 1413</i> will be displayed.</p> <p>In the <i>Ethernet (MAC) Address</i> tab, enter the <i>Ethernet Address</i> of the <i>CP 1413</i>. In this sample, the address is <i>08.00.06.01.00.01</i>, which must be specified during the configuration of the Transport Connections for the communication processor <i>CP 1430</i>.</p>

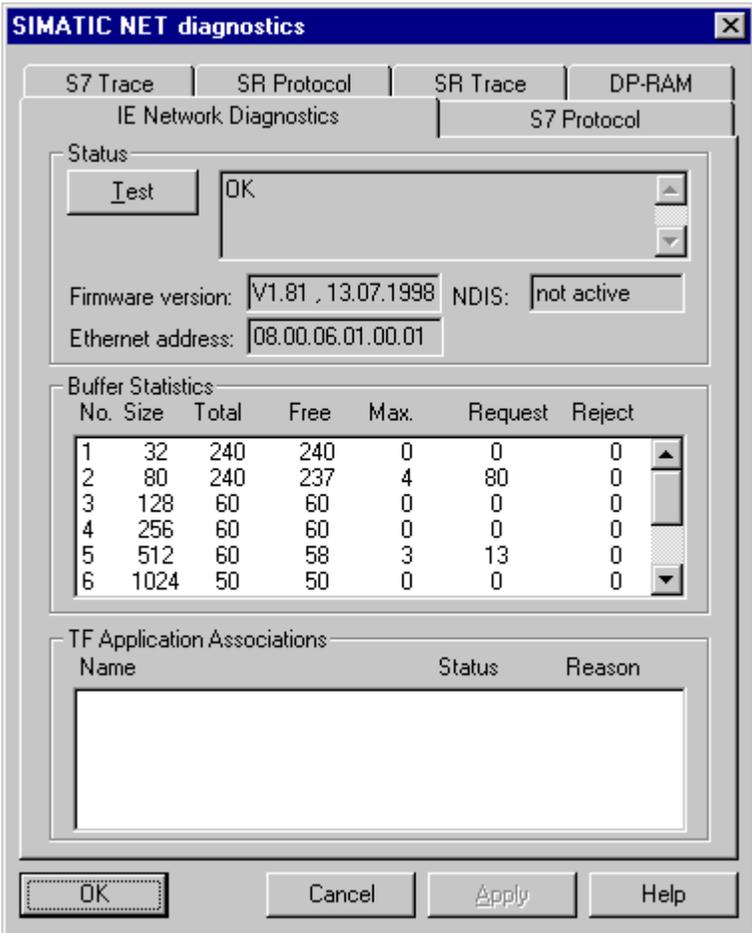
Step	D: Assigning the Communication Processor
	<p>The <i>Ethernet Address</i> is six Bytes long and structured as follows for SIEMENS devices:</p> <ul style="list-style-type: none">• <i>08.00.06</i>: The first six digits of the hexadecimal value correspond to the number for SIEMENS.• <i>01</i>: The next two digits specify the range for SIEMENS.• <i>0</i>: The next digit signifies the SIMATIC system.• <i>0.01</i>: The last three digits correspond to the significant station address of a SIEMENS device. 

Step	D: Assigning the Communication Processor
3	<p>Exit the program <i>Setting the PG/PC Interface</i> via the <i>OK</i> button.</p> <p>A dialog box will be displayed requesting the restart of the <i>CP 1413</i>. Acknowledge this dialog box by clicking on <i>OK</i>, which will result in the restart of the communication processor <i>CP 1413</i>.</p> <p>This completes the installation of the communication processor.</p> 

E: Testing the Communication Processor

Step	E: Testing the Communication Processor
1	<p>Check the proper installation of the communication processor <i>CP 1413</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>

Step	E: Testing the Communication Processor
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface to be checked. In this case, select the entry <i>CP 1413</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The check for a proper installation is activated by clicking on the <i>Diagnostics</i> button.</p> 

Step	E: Testing the Communication Processor																																																	
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>In the <i>IE Network Diagnostics</i> tab, the diagnosis is started via the <i>Test</i> button. The result of the diagnosis will be displayed immediately following.</p> <p>If the result of the diagnosis is positive (correct installation), the dialog box can be exited with <i>OK</i>. In this case, the program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>. The configuration of the communication to the S5 via the <i>Industrial Ethernet</i> is continued in the following section.</p> <p>However, if the result of the diagnosis is negative (incorrect installation), the error must be localized and corrected. Troubleshooting procedures are described in the section <i>Is the Communication Module in the Computer operational?</i>.</p>  <table border="1"> <caption>Buffer Statistics</caption> <thead> <tr> <th>No.</th> <th>Size</th> <th>Total</th> <th>Free</th> <th>Max.</th> <th>Request</th> <th>Reject</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>32</td> <td>240</td> <td>240</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>2</td> <td>80</td> <td>240</td> <td>237</td> <td>4</td> <td>80</td> <td>0</td> </tr> <tr> <td>3</td> <td>128</td> <td>60</td> <td>60</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>4</td> <td>256</td> <td>60</td> <td>60</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>5</td> <td>512</td> <td>60</td> <td>58</td> <td>3</td> <td>13</td> <td>0</td> </tr> <tr> <td>6</td> <td>1024</td> <td>50</td> <td>50</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	No.	Size	Total	Free	Max.	Request	Reject	1	32	240	240	0	0	0	2	80	240	237	4	80	0	3	128	60	60	0	0	0	4	256	60	60	0	0	0	5	512	60	58	3	13	0	6	1024	50	50	0	0	0
No.	Size	Total	Free	Max.	Request	Reject																																												
1	32	240	240	0	0	0																																												
2	80	240	237	4	80	0																																												
3	128	60	60	0	0	0																																												
4	256	60	60	0	0	0																																												
5	512	60	58	3	13	0																																												
6	1024	50	50	0	0	0																																												

7.2 Creation of the STEP5 Project S5_IEHst

The following description details the configuration steps necessary to create and start up the STEP5 project *S5_IEHst*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to create the STEP5 project *S5_IEHst*:

- A: Installing the Hardware and Software
- B: Creating the STEP5 Program
- C: Configuring the Communication Processor
- D: Starting up the PLC

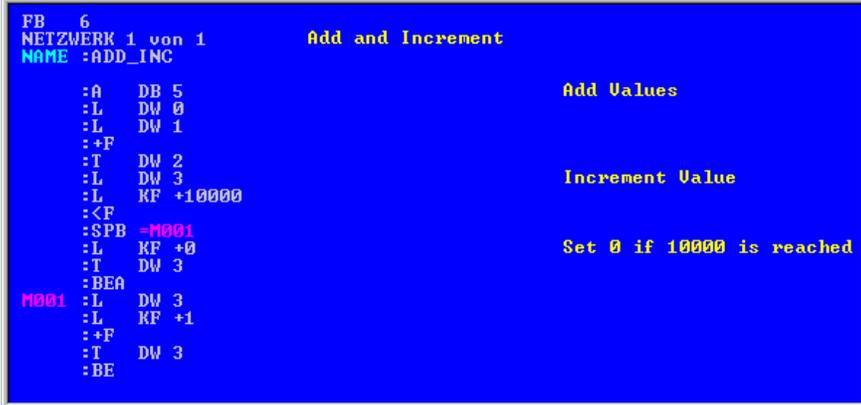
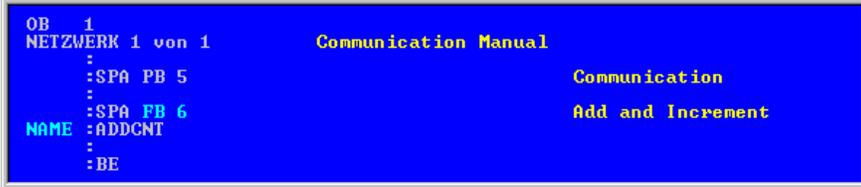
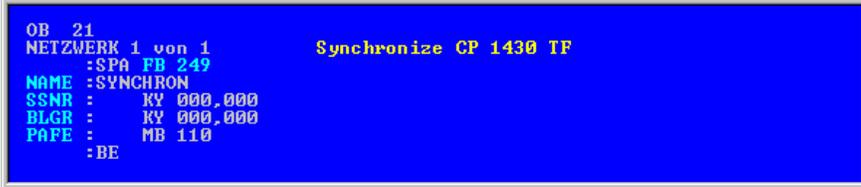
A: Installing the Hardware and Software

Step	A: Installing the Hardware and Software
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 951</i>, the CPU module <i>CPU 944</i> and the communication processor <i>CP 1430</i>.</p> <p>Establishing the connection from the programming device to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 1413</i> in the computer to the communication processor <i>CP 1430</i> in the PLC.</p>
2	<p>Installing the communication package SINEC NCM for COMs from the corresponding installation disk. This communication package is required for the configuration of the communication processor <i>CP 1430</i>.</p> <p>The installation disk contains the program file <i>install.exe</i>. Start this program. Follow the instructions of the installation program and complete the installation.</p> <div style="text-align: center;">  <p>Install.exe</p> </div>

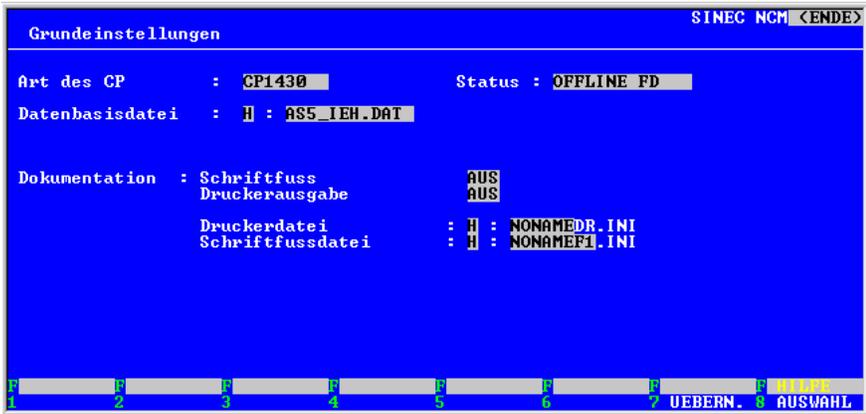
B: Creating the STEP5 Program

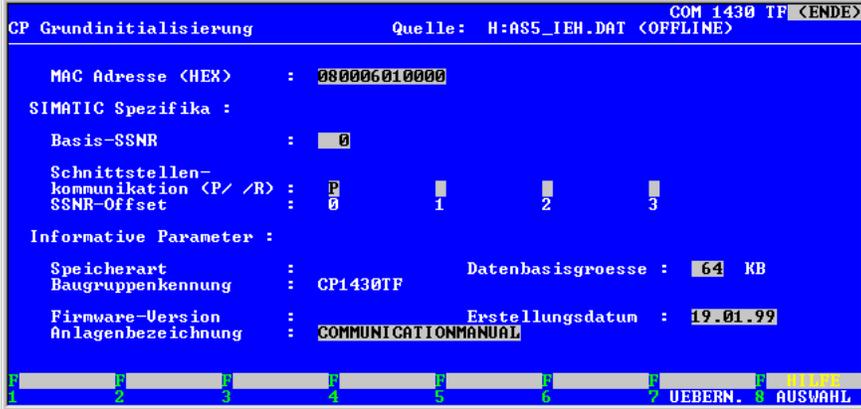
Step	B: Creating the STEP5 Program
1	<p>Creation of a new project with the STEP5 software.</p> <p>Start the STEP5 software. From the <i>Object</i> → <i>Project</i> → <i>Settings</i> → <i>Page1</i> and <i>Page2</i> menus, define the settings for the new project. In the <i>Program File</i> field, specify the name of the new program file to be created. In this sample, the name <i>S5_IEHST.S5D</i> is used. Only the first six characters of the file name can be changed by the user.</p>
2	<p>Creation of a data block.</p> <p>In STEP5, this is accomplished via the <i>Editor</i> → <i>Data Block</i> → <i>menus of the program file</i>.</p> <p>As the name of the data block, this sample uses <i>DB5</i>.</p>

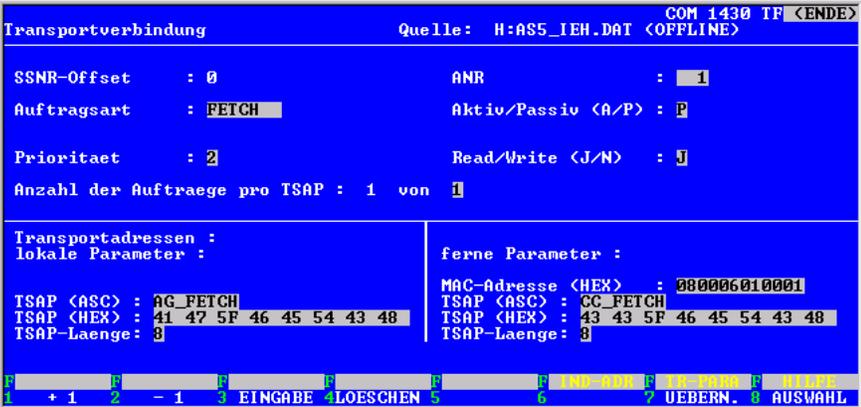
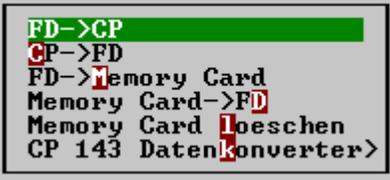
Step	B: Creating the STEP5 Program
	<p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits. One additional tag with a length of 16 Bits is created, whose value is cyclically incremented in <i>OBI</i>.</p> <p>The tags created in the data block <i>DB5</i> are visualized in the WinCC project. To do so, WinCC tags with corresponding addresses are created there.</p> <p>The following graphic displays the programmed data block <i>DB5</i>.</p> <div style="border: 1px solid black; background-color: #0000FF; color: #00FF00; padding: 5px;"> <pre> DB 5 0:KH = 0000 1:KH = 0000 2:KH = 0000 3:KH = 0000 4:KH = 0000 5:KH = 0000 6:KH = 0000 7:KH = 0000 8:KH = 0000 value 1 value 2 sum inc </pre> </div>
3	<p>Creation of a program block for the communication.</p> <p>The communication to WinCC via the communication processor CP 1430 is carried out by calling the data handling blocks SEND and RECEIVE. For the SIMATIC S5 115U PLC used in this sample, these are the blocks FB244 and FB245. These blocks must be called once every program cycle. As the request number A-NR, 0 is assigned to these blocks to allow execution of the Send All and Receive All functions.</p> <p>In this sample, the data handling block calls are carried out in a program block, which is called in the <i>OBI</i>.</p> <p>In STEP5, the creation of a new program block is carried out via the <i>Editor</i> → <i>STEP5 Block</i> → <i>menus of the program file</i>. As the name of the program block, this sample uses <i>PB5</i>.</p> <div style="border: 1px solid black; background-color: #0000FF; color: #00FF00; padding: 5px;"> <pre> PB 5 NETZWERK 1 von 1 :SPA FB 244 NAME :SEND SSNR : KY 000.000 A-NR : KY 000.000 ANZW : MW 100 QTYP : KC NN DBNR : KY 000.000 QBMF : KF +0 QLAE : KF +0 PAFE : MB 104 :SPA FB 245 NAME :RECEIVE SSNR : KY 000.000 A-NR : KY 000.000 ANZW : MW 105 ZTYP : KC NN DBNR : KY 000.000 ZBMF : KF +0 ZLAE : KF +0 PAFE : MB 109 :BE CP1430 Communication SEND ALL RECEIVE ALL </pre> </div>

Step	B: Creating the STEP5 Program
4	<p>Creation of a function block, which makes available the functionality of the sample program.</p> <p>Two values stored in the <i>DB5</i> are added and the sum again stored in the <i>DB5</i>. Additionally, a value stored in the <i>DB5</i> is incremented every program cycle. If this value reaches 10000, it is reset back to 0.</p> <p>In STEP5, the creation of a new function block is carried out via the <i>Editor</i> → <i>STEP5 Block</i> → <i>menus of the program file</i>. As the name of the program block, this sample uses <i>FB6</i>.</p>  <pre> FB 6 NETZWERK 1 von 1 NAME :ADD_INC : :A DB 5 :L DW 0 :L DW 1 :+F :T DW 2 :L DW 3 :L KF +10000 :<F :SPB -M001 :L KF +0 :T DW 3 :BE M001 :L DW 3 :L KF +1 :+F :T DW 3 :BE </pre>
5	<p>Creation of the <i>OBI</i>.</p> <p>In the <i>OBI</i>, the previously created blocks <i>PB5</i> and <i>FB6</i> are called.</p>  <pre> OB 1 NETZWERK 1 von 1 :SPA PB 5 :SPA FB 6 NAME :ADDCNT :BE </pre>
6	<p>Creation of the startup blocks.</p> <p>During the startup of the PLC, the communication processor <i>CP 1430</i> must be synchronized. This is done by the data handling block <i>SYNCHRON</i>. For the <i>SIMATIC S5 115U</i> PLC used in this sample, this is the block <i>FB249</i>.</p>  <pre> OB 21 NETZWERK 1 von 1 :SPA FB 249 NAME :SYNCHRON SSNR : KY 000,000 BLGR : KY 000,000 PAFE : MB 110 :BE </pre>
7	<p>Loading the STEP5 program into the PLC.</p> <p>In STEP5, this is done via the <i>Object</i> → <i>Blocks</i> → <i>Transfer</i> → <i>PLC File</i> menus. In the Selection field, the option <i>All Blocks</i> must be selected to load all previously created blocks to the PLC.</p>

C: Configuring the Communication Processor

Step	C: Configuring the Communication Processor
1	<p>Start the communication package <i>SINEC NCM for COMs</i> to configure the communication processor <i>CP 1430</i>.</p> <p>From STEP5, start the communication package via the <i>Change</i> → <i>Additional</i> → <i>SINEC NCM for COMs</i> menus.</p>
2	<p>This will open the communication package <i>SINEC NCM for COMs</i>.</p> <p>If no database file is set, the <i>Basic Settings</i> entry mask will initially be displayed. This entry mask can also be opened via the <i>File</i> → <i>Select</i> (or <i>Init.</i> → <i>Edit</i>) menus.</p> <p>In the <i>CP Type</i> field, indicate the type of communication processor used. Via the F8 function key, one of the available communication processors can be set. Select the <i>CP 1430</i>. Set the <i>Status</i> field to <i>OFFLINE FD</i> via the F8 function key. This stores the configuration made in the program to a database file. In the <i>Database File</i> field, specify the name of this database file. This name has to start with the letter <i>A</i>. For this sample, the name <i>AS5_I EH.DAT</i> is used for the database file.</p> <p>The settings made in the <i>Basic Settings</i> entry mask are applied via the F7 function key.</p> 

Step	C: Configuring the Communication Processor
3	<p>The settings for the basic initialization of the communication processor must be made.</p> <p>They are entered in the <i>Basic Initialization</i> entry mask. This entry mask is opened via the <i>Edit</i> → <i>CP Init.</i> menus.</p> <p>In the <i>MAC Address (HEX)</i> field, the <i>Ethernet address</i> of the communication processor <i>CP 1430</i> is specified. In this sample, the address <i>080006010000</i> has been entered. This address is one of the parameters that have to be set during the creation of the connection in WinCC.</p> <p>The remaining settings can be seen in the following graphic. The settings made in the <i>Basic Initialization</i> entry mask are applied via the F7 function key.</p> 
4	<p>Creation of the transport connections.</p> <p>This is done in the <i>Transport Connection</i> entry mask. This entry mask is opened via the <i>Edit</i> → <i>Connections</i> → <i>Transport Connections</i> menus.</p> <p>Two connections are needed: One processes the write requests of WinCC, the other one the read requests of WinCC. The PLC is set to passive for both connections by entering <i>P</i> in the <i>Active/Passive</i> field.</p> <p>For the connection used to process the read requests from WinCC, this sample keeps <i>1</i> as the value of the request number <i>ANR</i>. In the <i>Request Type</i> field, <i>FETCH</i> is specified. In the <i>Transport Addresses</i> area, <i>TSAP</i> with <i>PLC_FETCH</i> is set for the <i>Local Parameter</i> in ASCII-Code, and <i>TSAP</i> with <i>CC_FETCH</i> for the <i>Remote Parameter</i>. The remote parameter also requires the specification of the Ethernet address in the <i>MAC Address</i> field that has been entered for the communication processor <i>CP 1413</i> in the computer. In this sample, the address <i>080006010001</i> has been set during the installation of the communication processor <i>CP 1413</i>.</p> <p>By hitting the F3 function key, the parameters for the next transport connection can be entered. This transport connection will process the write requests of WinCC. In this sample, the value <i>2</i> for the request number <i>ANR</i> is kept. In the <i>Request Type</i> field, <i>RECEIVE</i> is specified. In the <i>Transport Addresses</i> area, <i>TSAP</i> with <i>PLC_RECVE</i> is set for the <i>Local Parameter</i> in ASCII-Code, and <i>TSAP</i> with <i>CC_RECVE</i> for the <i>Remote Parameter</i>. For the remote parameter, also enter the Ethernet address of the communication processor <i>CP 1413</i> from the computer.</p>

Step	C: Configuring the Communication Processor
	<p>The connection parameters just defined must also be set during the creation of the connection in the WinCC project. For the TSAP values set, note that there is a difference between an entered blank space and no entered character. Always check the hexadecimal code.</p> <p>The settings made in the <i>Transport Connection</i> entry mask are applied via the F7 function key.</p> 
5	<p>Loading the configuration data of the database file to the communication processor <i>CP 1430</i>.</p> <p>This is done via the <i>Transfer</i> → <i>FD->CP</i> menus. The configuration data can only be uploaded while the communication processor is in the <i>STOP</i> operating mode.</p> <p>Transfer</p> 

D: Starting up the PLC

Step	D: Starting up the PLC
1	<p>Starting the individual modules of the PLC.</p> <p>Previously, the STEP5 program and the database file of the communication processor <i>CP 1430</i> must have been loaded to the PLC.</p> <p>First, the operating mode switch of the communication processor <i>CP 1430</i> is set to the <i>RUN</i> position. The status LEDs <i>RUN</i> and <i>STOP</i> will light up at the communication processor, indicating that the module has not be synchronized.</p> <p>Next, the operating mode switch of the CPU module is set to the <i>RN</i> position. During the startup of the CPU module, the communication processor is synchronized by the startup block. The communication processor's status LED <i>STOP</i> go out. At the CPU module, only the status LED <i>RN</i> will be illuminated.</p>

7.3 Creation of the WinCC Project WinCC_S5_IEH

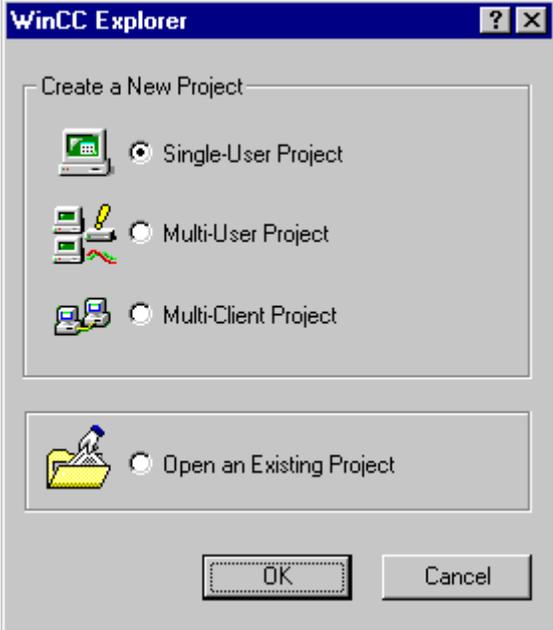
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S5_IEH*.

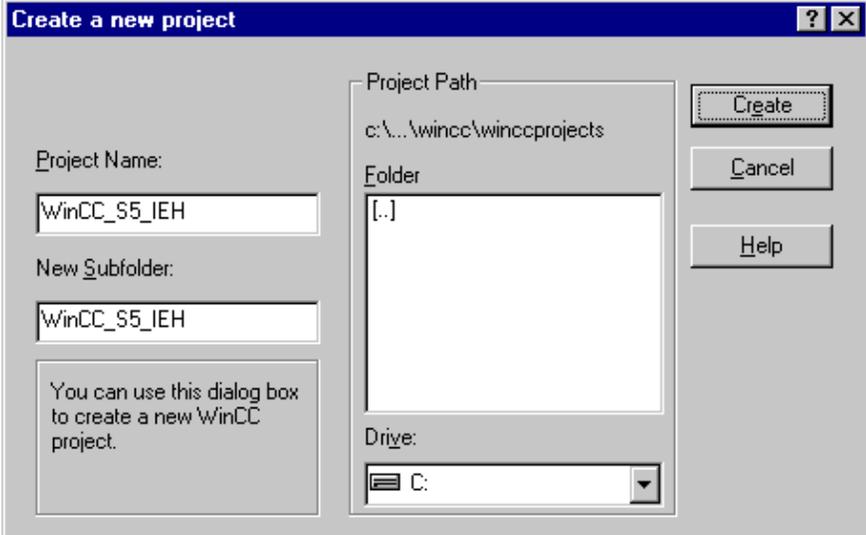
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_S5_IEH*:

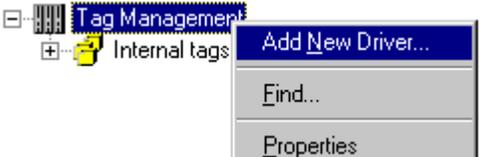
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Tags
- D: Creating the WinCC Screen

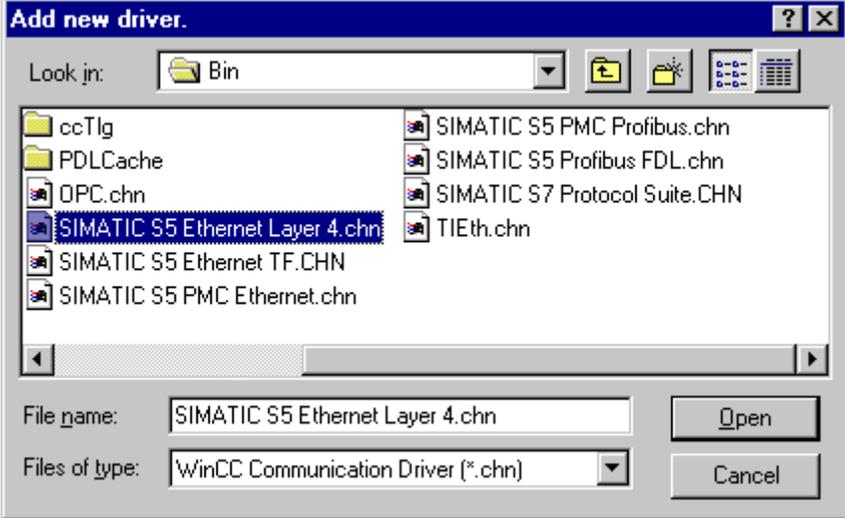
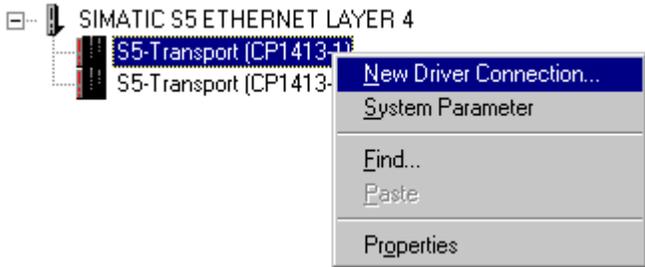
A: Creating the WinCC Project

Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>This will display the <i>WinCC Explorer</i>.</p> <p>Via the menu <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

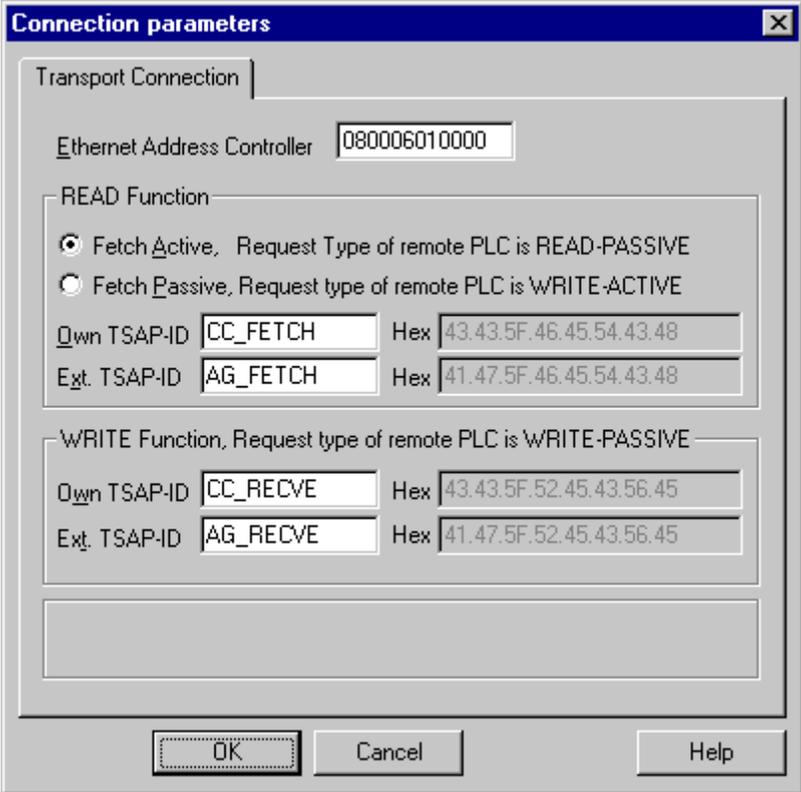
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S5_IEH</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

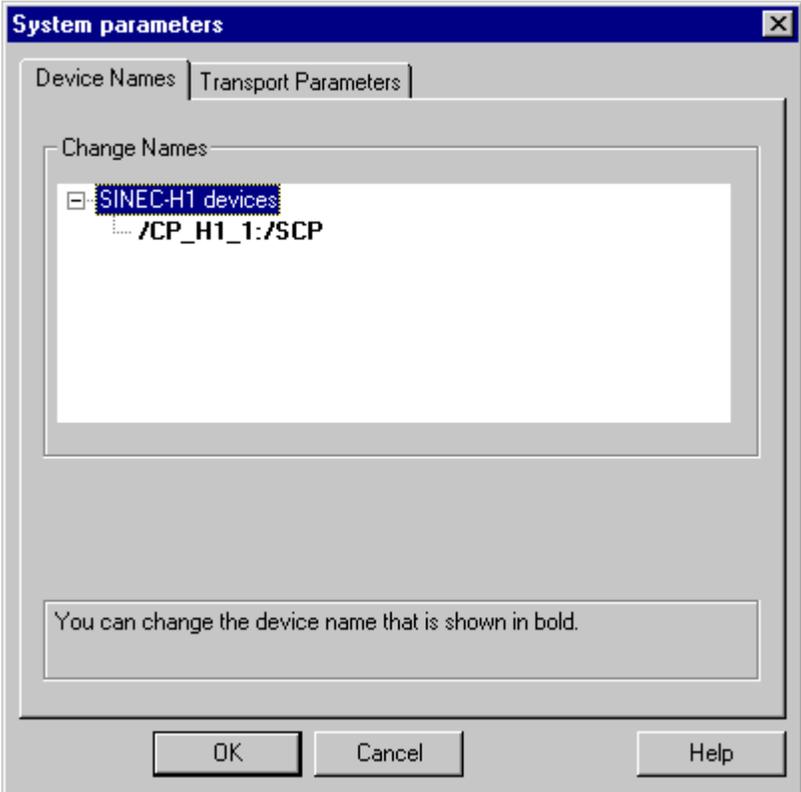
B: Creating the Connection

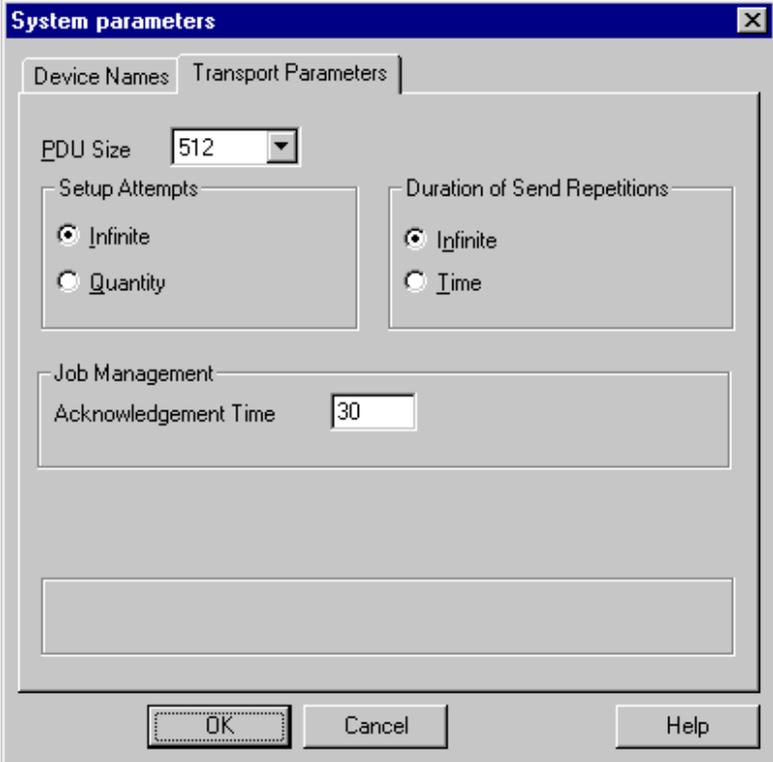
Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. For the communication to the <i>SIMATIC S5 via Industrial Ethernet</i>, the driver <i>SIMATIC S5 Ethernet Layer 4</i> is required. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added driver <i>SIMATIC S5 Ethernet Layer 4</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The driver contains two channel units. The second channel unit is needed if two <i>CP 1413</i> communication processors are operated in the computer.</p> <p>A new connection for the <i>S5-Transport (CP1413-1)</i> channel unit is created by clicking on <i>S5-Transport (CP1413-1)</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> 

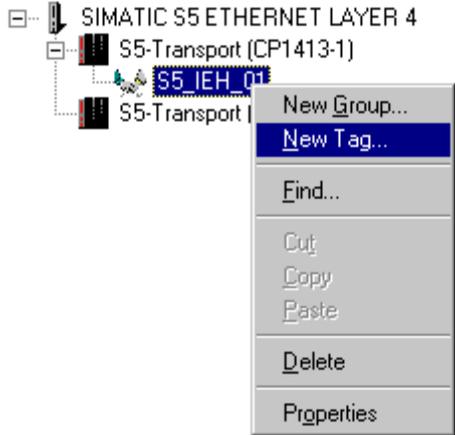
Step	B: Creating the Connection
4	<p>The properties dialog box of the connection will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered. In this sample, this is <i>S5_I EH_01</i>.</p> <p>Click on the <i>Properties</i> button to define the connection properties.</p> 

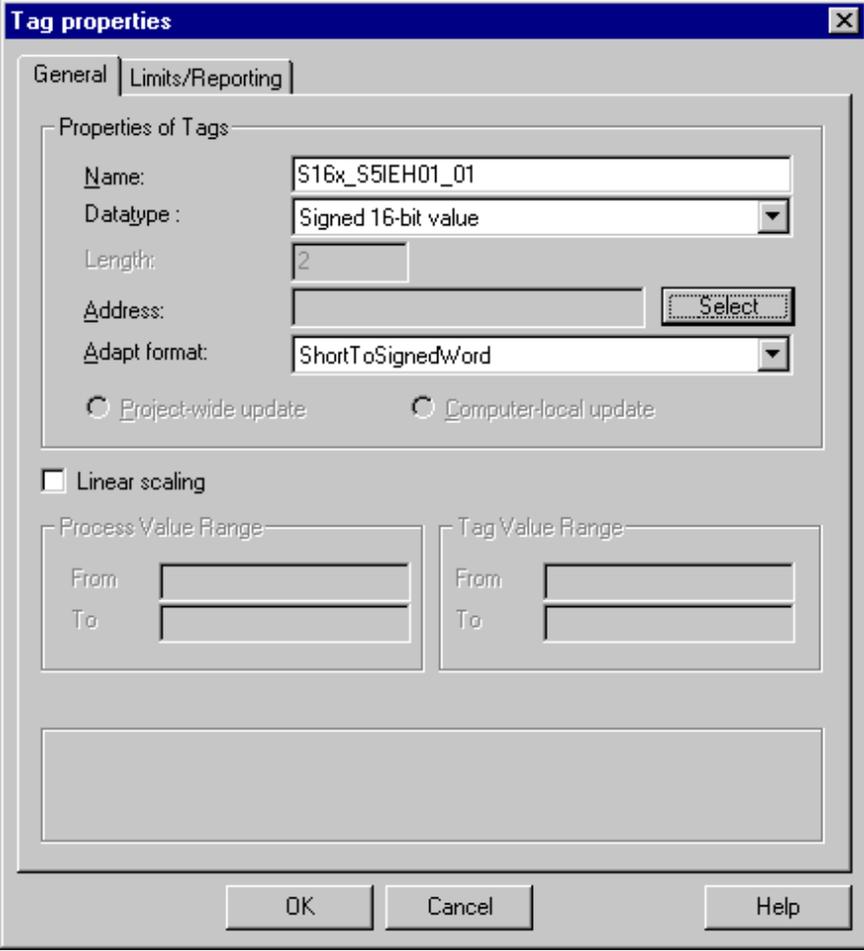
Step	B: Creating the Connection
5	<p>The dialog box <i>Connection Properties</i> will be displayed.</p> <p>In the <i>Transport Connection</i> tab, the parameters of the desired communication connection are defined.</p> <p>In the <i>PLC Ethernet Address</i> field, the Ethernet address specified for the PLC is entered. In this sample, the address <i>080006010000</i> has been defined during the configuration of the communication processor <i>CP 1430</i>.</p> <p>In the <i>READ Function</i> area, the connection settings for reading data from the PLC are made. In order for WinCC to request the data actively, the radio-button <i>Fetch Actively, Request Type of the Partner is READ-PASSIVE</i> must be selected. For the local and remote TSAPs, the values defined during the creation of the transport connections for the communication processor <i>CP 1430</i> are entered. In this sample, the value <i>CC_FETCH</i> is entered in the <i>Local TSAP</i> field and the value <i>PLC_FETCH</i> in the <i>Remote TSAP</i> field.</p> <p>In the <i>WRITE Function</i> area, the connection settings for writing data to the PLC are made. In this sample, the value <i>CC_RECVE</i> is entered in the <i>Local TSAP</i> field and the value <i>PLC_RECVE</i> in the <i>Remote TSAP</i> field.</p> <p>The parameters that have just been set were defined during the configuration of the transport connections for the communication processor <i>CP 1430</i>.</p> <p>Close the dialog box by clicking on <i>OK</i>. Also close the <i>Connection Properties</i> dialog box by clicking on <i>OK</i>.</p> 

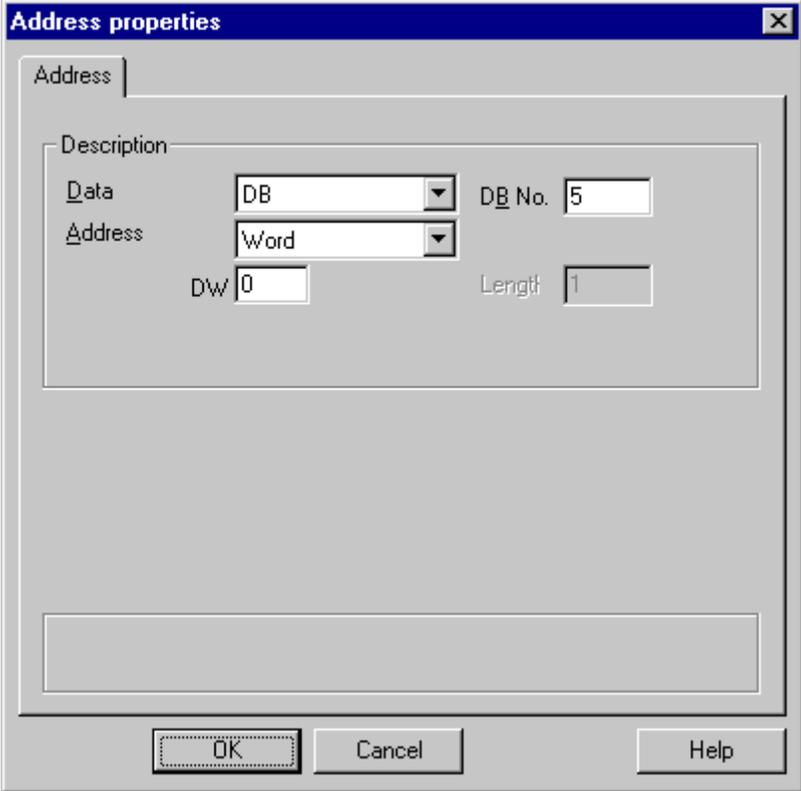
Step	B: Creating the Connection
6	<p>Setting the system parameters of the channel unit.</p> <p>These settings are made in the System Parameters dialog box, which is accessed via a  on the <i>S5-Transport (CP1413-1)</i> entry and then selecting <i>System Parameters</i> from the pop-up menu.</p> <p>In the displayed dialog box, the name of the access point, which is used by WinCC to access the PLC, can be changed. By default, the access point <i>CP_H1_1:</i> is set. Previously, during the installation of the communication processor in the computer, the <i>CP 1413</i> has been assigned to the access point <i>CP_H1_1:</i>.</p> 

Step	B: Creating the Connection
7	<p>In the <i>Transport Parameters</i> tab, various settings affecting the communication can be edited. In this sample, all existing settings are kept.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

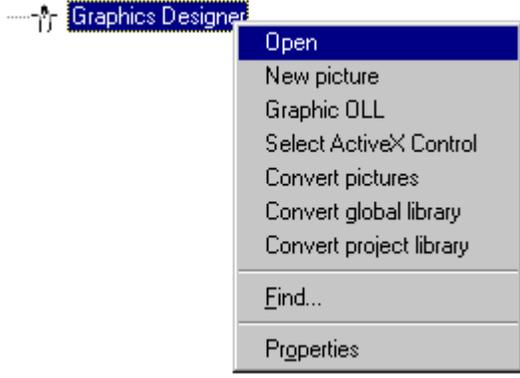
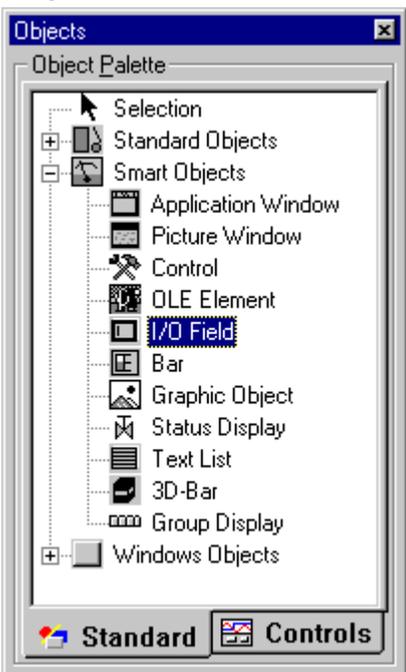
C: Creating the WinCC Tags

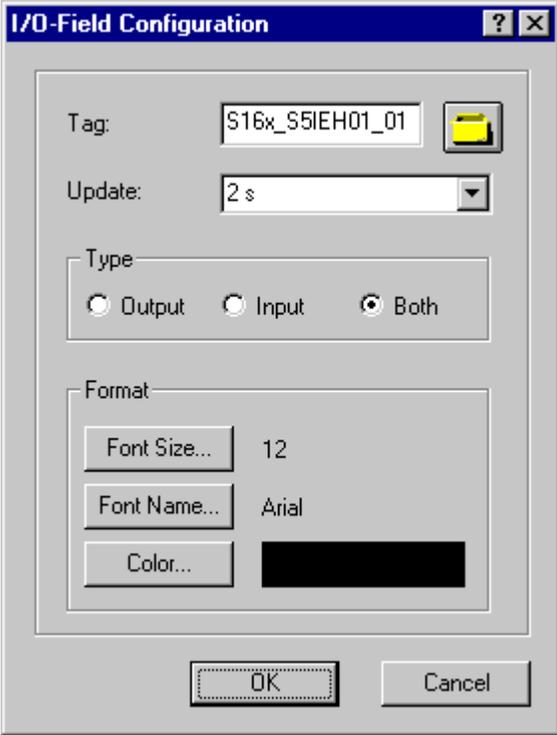
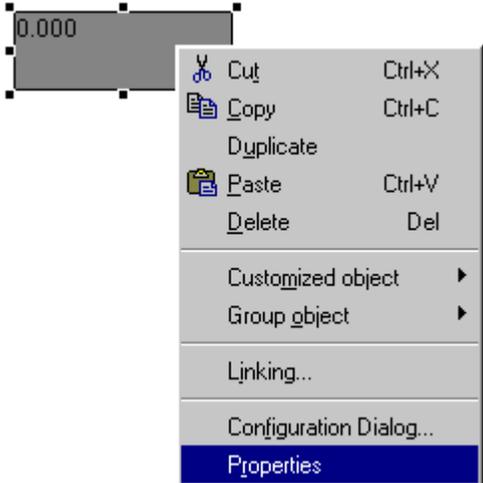
Step	C: Creating the WinCC Tags
1	<p>Creation of the WinCC tags required for the sample.</p> <p>This is done via a  on the newly created connection <i>S5_IEH_01</i> and then selecting <i>New Tag</i> from the pop-up menu.</p> 

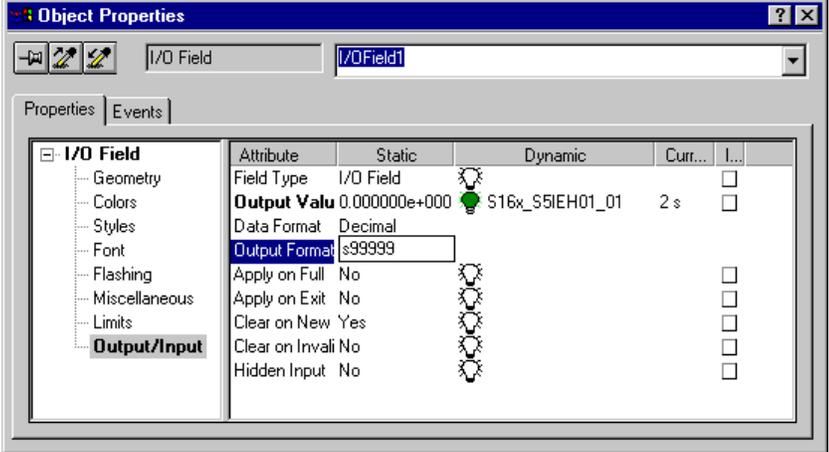
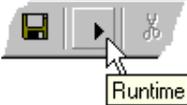
Step	C: Creating the WinCC Tags
2	<p>The properties dialog box of the tag will be displayed.</p> <p>In the sample, the <i>Name</i> of the first tag is <i>S16x_S5IEH01_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type. Click on the <i>Select</i> button to set the <i>Address</i> of the new tag.</p> 

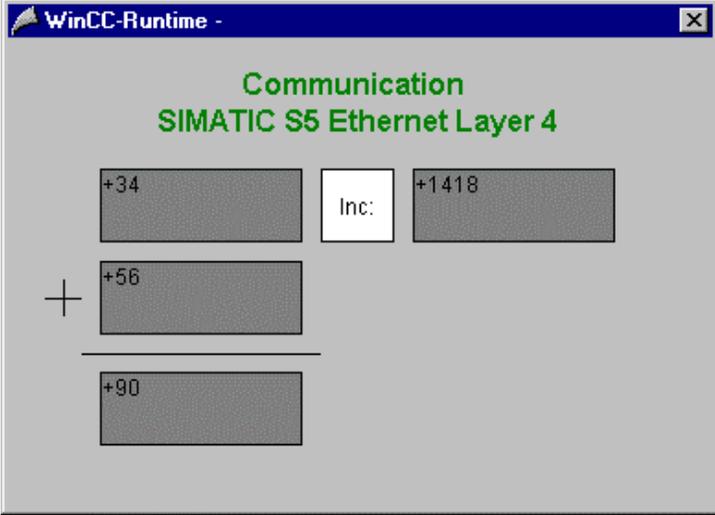
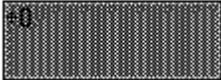
Step	C: Creating the WinCC Tags															
3	<p>The dialog box <i>Address Properties</i> will be displayed.</p> <p>Set <i>DB</i> as the <i>Data Range</i> and the value <i>5</i> as the <i>DB No.</i>. Set <i>Word</i> in the <i>Address</i> field and the value <i>0</i> in the <i>DW</i> field. Close the dialog box by clicking on <i>OK</i>. The properties dialog box of the tag is also closed by clicking on <i>OK</i>.</p> <p>The just created WinCC tag is addressed in the range of the <i>DB5</i>, where the first of the two values to be added is located.</p> <p>The <i>Address Properties</i> and <i>Tag Properties</i> dialog boxes can be closed by clicking on the <i>OK</i> button.</p> 															
4	<p>Creation of the remaining WinCC tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td>S16x_S5IEH01_01</td> <td>Signed 16-bit value</td> <td>DB5,DW0</td> </tr> <tr> <td>S16x_S5IEH01_02</td> <td>Signed 16-bit value</td> <td>DB5,DW1</td> </tr> <tr> <td>S16x_S5IEH01_03</td> <td>Signed 16-bit value</td> <td>DB5,DW2</td> </tr> <tr> <td>S16x_S5IEH01_04</td> <td>Signed 16-bit value</td> <td>DB5,DW3</td> </tr> </tbody> </table>	Name	Type	Parameters	S16x_S5IEH01_01	Signed 16-bit value	DB5,DW0	S16x_S5IEH01_02	Signed 16-bit value	DB5,DW1	S16x_S5IEH01_03	Signed 16-bit value	DB5,DW2	S16x_S5IEH01_04	Signed 16-bit value	DB5,DW3
Name	Type	Parameters														
S16x_S5IEH01_01	Signed 16-bit value	DB5,DW0														
S16x_S5IEH01_02	Signed 16-bit value	DB5,DW1														
S16x_S5IEH01_03	Signed 16-bit value	DB5,DW2														
S16x_S5IEH01_04	Signed 16-bit value	DB5,DW3														

D: Creating the WinCC Screen

Step	D: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	D: Creating the WinCC Screen
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S7IEH01_01</i> via the button displayed below.</p>  <p>Leave the <i>Update</i> of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p> 

Step	D: Creating the WinCC Screen																																																												
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p>  <table border="1"> <thead> <tr> <th>I/O Field</th> <th>Attribute</th> <th>Static</th> <th>Dynamic</th> <th>Curr...</th> <th>L...</th> </tr> </thead> <tbody> <tr> <td>Geometry</td> <td>Field Type</td> <td>I/O Field</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Colors</td> <td>Output Value</td> <td>0.000000e+000</td> <td></td> <td>S16x_S5IEH01_01</td> <td>2 s <input type="checkbox"/></td> </tr> <tr> <td>Styles</td> <td>Data Format</td> <td>Decimal</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Font</td> <td>Output Format</td> <td>s99999</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Flashing</td> <td>Apply on Full</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Miscellaneous</td> <td>Apply on Exit</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Limits</td> <td>Clear on New</td> <td>Yes</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Output/Input</td> <td>Clear on Invalid</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td></td> <td>Hidden Input</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>	I/O Field	Attribute	Static	Dynamic	Curr...	L...	Geometry	Field Type	I/O Field			<input type="checkbox"/>	Colors	Output Value	0.000000e+000		S16x_S5IEH01_01	2 s <input type="checkbox"/>	Styles	Data Format	Decimal				Font	Output Format	s99999				Flashing	Apply on Full	No			<input type="checkbox"/>	Miscellaneous	Apply on Exit	No			<input type="checkbox"/>	Limits	Clear on New	Yes			<input type="checkbox"/>	Output/Input	Clear on Invalid	No			<input type="checkbox"/>		Hidden Input	No			<input type="checkbox"/>
I/O Field	Attribute	Static	Dynamic	Curr...	L...																																																								
Geometry	Field Type	I/O Field			<input type="checkbox"/>																																																								
Colors	Output Value	0.000000e+000		S16x_S5IEH01_01	2 s <input type="checkbox"/>																																																								
Styles	Data Format	Decimal																																																											
Font	Output Format	s99999																																																											
Flashing	Apply on Full	No			<input type="checkbox"/>																																																								
Miscellaneous	Apply on Exit	No			<input type="checkbox"/>																																																								
Limits	Clear on New	Yes			<input type="checkbox"/>																																																								
Output/Input	Clear on Invalid	No			<input type="checkbox"/>																																																								
	Hidden Input	No			<input type="checkbox"/>																																																								
6	<p>Creation of three additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>																																																												
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_3_S5IEH_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p> 																																																												

Step	D: Creating the WinCC Screen
	<p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the I/O fields. They can be changed by entering values in the individual <i>I/O Fields</i>.</p>  <p>The screenshot shows a window titled 'WinCC-Runtime -' with a blue title bar. The main content area has a grey background and is titled 'Communication SIMATIC S5 Ethernet Layer 4' in green text. Below the title, there are several numerical fields and a button. On the left, there is a vertical stack of three fields: the top one contains '+34', the middle one contains '+56' with a '+' sign to its left, and the bottom one contains '+90'. A horizontal line is drawn below the '+56' field. To the right of this stack is a white button labeled 'Inc:'. To the right of the 'Inc:' button is another field containing '+1418'.</p> <p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p>  <p>The second screenshot shows a single numerical field containing '+0'. The field has a gray, textured background, indicating it is disabled or grayed out.</p>

7.4 Diagnosis of the Communication Connection

The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S5_IEH* and the SIMATIC S5 station.

A diagnosis of the sample according to this description makes only sense, if the checks listed below have been completed successfully.

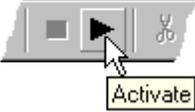
Startup of the Communication Processor CP 1413

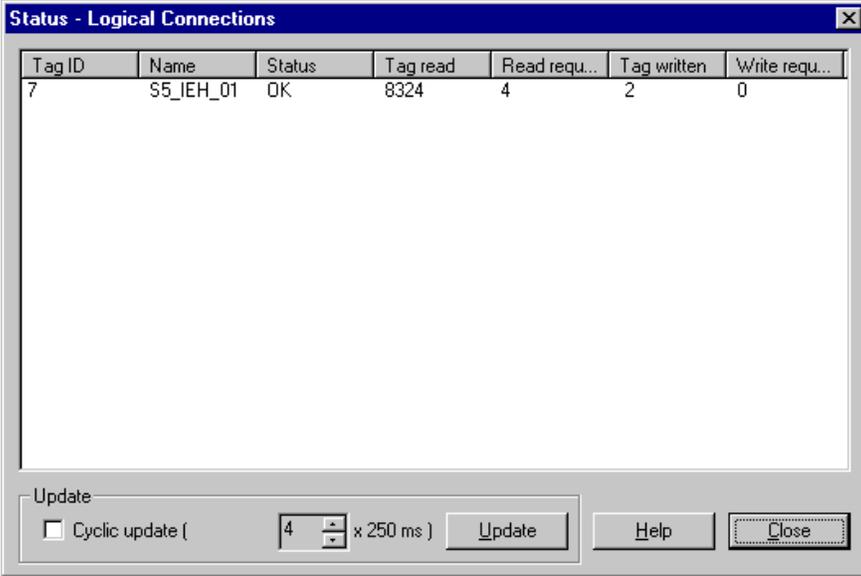
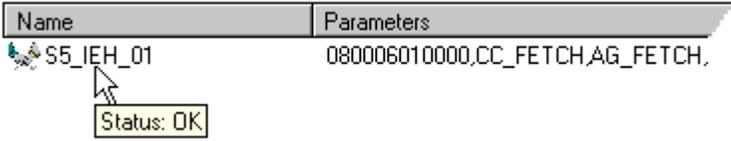
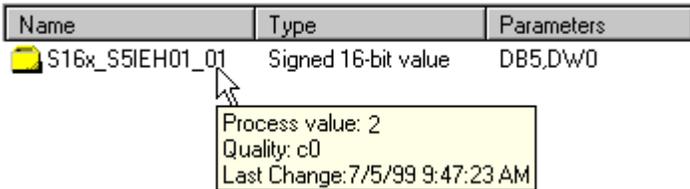
- E: Testing the Communication Processor

Creation of the STEP5 Project *S5_IEHst*

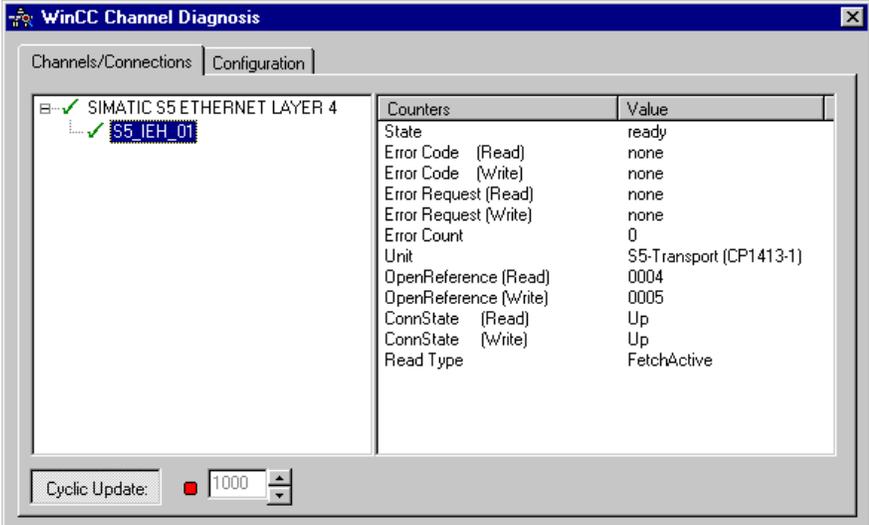
- D: Starting up the PLC

WinCC Explorer

Step	WinCC Explorer
1	<p>Diagnosis of the communication connection from the <i>WinCC Explorer</i>. Switch the project <i>WinCC_S5_IEH</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below.</p>  <p>The created WinCC screen <i>com_3_S5IEH_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 

Step	WinCC Explorer
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>S5_IEH_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p> 
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>.</p> <p>The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p>  <p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> 

Channel Diagnosis

Step	Channel Diagnosis																										
1	<p>Diagnosis of the communication connection via the program <i>WinCC Channel Diagnosis</i>.</p> <p>Start this program via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Channel Diagnosis</i>.</p> <div style="text-align: center;">  <p>Channel Diagnosis</p> </div>																										
2	<p>The program <i>WinCC Channel Diagnosis</i> will be displayed.</p> <p>The <i>Channels/Connections</i> tab displays detailed information about the status of each configured connection. By default, the display is updated every second. The update cycle can be changed in the input field located at the bottom.</p> <div style="border: 1px solid gray; padding: 5px;">  <p>The screenshot shows the 'WinCC Channel Diagnosis' window with the 'Channels/Connections' tab selected. It displays a tree view on the left with 'SIMATIC S5 ETHERNET LAYER 4' and 'S5 IEH_01' expanded. A table on the right shows the status of various counters. At the bottom, there is a 'Cyclic Update' section with a red status indicator and a numeric input field set to '1000'.</p> <table border="1"> <thead> <tr> <th>Counters</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>State</td><td>ready</td></tr> <tr><td>Error Code (Read)</td><td>none</td></tr> <tr><td>Error Code (Write)</td><td>none</td></tr> <tr><td>Error Request (Read)</td><td>none</td></tr> <tr><td>Error Request (Write)</td><td>none</td></tr> <tr><td>Error Count</td><td>0</td></tr> <tr><td>Unit</td><td>S5-Transport (CP1413-1)</td></tr> <tr><td>OpenReference (Read)</td><td>0004</td></tr> <tr><td>OpenReference (Write)</td><td>0005</td></tr> <tr><td>ConnState (Read)</td><td>Up</td></tr> <tr><td>ConnState (Write)</td><td>Up</td></tr> <tr><td>Read Type</td><td>FetchActive</td></tr> </tbody> </table> </div>	Counters	Value	State	ready	Error Code (Read)	none	Error Code (Write)	none	Error Request (Read)	none	Error Request (Write)	none	Error Count	0	Unit	S5-Transport (CP1413-1)	OpenReference (Read)	0004	OpenReference (Write)	0005	ConnState (Read)	Up	ConnState (Write)	Up	Read Type	FetchActive
Counters	Value																										
State	ready																										
Error Code (Read)	none																										
Error Code (Write)	none																										
Error Request (Read)	none																										
Error Request (Write)	none																										
Error Count	0																										
Unit	S5-Transport (CP1413-1)																										
OpenReference (Read)	0004																										
OpenReference (Write)	0005																										
ConnState (Read)	Up																										
ConnState (Write)	Up																										
Read Type	FetchActive																										

8 Communication to the SIMATIC S5 via PROFIBUS FMS

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder C:\Communication_Manual. You have the option to copy the following components to the hard drive:



The database file of the communication processor CP 5412 A2 and the files generated during its creation.



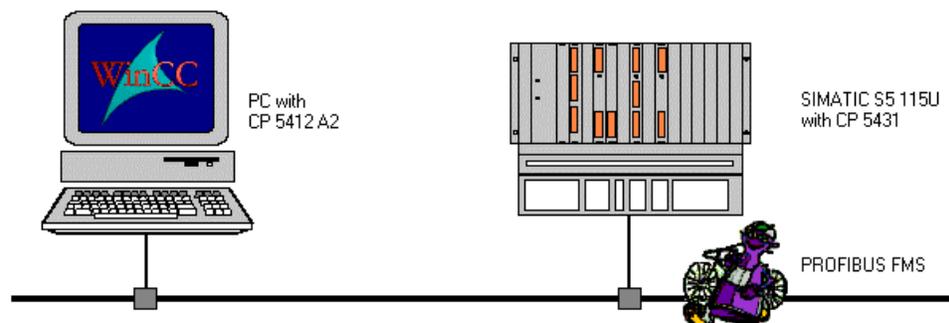
The STEP5 project we will create including the database file of the communication processor CP 5431 FMS/DP.



The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a SIMATIC S5 station and a WinCC station. The communication connection is implemented via the PROFIBUS, on which the FMS Protocol (Fieldbus Message Specification) is running.

Overview of the Structure of the Sample



On the computer side, the connection to the *PROFIBUS* network is established via the communication processor *CP 5412 A2*. To install this communication processor in the computer, the driver *PB FMS-5412*, located on the *SIMATIC NET* CD-ROM, is needed. In the WinCC project, the communication driver *PROFIBUS FMS* must be installed. This communication driver is used to configure the connection to the *SIMATIC S5*. The PLC *SIMATIC S5 115U* is equipped with the CPU module *CPU 944*. The connection to the network is established via the communication processor *CP 5431 FMS/DP*. For the configuration of this communication processor, the communication package *SINEC NCM for COMs* is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 5412 A2
- Creation of the STEP5 Project S5_FMSst
- Creation of the WinCC Project WinCC_S5_FMS
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>PB FMS-5412</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 5412 A2</i> .
STEP5	STEP5 software for the creation of the STEP5 project. Communication package <i>SINEC NCM for COMs</i> for the configuration of the communication processor <i>CP 5431 FMS/DP</i> .
WinCC	WinCC with communication driver <i>PROFIBUS FMS</i> for the creation of the WinCC project and for the configuration of the connection to the PLC.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 5412 A2</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>CR 700-3</i> .
Power Supply	Power supply <i>PS 951</i> .
CPU Module	CPU module <i>CPU 944</i> .
Communication Processor	Communication processor <i>CP 5431 FMS/DP</i> .

8.1 Startup of the Communication Processor CP 5412 A2

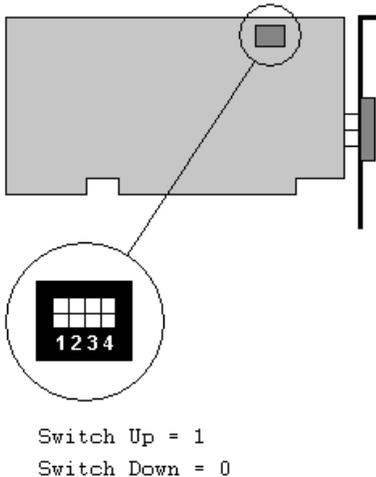
The following description details the configuration steps necessary to successfully start up the communication processor *CP 5412 A2*.

Overview of the Configuration Steps

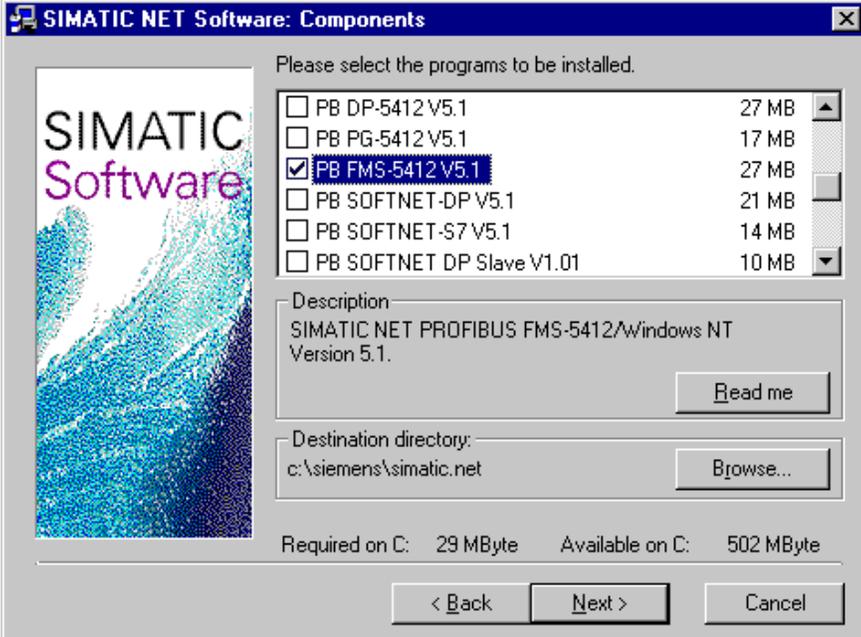
The following lists the configuration steps necessary to start up the communication processor *CP 5412 A2*:

- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Creating the Database File
- E: Assigning the Communication Processor
- F: Testing the Communication Processor

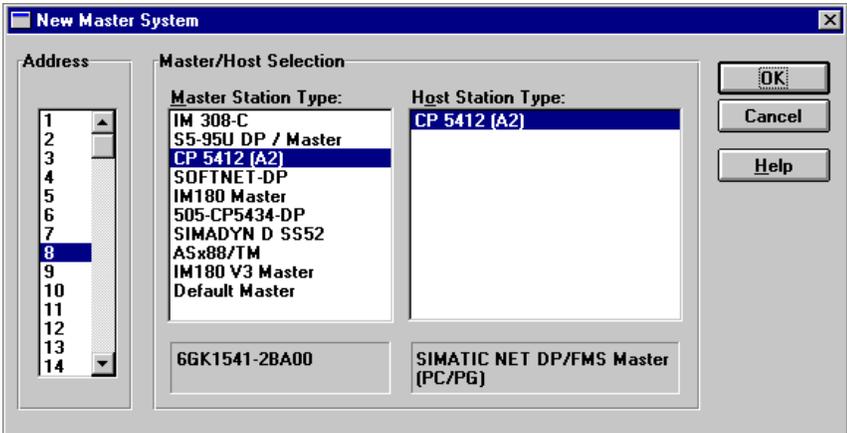
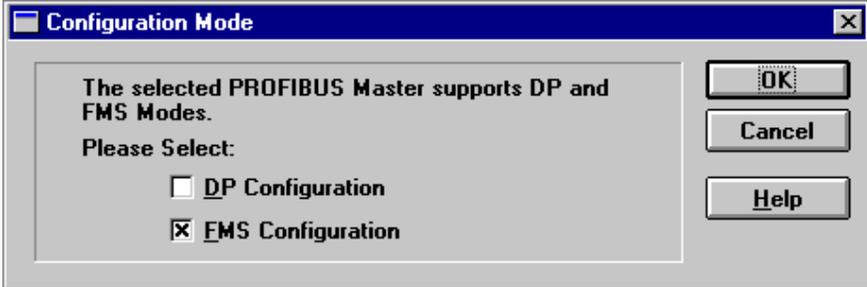
A: Mounting the Communication Processor in the Computer

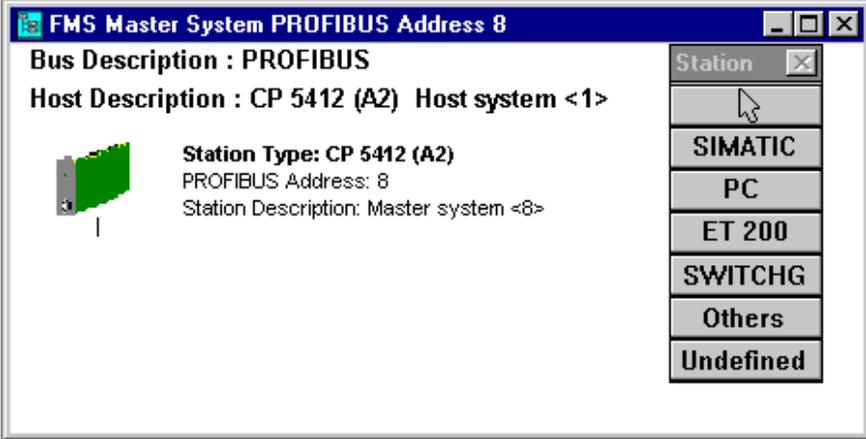
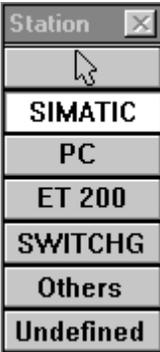
Step	A: Mounting the Communication Processor in the Computer																																		
1	<p>Check the selected jumper settings at the <i>CP 5412 A2</i>.</p> <p>During the software installation of the <i>CP 5412 A2</i>, the <i>I/O Range</i> must be specified. The <i>I/O Range</i> is set via <i>jumpers</i>.</p> <p>By default, the <i>I/O Range</i> is set to <i>0240-0243</i>. However, other settings are also possible. The following graphic illustrates the jumper settings necessary for the various <i>I/O Ranges</i>.</p> <div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="border-bottom: 1px solid black;">I/O Area</th> <th style="border-bottom: 1px solid black;">1-2-3-4</th> </tr> </thead> <tbody> <tr><td>0240-0243</td><td>0 0 0 0</td></tr> <tr><td>0244-0247</td><td>0 0 0 1</td></tr> <tr><td>0248-024B</td><td>0 0 1 0</td></tr> <tr><td>024C-024F</td><td>0 0 1 1</td></tr> <tr><td>0280-0283</td><td>0 1 0 0</td></tr> <tr><td>0284-0287</td><td>0 1 0 1</td></tr> <tr><td>0288-028B</td><td>0 1 1 0</td></tr> <tr><td>028C-028F</td><td>0 1 1 1</td></tr> <tr><td>0300-0303</td><td>1 0 0 0</td></tr> <tr><td>0304-0307</td><td>1 0 0 1</td></tr> <tr><td>0308-030B</td><td>1 0 1 0</td></tr> <tr><td>030C-030F</td><td>1 0 1 1</td></tr> <tr><td>0390-0393</td><td>1 1 0 0</td></tr> <tr><td>0394-0397</td><td>1 1 0 1</td></tr> <tr><td>0398-039B</td><td>1 1 1 0</td></tr> <tr><td>039C-039F</td><td>1 1 1 1</td></tr> </tbody> </table> </div>	I/O Area	1-2-3-4	0240-0243	0 0 0 0	0244-0247	0 0 0 1	0248-024B	0 0 1 0	024C-024F	0 0 1 1	0280-0283	0 1 0 0	0284-0287	0 1 0 1	0288-028B	0 1 1 0	028C-028F	0 1 1 1	0300-0303	1 0 0 0	0304-0307	1 0 0 1	0308-030B	1 0 1 0	030C-030F	1 0 1 1	0390-0393	1 1 0 0	0394-0397	1 1 0 1	0398-039B	1 1 1 0	039C-039F	1 1 1 1
I/O Area	1-2-3-4																																		
0240-0243	0 0 0 0																																		
0244-0247	0 0 0 1																																		
0248-024B	0 0 1 0																																		
024C-024F	0 0 1 1																																		
0280-0283	0 1 0 0																																		
0284-0287	0 1 0 1																																		
0288-028B	0 1 1 0																																		
028C-028F	0 1 1 1																																		
0300-0303	1 0 0 0																																		
0304-0307	1 0 0 1																																		
0308-030B	1 0 1 0																																		
030C-030F	1 0 1 1																																		
0390-0393	1 1 0 0																																		
0394-0397	1 1 0 1																																		
0398-039B	1 1 1 0																																		
039C-039F	1 1 1 1																																		
2	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>For the communication card <i>CP 5412 A2</i>, a free ISA slot in the computer is required. After the installation of the <i>CP 5412 A2</i>, close the computer's case and start the computer.</p>																																		

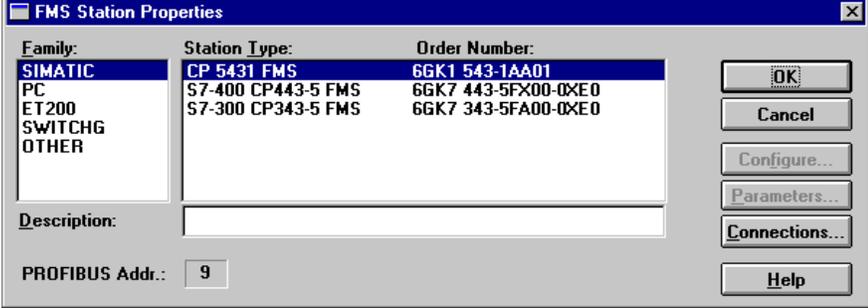
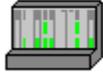
B: Installing the Communication Driver

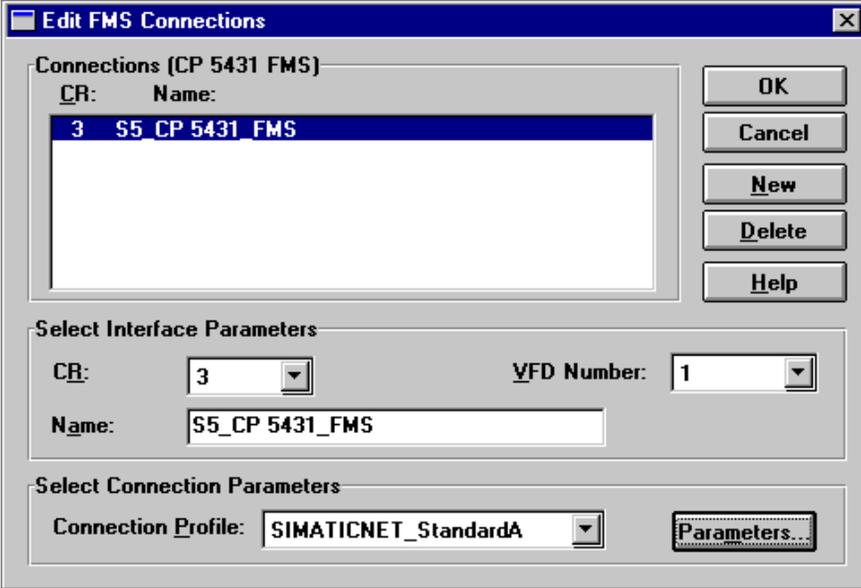
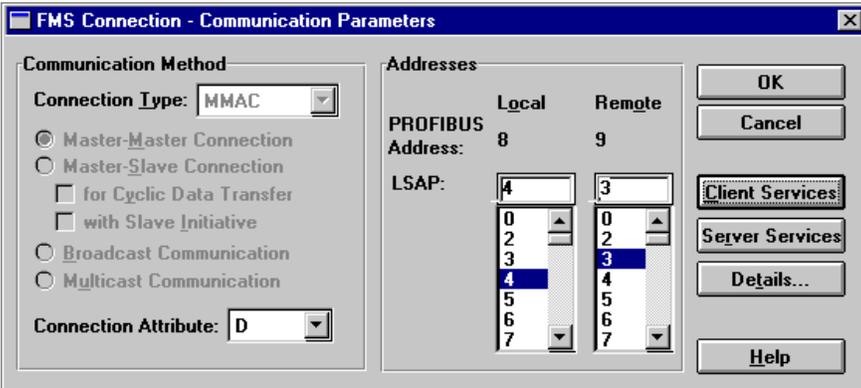
Step	B: Installing the Communication Driver
1	<p>Installation of the communication driver <i>PB FMS-5412</i> from the <i>SIMATIC NET</i> CD-ROM.</p> <p>After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">SIMATIC NET Software Installieren</p> </div> <p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>PB FMS-5412</i> to be installed must be selected. Finish the installation.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;">  </div>

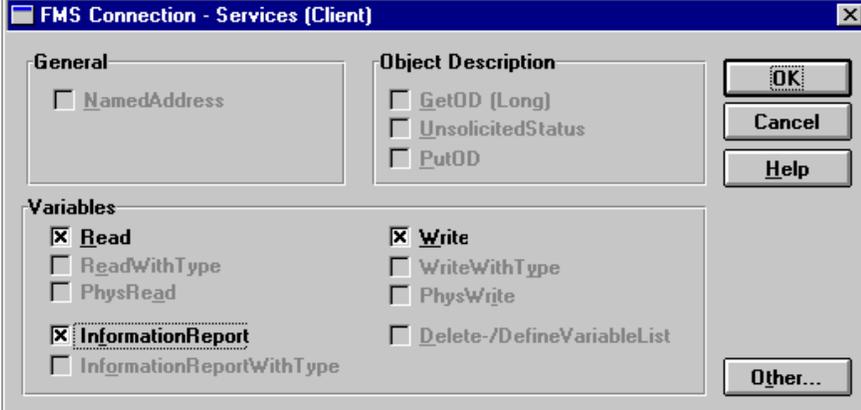
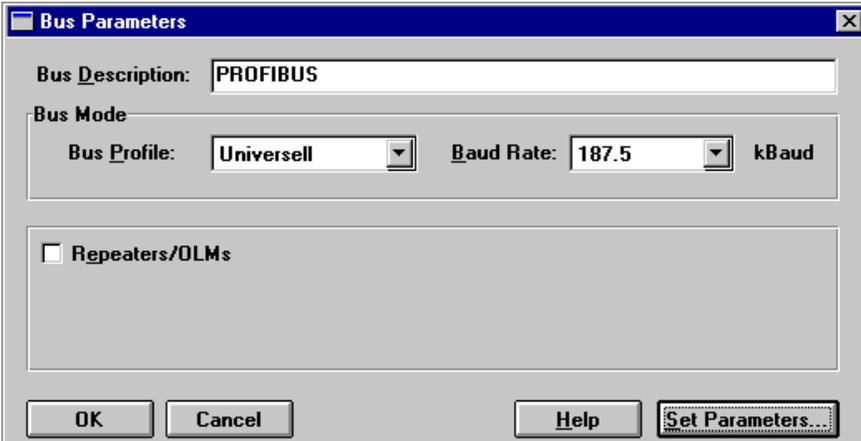
C: Creating the Database File

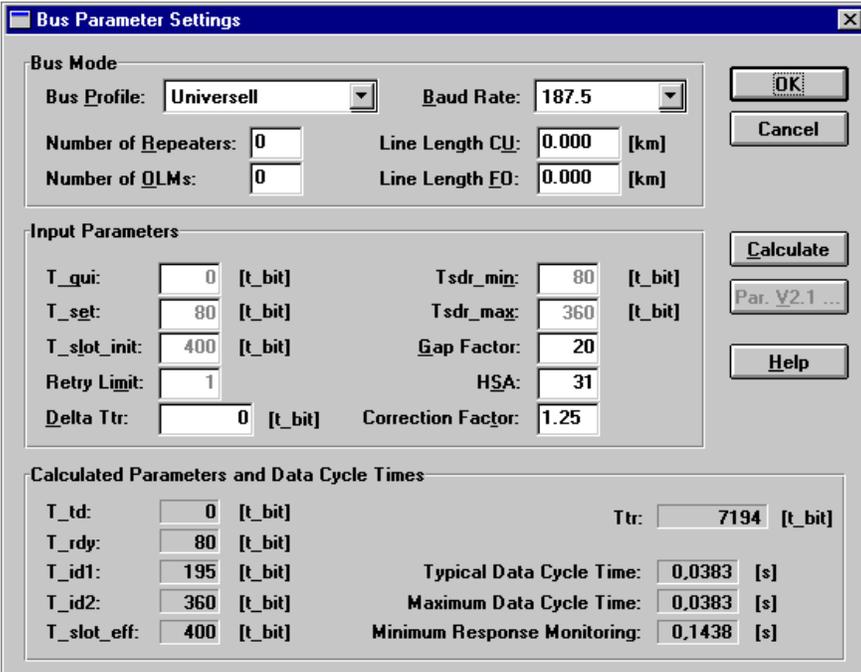
Step	C: Creating the Database File
1	<p>Creation of the database file for the communication via the FMS protocol PROFIBUS. This is done with the COM PROFIBUS program. This program has already been installed with the communication driver PB FMS-5412.</p> <p>Start the program via <i>Start</i> → <i>Simatic</i> → <i>SIMATIC NET</i> → <i>COM PROFIBUS</i>.</p>  <p>COM PROFIBUS</p>
2	<p>The program <i>COM PROFIBUS</i> will be opened.</p> <p>A new file is created by clicking on the button displayed below.</p> 
3	<p>The dialog box <i>New Master System</i> will be displayed. In this dialog box, the parameters of the WinCC station must be specified.</p> <p>In the <i>Master Station Type</i> field, select the entry <i>CP 5412 (A2)</i>.</p> <p>The <i>Bus Address of the WinCC station is set</i> to 8. For the following installation of the communication processor <i>CP 5412 A2</i> in the computer, the address specified here must be used as the local station address.</p> <p>Close the <i>New Master System</i> dialog box by clicking on <i>OK</i>.</p> 
4	<p>The <i>Operating Mode of the Master</i> dialog box will be displayed.</p> <p>In this dialog box, the check-box <i>FMS Configuration</i> is selected. Close the <i>Operating Mode of the Master</i> dialog box by clicking on <i>OK</i>.</p> 

Step	C: Creating the Database File
5	<p>The <i>FMS Master System</i> dialog box will be displayed.</p> <p>It displays the current settings. At the moment, only the communication processor <i>CP 5412 A2</i> is listed as a master. This master has a <i>PROFIBUS Address</i> of 8.</p> 
6	<p>Specifying the communication partner.</p> <p>Select the <i>SIMATIC</i> entry from the <i>Station</i> selection dialog box.</p> <p>If the mouse pointer is then moved over the <i>FMS Master System</i> window, its appearance will change. The new station is inserted via a mouse click on this window.</p> 
7	<p>The <i>PROFIBUS Address</i> dialog box will be displayed.</p> <p>In this sample, 9 is set as the PROFIBUS address for the new station.</p> <p>This PROFIBUS address must be set in the PLC during the configuration of the communication processor. Close the dialog box by clicking on <i>OK</i>.</p> 

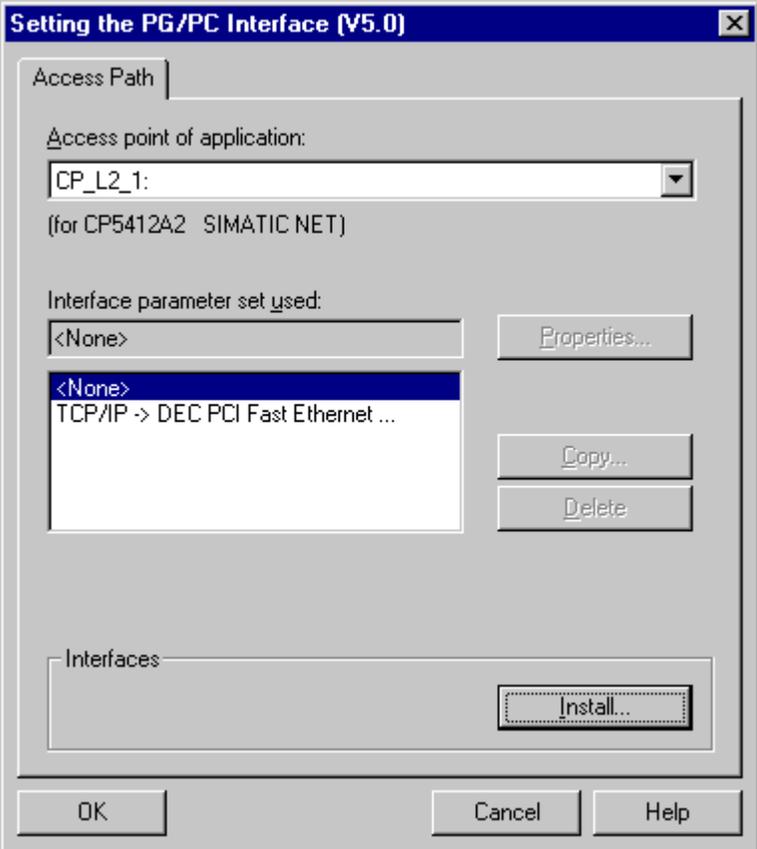
Step	C: Creating the Database File
8	<p>The <i>FMS Station Properties</i> dialog box will be displayed.</p> <p>In this dialog box, the type of the communication partner is specified. In this sample, this is <i>CP 5431 FMS</i>. Close the dialog box by clicking on <i>OK</i>.</p> 
9	<p>In the <i>FMS Master System</i> dialog box, the newly inserted station will be displayed.</p> <p>For this station, a connection must be created which is used for the communication to the WinCC station. This is done by  on the icon of the newly inserted station.</p>  <p>Station Type : CP 5431 FMS PROFIBUS Address : 9 Station Description :</p>
10	<p>The <i>Edit FMS Connections</i> dialog box will be displayed.</p> <p>A new connection is created by clicking on the <i>New</i> button.</p> <p>In the <i>CR</i> field, a unique communication reference is assigned to the new FMS connection, and a unique connection name is assigned in the <i>Name</i> field. In this sample, the value <i>3</i> is kept for the <i>CR</i> and the <i>Name S5_CP5431_FMS</i> is entered. Using these two values, the connection created in the WinCC project is assigned to this FMS connection.</p>

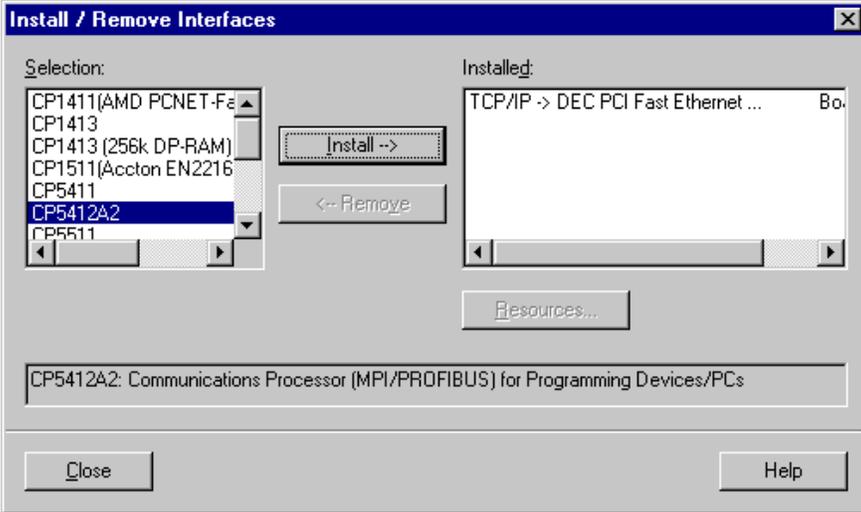
Step	C: Creating the Database File
	<p>As the <i>Connection Profile</i>, the predefined <i>SIMATICNET_StandardA</i> profile is set.</p> <p>Clicking on the <i>Parameters</i> button displays additional setting options for the new connection.</p> 
11	<p>The <i>FMS Connection - Communication Parameters</i> dialog box will be displayed. The local and remote <i>LSAP</i> settings must be made. In this context, the local <i>LSAP</i> is the <i>LSAP (Local Service Access Point)</i> of the communication processor <i>CP 5412 A2</i> in the WinCC station and the remote <i>LSAP</i> is the one of the communication processor <i>CP 5431</i> in the SIMATIC S5 station. These <i>LSAP</i> values must also be used for the connection configuration of the communication processor <i>CP 5431</i>.</p> <p>In this sample, the value 4 is set in the <i>Local</i> field and the value 3 in the <i>Remote</i> field.</p> <p>The required services are specified via the <i>Client Services</i> button.</p> 

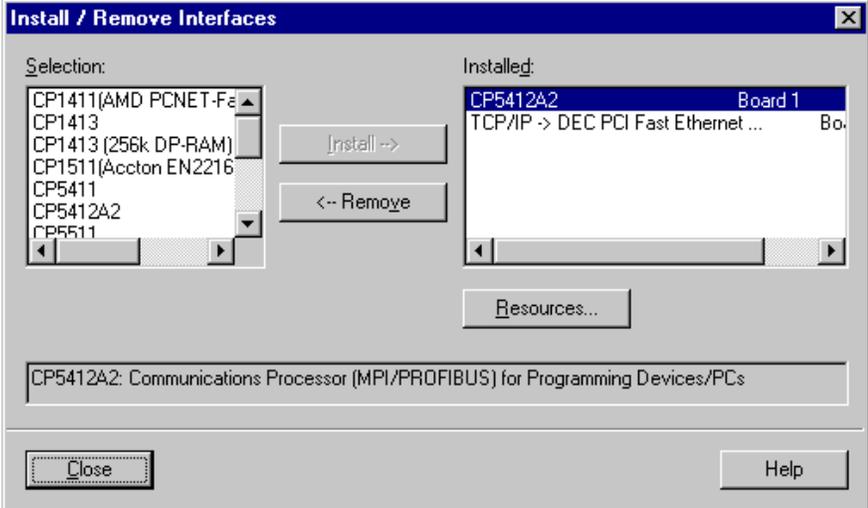
Step	C: Creating the Database File
12	<p>The <i>FMS Connection - Services (Client)</i> will be displayed.</p> <p>In this dialog box, all available services (<i>Read</i>, <i>Write</i> and <i>InformationReport</i>) are selected.</p> <p>Close the dialog box by clicking on <i>OK</i>. The <i>FMS Connection - Communication Parameters</i> and the <i>Edit FMS Connections</i> dialog boxes are also closed with <i>OK</i>.</p> 
13	<p>Setting the <i>Bus Parameters</i> for the <i>PROFIBUS</i> network.</p> <p>This is done from the <i>COM PROFIBUS</i> program via the <i>Configure</i> → <i>Bus Parameters</i> menus. The <i>Bus Parameters</i> dialog box will be displayed. The following settings must also be used for the network parameters during the installation of the communication processor <i>CP 5412 A2</i> and for the network parameters during the configuration of the communication processor <i>CP 5431</i> in the PLC.</p> <p>As the <i>Bus Profile</i>, <i>Universal</i> is set. As the <i>Baud Rate</i>, this sample uses <i>187.5 kBaud</i>.</p> <p>By clicking on the <i>Setting Parameters</i> button, an additional dialog box will be opened.</p> 

Step	C: Creating the Database File
14	<p>The <i>Bus Parameter Settings</i> dialog box will be opened.</p> <p>In this sample, the highest station address in the PROFIBUS network is set to 31. This value is entered in the <i>HSA</i> field.</p> <p>Close this and the <i>Bus Parameters</i> dialog boxes by clicking on <i>OK</i>.</p> 
15	<p>Save the configuration.</p> <p>This is done via the toolbar button displayed below or the <i>File</i> → <i>Save As</i> menus. In this sample, the file is saved under the name <i>S5FMS.ET2</i>.</p> 
16	<p>Using the file just created, a database file for the communication via the <i>CP 5412 A2</i> is generated.</p> <p>This is done via the <i>File</i> → <i>Export</i> → <i>NCM File</i> menus. In this sample, the file has been saved under the name <i>S5FMS.ldb</i>.</p>  <p>S5FMS.ldb</p>

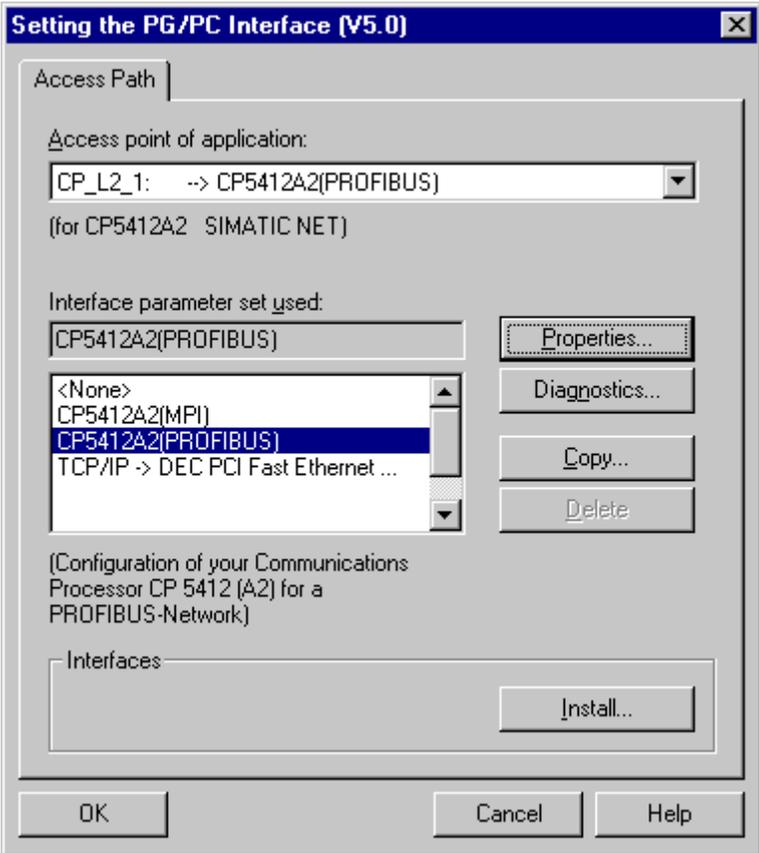
D: Installing the Communication Processor

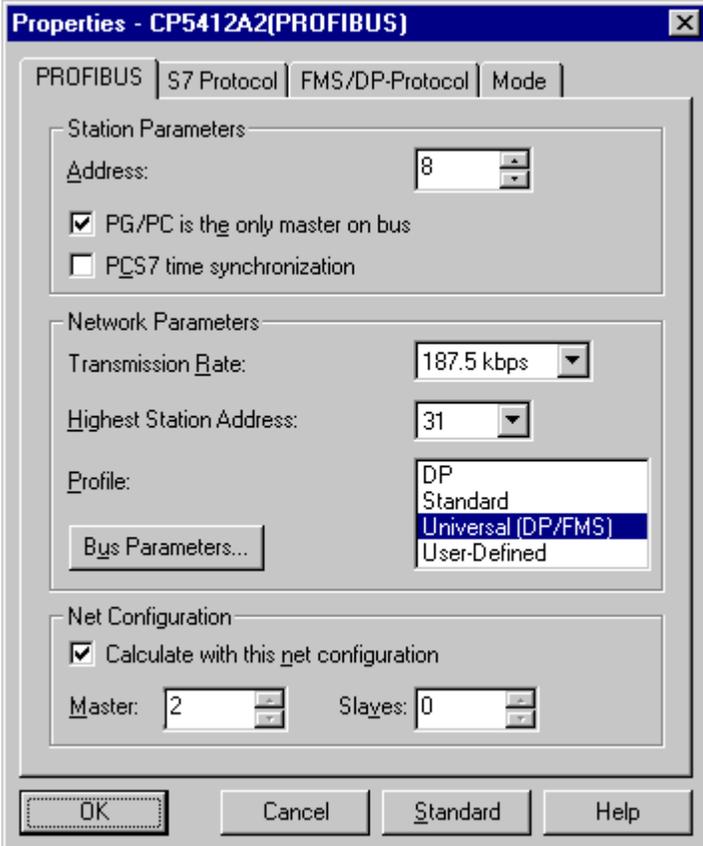
Step	D: Installing the Communication Processor
1	<p>Install the communication processor CP 5412 A2 via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>The dialog box for installing a new interface is opened via the <i>Install</i> button.</p> 

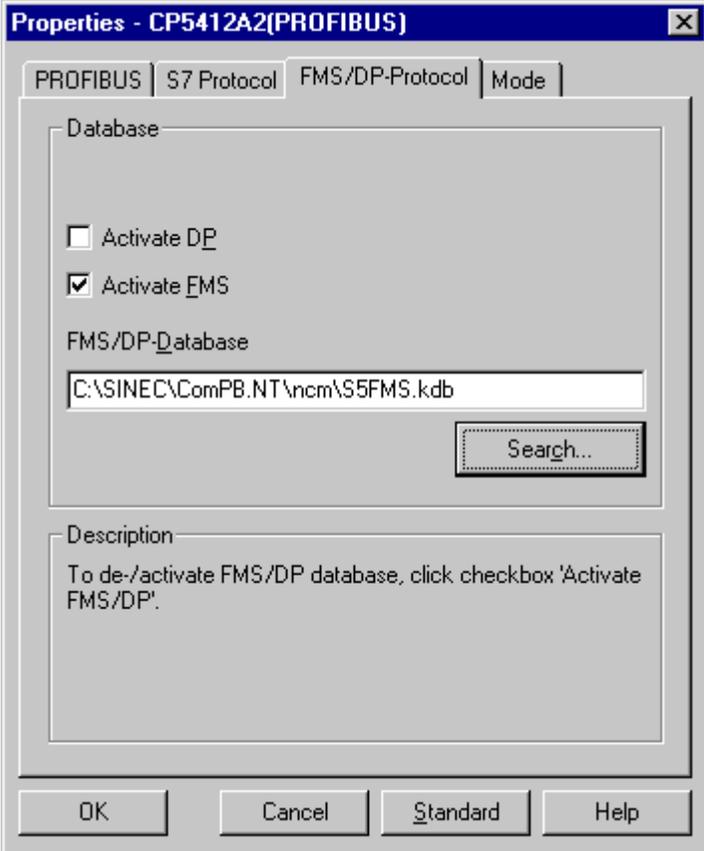
Step	D: Installing the Communication Processor
3	<p>The dialog box <i>Install/Remove Modules</i> will be displayed. The <i>Selection</i> field lists all interfaces that can be installed. Among them will be the entry for the <i>CP 5412 A2</i>, if the communication driver has been installed previously as outlined in step B.</p> <p>From the <i>Selection</i> field, select the entry <i>CP 5412 A2</i>. The installation of the communication processor is started by clicking on the <i>Install -></i> button.</p> 
4	<p>The dialog box <i>Resources - CP 5412 A2</i> will be displayed.</p> <p>The settings for the <i>Memory Range</i>, <i>I/O Range</i> and <i>Interrupt</i> have to be specified.</p> <p>The <i>I/O Range</i> has already been determined via the Jumper Settings at the <i>CP 5412 A2</i>.</p> <p>Make sure that the assigned resources have not already been taken by other modules in the computer. Information about already taken system resources can be obtained from the Resources tab accessed via <i>Start -> Programs -> Administrative Tools (Common) -> Windows NT Diagnostics</i>.</p> <p>Close the <i>Resources</i> tab by clicking on <i>OK</i>.</p> 

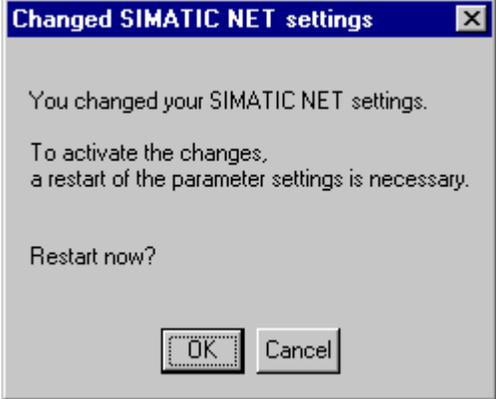
Step	D: Installing the Communication Processor
5	<p>In the dialog box <i>Install/Remove Modules</i>, the <i>Installed</i> field will now contain the entry for the <i>CP 5412 A2</i>.</p> <p>Exit the dialog box <i>Install/Remove Modules</i> via the <i>Close</i> button.</p>  <p>The screenshot shows a dialog box titled "Install / Remove Interfaces". It has two main sections: "Selection:" and "Installed:". The "Selection:" list contains the following items: CP1411 (AMD PCNET-Fa), CP1413, CP1413 (256k DP-RAM), CP1511 (Accton EN2216), CP5411, CP5412A2, and CP5511. The "Installed:" list contains: CP5412A2 Board 1 and TCP/IP -> DEC PCI Fast Ethernet ... Bo. There are buttons for "Install ->", "<- Remove", "Resources...", "Close", and "Help". A status bar at the bottom of the dialog box displays "CP5412A2: Communications Processor (MPI/PROFIBUS) for Programming Devices/PCs".</p>

E: Assigning the Communication Processor

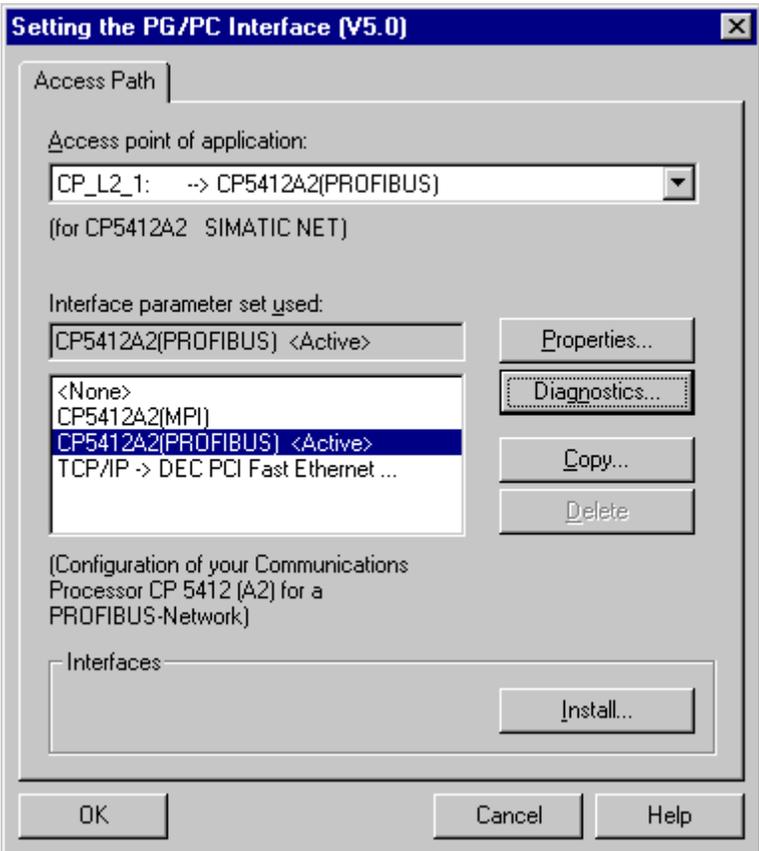
Step	E: Assigning the Communication Processor
1	<p>In the program <i>Setting the PG/PC Interface</i>, assign the access point <i>CP_L2_1</i>: to the just installed interface.</p> <p>The access point <i>CP_L2_1</i>: is the default access point used by WinCC for the communication via the <i>PROFIBUS</i>. It has been created automatically during the installation of the communication driver <i>PB FMS-5412</i>.</p> <p>In the field <i>Access Point of the Application</i>, set the entry <i>CP_L2_1</i>:. In the field below, select the entry <i>CP 5412 A2 (PROFIBUS)</i>. This completes the assignment between the access point and the communication processor.</p> 

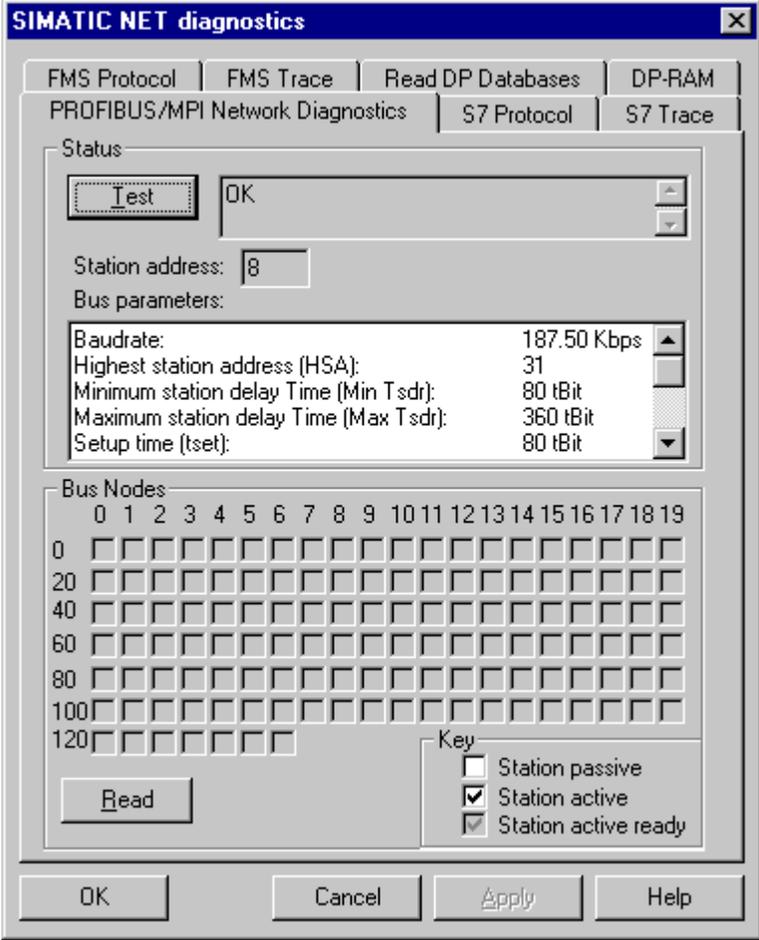
Step	E: Assigning the Communication Processor
2	<p>Setting the properties of the communication processor <i>CP 5412 A2</i>.</p> <p>The dialog box for setting the properties is opened via the <i>Properties</i> button of the <i>Setting the PG/PC Interface</i> program.</p> <p>The dialog box <i>Properties - CP 5412 (PROFIBUS)</i> will be displayed.</p> <p>In the <i>PROFIBUS</i> tab, station and network related parameters are set.</p> <p>As the <i>Local Station Address</i> of the communication processor <i>CP 5412 A2</i>, this sample uses 8. This address has already been defined during the creation of the database file with the assignment of the bus address for the communication processor.</p> <p>For the <i>PROFIBUS Network</i>, a <i>Baud Rate</i> of 187.5 kBit/s is selected. The <i>Highest Station Address</i> is set to the value of 31. As the <i>Profile</i>, <i>Universal (DP/FMS)</i> is selected. The settings just made for the network parameters must agree with the settings for the bus parameters of the previously generated database file.</p> 

Step	E: Assigning the Communication Processor
3	<p>Assigning the database file for the <i>FMS Protocol</i>.</p> <p>This is done in the <i>FMS/DP Protocol</i> tab of the <i>Properties - CP 5412 (PROFIBUS)</i> dialog box.</p> <p>Select the check-box <i>Activate FMS</i>. This will enable the <i>FMS/DP Database</i> field. In here, specify the previously created database file <i>S5FMS.kdb</i>. Via the <i>Browse</i> button, the database file can easily be located and selected.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

Step	E: Assigning the Communication Processor
4	<p>Exit the program <i>Setting the PG/PC Interface</i> via the <i>OK</i> button.</p> <p>A dialog box will be displayed requesting the restart of the <i>CP 5412 A2</i>. Acknowledge this dialog box by clicking on <i>OK</i>, which will result in the restart of the communication processor <i>CP 5412 A2</i>.</p> <p>This completes the installation of the communication processor.</p> 

F: Testing the Communication Processor

Step	F: Testing the Communication Processor
1	<p>Test the communication processor <i>CP 5412 A2</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface to be checked. In this case, select the entry <i>CP 5412 A2 (PROFIBUS)</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The check for a proper installation is activated by clicking on the <i>Diagnostics</i> button.</p> 

Step	F: Testing the Communication Processor
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>In the <i>PROFIBUS/MPI Network Diagnostics</i> tab, the diagnosis is started via the <i>Test</i> button. The result of the diagnosis will be displayed immediately following.</p> <p>If the result of the diagnosis is positive (correct installation), the dialog box can be exited with <i>OK</i>. In this case, the program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>. The configuration of the communication to the S5 via <i>PROFIBUS FMS</i> is continued in the following section.</p> <p>However, if the result of the diagnosis is negative (incorrect installation), the error must be localized and corrected. Troubleshooting procedures are described in the section <i>Is the Communication Module in the Computer operational?</i>.</p> 

8.2 Creation of the STEP5 Project S5_FMSst

The following description details the configuration steps necessary to create and start up the STEP5 project *S5_FMSst*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to create the STEP5 project *S5_FMSst*:

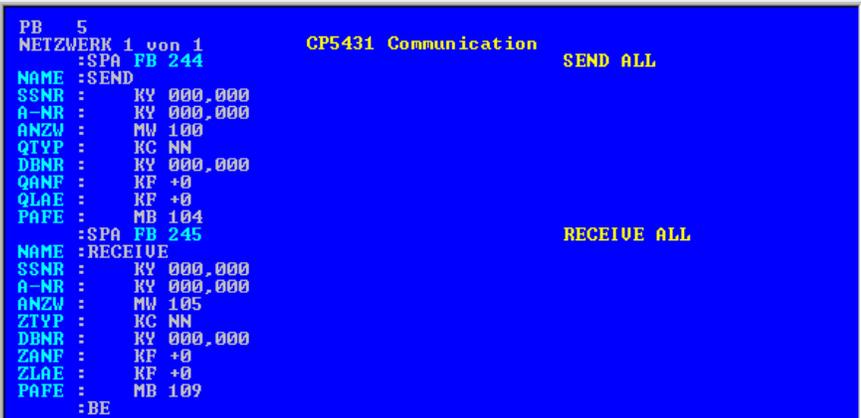
- A: Installing the Hardware and Software
- B: Creating the STEP5 Program
- C: Configuring the Communication Processor
- D: Starting up the PLC

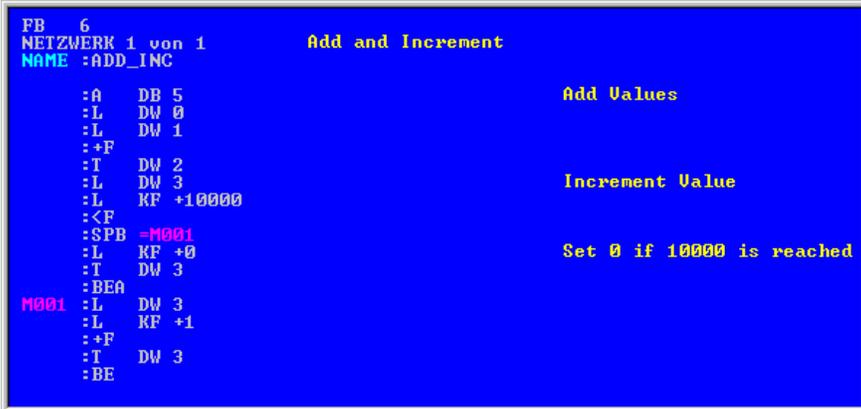
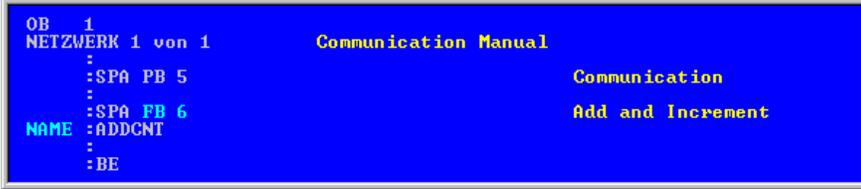
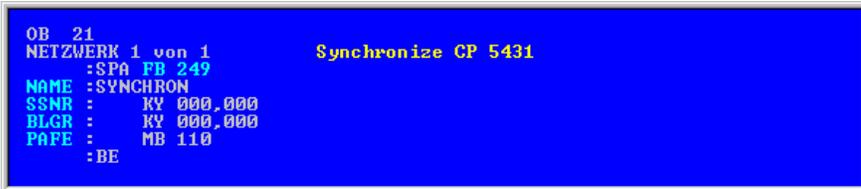
A: Installing the Hardware and Software

Step	A: Installing the Hardware and Software
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 951</i>, the CPU module <i>CPU 944</i> and the communication processor <i>CP 5431</i>.</p> <p>Establishing the connection from the programming device to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 5412 A2</i> in the computer to the communication processor <i>CP 5431</i> in the PLC.</p>
2	<p>Installing the communication package SINEC NCM for COMs from the corresponding installation disk. This communication package is required for the configuration of the communication processor <i>CP 5431</i>.</p> <p>The installation disk contains the program file <i>install.exe</i>. Start this program. Follow the instructions of the installation program and complete the installation.</p> <div style="text-align: center;">  <p>Install.exe</p> </div>

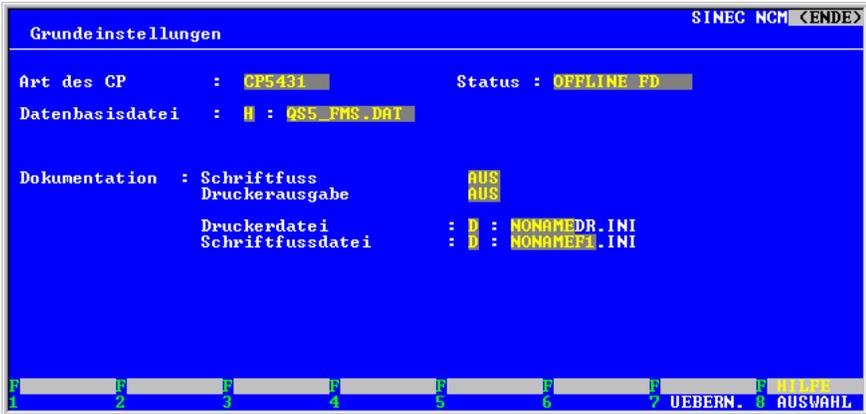
B: Creating the STEP5 Program

Step	B: Creating the STEP5 Program
1	<p>Creation of a new project with the STEP5 software.</p> <p>Start the STEP5 software. From the <i>Object</i> → <i>Project</i> → <i>Settings</i> → <i>Page1</i> and <i>Page2</i> menus, define the settings for the new project. In the <i>Program File</i> field, specify the name of the new program file to be created. In this sample, the name <i>S5_FMSST.S5D</i> is used. Only the first six characters of the file name can be changed by the user.</p>

Step	B: Creating the STEP5 Program
2	<p>Creation of a data block.</p> <p>In STEP5, this is accomplished via the <i>Editor</i> → <i>Data Block</i> → <i>menus of the program file</i>. As the name of the data block, this sample uses <i>DB5</i>.</p> <p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits. One additional tag with a length of 16 Bits is created, whose value is cyclically incremented in <i>OBI</i>.</p> <p>The following graphic displays the programmed data block <i>DB5</i>. The data of the <i>DB5</i> is made visible to WinCC via FMS tags created during the configuration of the communication processor <i>CP 5431</i>.</p>  <pre> DB 5 0:KH = 0000 1:KH = 0000 2:KH = 0000 3:KH = 0000 4:KH = 0000 5:KH = 0000 6:KH = 0000 7:KH = 0000 8:KH = 0000 value 1 value 2 sum inc </pre>
3	<p>Creation of a program block for the communication.</p> <p>The communication to WinCC via the communication processor <i>CP 5431</i> is carried out by calling the data handling blocks <i>SEND</i> and <i>RECEIVE</i>. For the <i>SIMATIC S5 115U</i> PLC used in this sample, these are the blocks <i>FB244</i> and <i>FB245</i>. These blocks must be called once every program cycle. As the request number <i>A-NR</i>, 0 is assigned to these blocks to allow execution of the Send All and Receive All functions.</p> <p>In this sample, the data handling block calls are carried out in a program block, which is called in the <i>OBI</i>.</p> <p>In STEP5, the creation of a new program block is carried out via the <i>Editor</i> → <i>STEP5 Block</i> → <i>menus of the program file</i>. As the name of the program block, this sample uses <i>PB5</i>.</p>  <pre> PB 5 NETZWERK 1 von 1 :SPA FB 244 NAME :SEND SSNR : RY 000,000 A-NR : RY 000,000 ANZW : MW 100 QTYP : KC NN DBNR : RY 000,000 QANF : KF +0 QLAE : KF +0 PAFE : MB 104 :SPA FB 245 NAME :RECEIUE SSNR : RY 000,000 A-NR : RY 000,000 ANZW : MW 105 ZTYP : KC NN DBNR : RY 000,000 ZANF : KF +0 ZLAE : KF +0 PAFE : MB 109 :BE </pre>

Step	B: Creating the STEP5 Program
4	<p>Creation of a function block, which makes available the functionality of the sample program.</p> <p>Two values stored in the <i>DB5</i> are added and the sum again stored in the <i>DB5</i>. Additionally, a value stored in the <i>DB5</i> is incremented every program cycle. If this value reaches 10000, it is reset back to 0.</p> <p>In STEP5, the creation of a new function block is carried out via the <i>Editor</i> → <i>STEP5 Block</i> → <i>menus of the program file</i>. As the name of the program block, this sample uses <i>FB6</i>.</p>  <pre> FB 6 NETZWERK 1 von 1 Add and Increment NAME :ADD_INC : A DB 5 Add Values : L DW 0 : L DW 1 : +F : T DW 2 : L DW 3 Increment Value : L KF +10000 : <F : SPB -M001 : L KF +0 Set 0 if 10000 is reached : T DW 3 : BE0 M001 : L DW 3 : L KF +1 : +F : T DW 3 : BE </pre>
5	<p>Creation of the <i>OBI</i>.</p> <p>In the <i>OBI</i>, the previously created blocks <i>PB5</i> and <i>FB6</i> are called.</p>  <pre> OB 1 NETZWERK 1 von 1 Communication Manual : : SPA PB 5 Communication : : SPA FB 6 Add and Increment NAME :ADDCNT : : BE </pre>
6	<p>Creation of the startup blocks.</p> <p>During the startup of the PLC, the communication processor <i>CP 5431</i> must be synchronized. This is done by the data handling block <i>SYNCHRON</i>. For the <i>SIMATIC S5 115U</i> PLC used in this sample, this is the block <i>FB249</i>.</p>  <pre> OB 21 NETZWERK 1 von 1 Synchronize CP 5431 : SPA FB 249 NAME :SYNCHRON SSNR : KY 000,000 BLGR : KY 000,000 PAPE : MB 110 : BE </pre>
7	<p>Loading the STEP5 program into the PLC.</p> <p>In STEP5, this is done via the <i>Object</i> → <i>Blocks</i> → <i>Transfer</i> → <i>PLC File</i> menus. In the Selection field, the option <i>All Blocks</i> must be selected to load all previously created blocks to the PLC.</p>

C: Configuring the Communication Processor

Step	C: Configuring the Communication Processor
1	<p>Start the communication package <i>SINEC NCM for COMs</i> to configure the communication processor <i>CP 5431</i>.</p> <p>From STEP5, start the communication package via the <i>Change</i> → <i>Additional</i> → <i>SINEC NCM for COMs</i> menus.</p>
2	<p>This will open the communication package <i>SINEC NCM for COMs</i>.</p> <p>If no database file is set, the <i>Basic Settings</i> entry mask will initially be displayed. This entry mask can also be opened via the <i>File</i> → <i>Select</i> (or <i>Init.</i> → <i>Edit</i>) menus.</p> <p>In the <i>CP Type</i> field, indicate the type of communication processor used. Via the F8 function key, one of the available communication processors can be set. Select the <i>CP 5431</i>. Set the <i>Status</i> field to <i>OFFLINE FD</i> via the F8 function key. This stores the configuration made in the program to a database file. In the <i>Database File</i> field, specify the name of this database file. This name has to start with the letter <i>Q</i>. For this sample, the name <i>QS5_FMS.DAT</i> is used for the database file.</p> <p>The settings made in the <i>Basic Settings</i> entry mask are applied via the F7 function key.</p>  <p>The screenshot shows a blue dialog box titled 'Grundeinstellungen' with 'SINEC NCM' and '<ENDE>' in the top right corner. The settings are as follows:</p> <ul style="list-style-type: none"> Art des CP : CP5431 Status : OFFLINE FD Datenbasisdatei : Q : QS5_FMS.DAT Dokumentation : Schriftfuss AUS Druckerausgabe : AUS Druckerdatei : P : NONAMEDR.INI Schriftfussdatei : A : NONAMEPA.INI <p>At the bottom, there are function keys: UEBERN. and AUSWAHL.</p>

Step	C: Configuring the Communication Processor
3	<p>The settings for the basic initialization of the communication processor must be made.</p> <p>They are entered in the <i>Basic Initialization</i> entry mask. This entry mask is opened via the <i>Edit</i> → <i>CP Init.</i> menus.</p> <p>In the <i>L2 Address</i> field, the <i>PROFIBUS Address</i> of the communication processor <i>CP 5431</i> is specified. In this sample, the value <i>9</i> has been entered. This is the <i>PROFIBUS Address</i> that has been specified during the database file creation of the communication processor <i>CP 5412 A2</i> for the <i>CP 5431</i>.</p> <p>The remaining settings can be seen in the following graphic. The settings made in the <i>Basic Initialization</i> entry mask are applied via the <i>F7</i> function key.</p> 
4	<p>Setting the global network parameters.</p> <p>This is done in the <i>Global Network Parameters</i> entry mask, which is opened via the <i>Edit</i> → <i>Global Network Parameters</i> menus.</p> <p>Specify the <i>Network Parameters</i>. Use the bus parameters that have been defined during the database file creation of the communication processor <i>CP 5412 A2</i> for the <i>PROFIBUS</i>. Among other things, the <i>Baud Rate</i> is set to <i>18750 Baud</i> and the <i>Highest Station Address (HSA)</i> to <i>31</i>.</p> <p>The settings made in the <i>Global Network Parameters</i> entry mask are applied via the <i>F7</i> function key.</p> 

Step	C: Configuring the Communication Processor																																			
5	<p>Creation of an FMS Connection.</p> <p>This is done in the <i>CP Connection Configuration</i> entry mask, which is opened via the <i>Edit</i> → <i>Connections</i> → <i>FMS Connections</i> menus.</p> <p>For the <i>Connection Configuration</i>, the same values must be specified that have been used for the connection in the database file of the communication processor <i>CP 5412 A2</i>. However, local and remote parameters (e.g. LSAP values) must be switched correspondingly. Among other things, in this sample, the value 3 is set for the <i>Local LSAP</i> and the value 4 for the <i>Remote LSAP</i>.</p> <p>The settings made in the <i>CP Connection Configuration</i> entry mask are applied via the F7 function key.</p> 																																			
6	<p>Creation of the FMS tags.</p> <p>This is done in the <i>Creation of FMS Tags</i> entry mask, which is opened via the <i>Edit</i> → <i>VFD Tag Editor</i> menus.</p> <p>In this sample, 4 FMS tags of the <i>IN 16</i> (Integer 16 Bit) type are created. These FMS tags correspond to the tags previously created in the DB5. Each tag is marked with an Index, which is used by WinCC for addressing purposes.</p> <p>The settings made in the <i>Creation of FMS Tags</i> entry mask are applied via the F7 function key.</p>  <table border="1"> <thead> <tr> <th>Index</th> <th>Typ</th> <th>ZGRF</th> <th>Passw</th> <th>S5-Adresse</th> <th>ANZW</th> <th>S5NR</th> </tr> </thead> <tbody> <tr> <td>100</td> <td>IN 16</td> <td></td> <td></td> <td>DB 5 0</td> <td>DB 5 4</td> <td>0</td> </tr> <tr> <td>101</td> <td>IN 16</td> <td></td> <td></td> <td>DB 5 1</td> <td>DB 5 6</td> <td>0</td> </tr> <tr> <td>102</td> <td>IN 16</td> <td></td> <td></td> <td>DB 5 2</td> <td>DB 5 8</td> <td>0</td> </tr> <tr> <td>103</td> <td>IN 16</td> <td></td> <td></td> <td>DB 5 3</td> <td>DB 5 10</td> <td>0</td> </tr> </tbody> </table>	Index	Typ	ZGRF	Passw	S5-Adresse	ANZW	S5NR	100	IN 16			DB 5 0	DB 5 4	0	101	IN 16			DB 5 1	DB 5 6	0	102	IN 16			DB 5 2	DB 5 8	0	103	IN 16			DB 5 3	DB 5 10	0
Index	Typ	ZGRF	Passw	S5-Adresse	ANZW	S5NR																														
100	IN 16			DB 5 0	DB 5 4	0																														
101	IN 16			DB 5 1	DB 5 6	0																														
102	IN 16			DB 5 2	DB 5 8	0																														
103	IN 16			DB 5 3	DB 5 10	0																														

Step	C: Configuring the Communication Processor
7	<p>Loading the configuration data of the database file to the communication processor <i>CP 5431</i>.</p> <p>This is done via the <i>Load</i> → <i>CP Database Transfer</i> → <i>FD->CP</i> menus. The configuration data can only be uploaded while the communication processor is in the <i>STOP</i> operating mode.</p> <p>Laden</p>  <p>The screenshot shows two overlapping menu windows. The background window lists: CP Start, CP Stop, CP Zustand, CP Loeschen, FD Loeschen, and CP Datenbasistranf. The foreground window shows: FD->CP, CP->FD, FD->EPROM, EPROM->FD, and FD->FD. The 'FD->CP' option is highlighted in green.</p>

D: Starting up the PLC

Step	D: Starting up the PLC
1	<p>Starting the individual modules of the PLC.</p> <p>Previously, the STEP5 program and the database file of the communication processor <i>CP 5431</i> must have been loaded to the PLC.</p> <p>First, the operating mode switch of the communication processor <i>CP 5431</i> is set to the <i>RUN</i> position. The status LEDs <i>RUN</i> and <i>STOP</i> will light up at the communication processor, indicating that the module has not been synchronized.</p> <p>Next, the operating mode switch of the CPU module is set to the <i>RN</i> position. During the startup of the CPU module, the communication processor is synchronized by the startup block. The communication processor's status LED <i>STOP</i> goes out. At the CPU module, only the status LED <i>RN</i> will be illuminated.</p>

8.3 Creation of the WinCC Project WinCC_S5_FMS

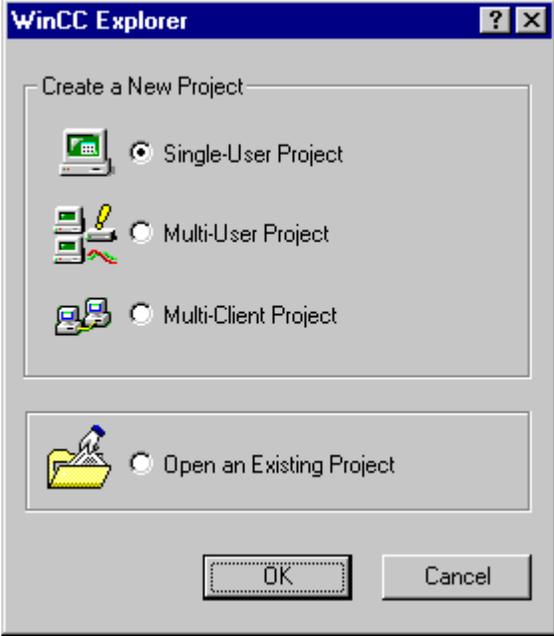
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S5_FMS*.

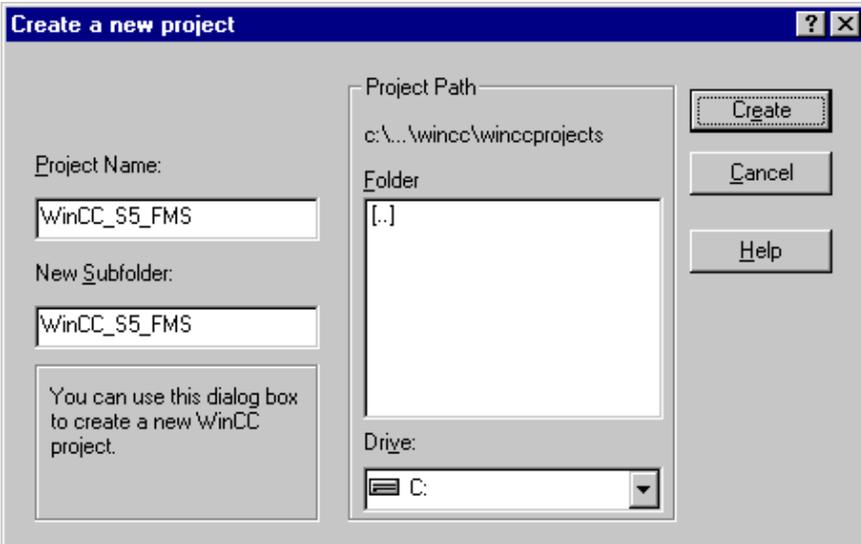
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_S5_FMS*:

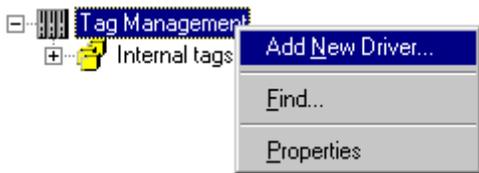
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Tags
- D: Creating the WinCC Screen

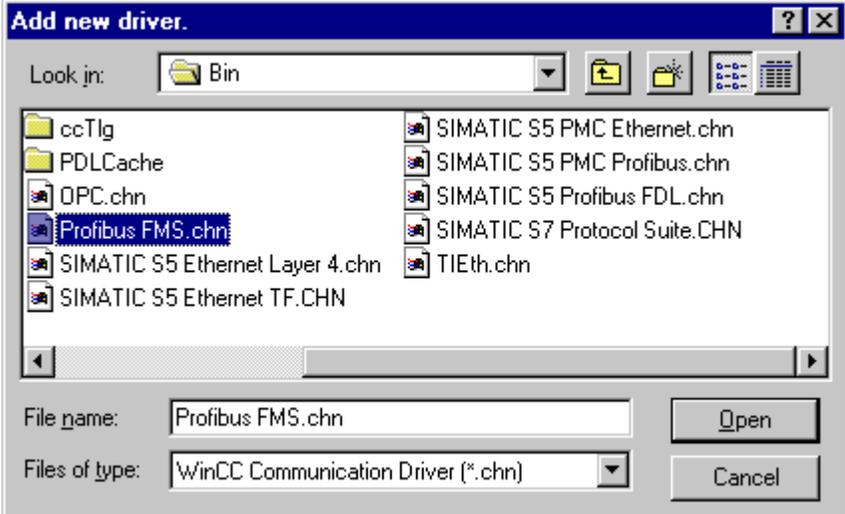
A: Creating the WinCC Project

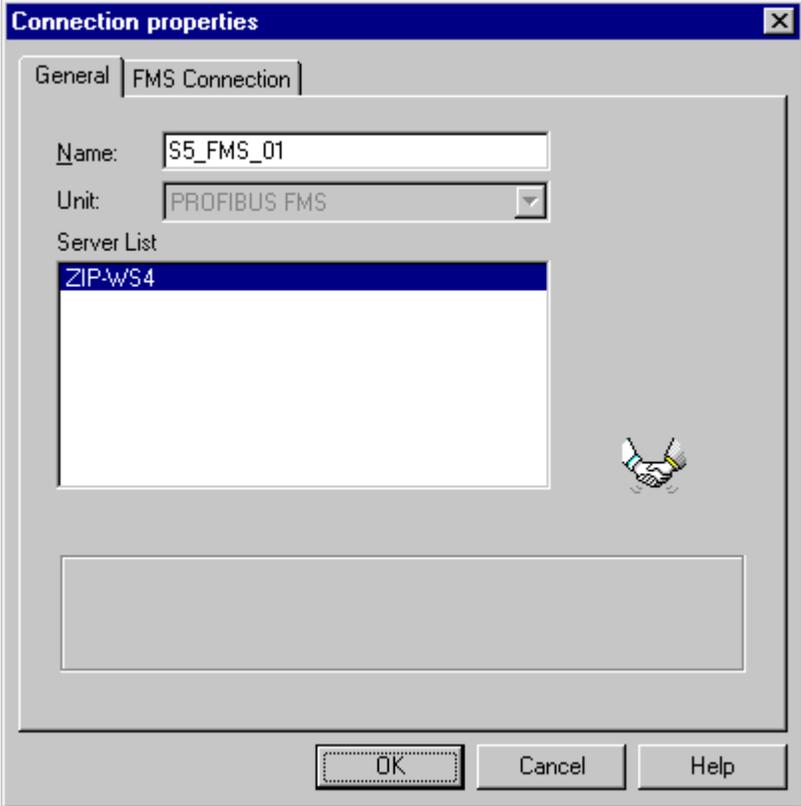
Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>This will display the <i>WinCC Explorer</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

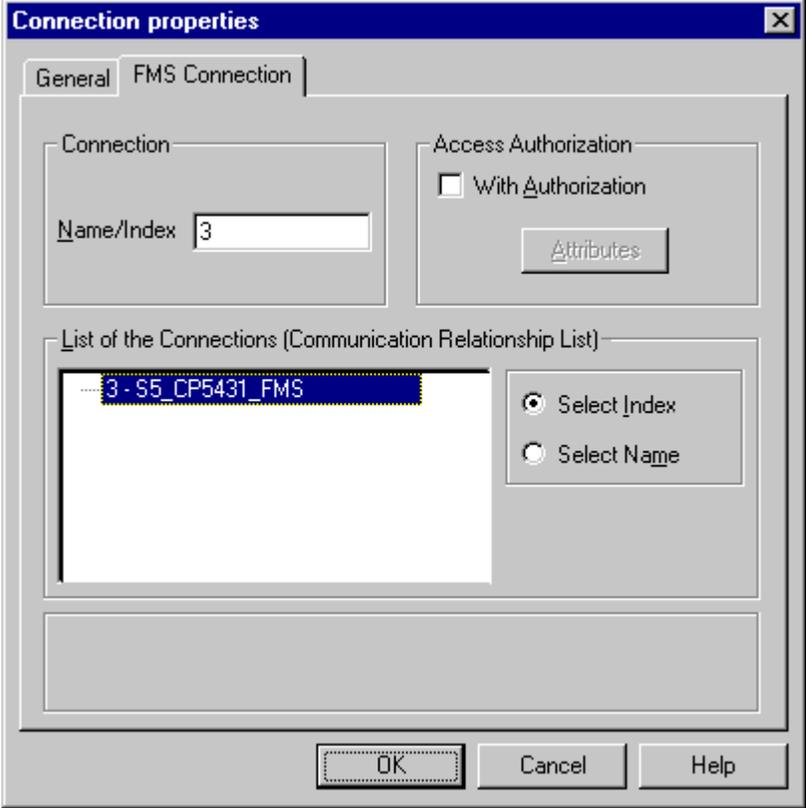
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S5_FMS</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

B: Creating the Connection

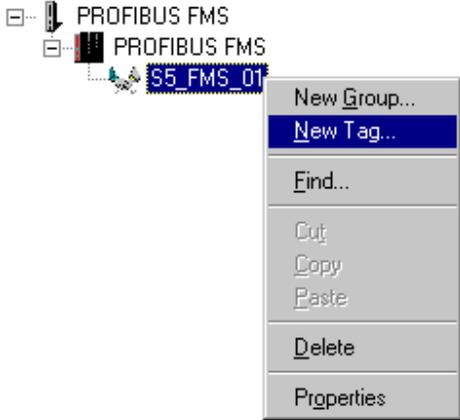
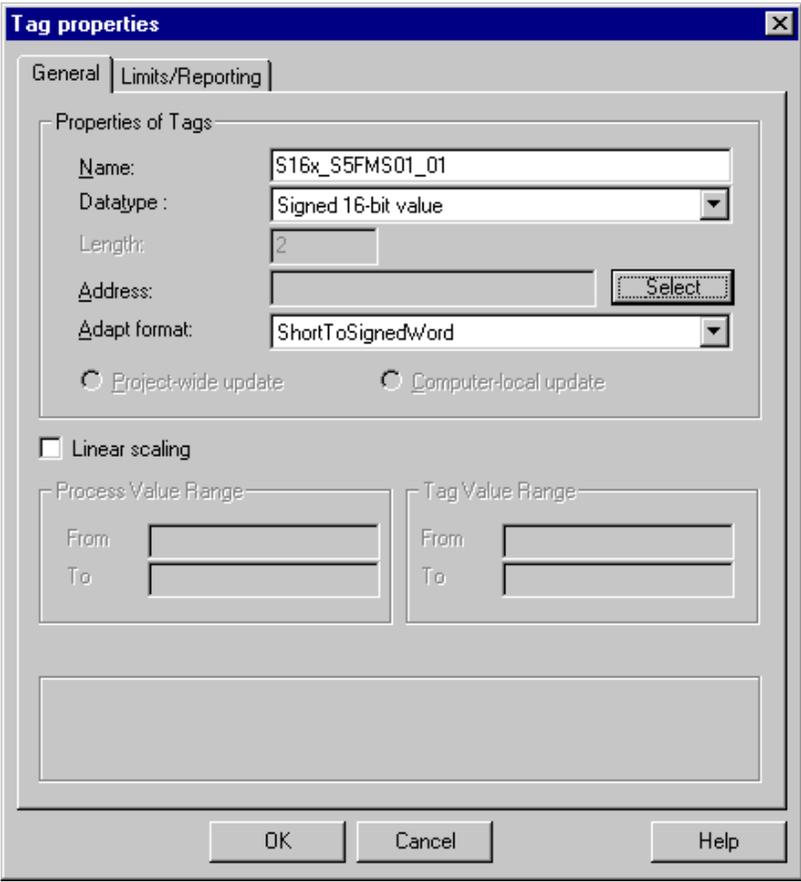
Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

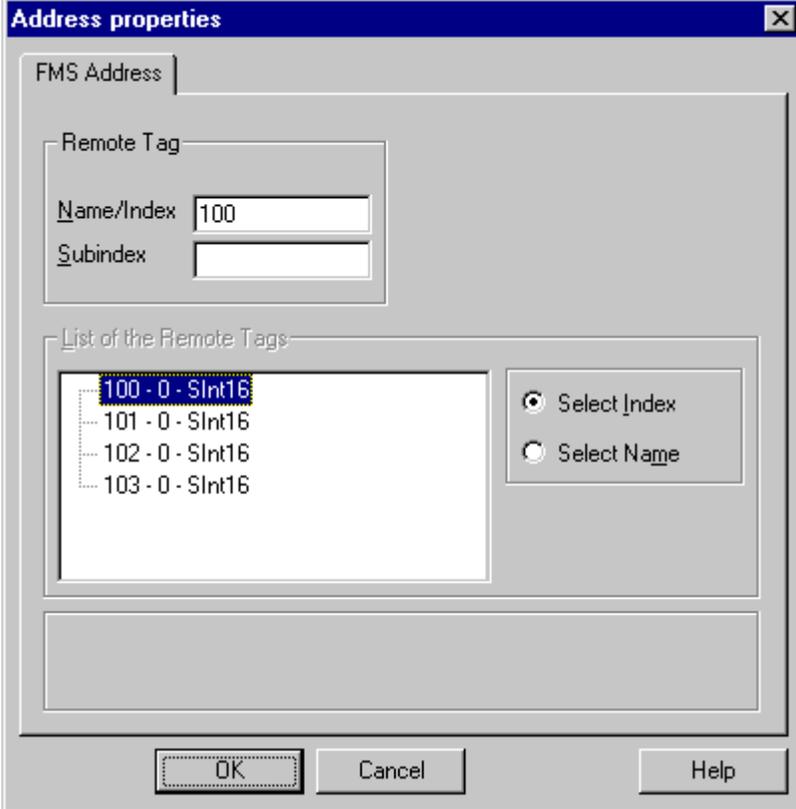
Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. For the communication to the <i>SIMATIC S5</i> via <i>PROFIBUS FMS</i>, the driver <i>PROFIBUS FMS</i> is required. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added driver <i>PROFIBUS FMS</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The driver contains a channel unit named <i>PROFIBUS FMS</i>. Create a new connection for this channel unit by  on <i>PROFIBUS FMS</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> 

Step	B: Creating the Connection
4	<p>The properties dialog box of the connection will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered. In this sample, this is <i>S5_FMS_01</i>.</p>  <p>The screenshot shows a dialog box titled "Connection properties" with a close button (X) in the top right corner. It has two tabs: "General" and "FMS Connection". The "General" tab is active. Inside the dialog, there is a "Name:" label followed by a text input field containing "S5_FMS_01". Below that is a "Unit:" label followed by a dropdown menu showing "PROFIBUS FMS". Underneath is a "Server List" label followed by a list box containing "ZIP-WS4". At the bottom of the dialog are three buttons: "OK", "Cancel", and "Help".</p>

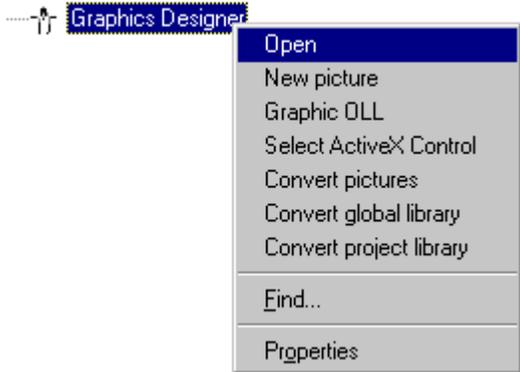
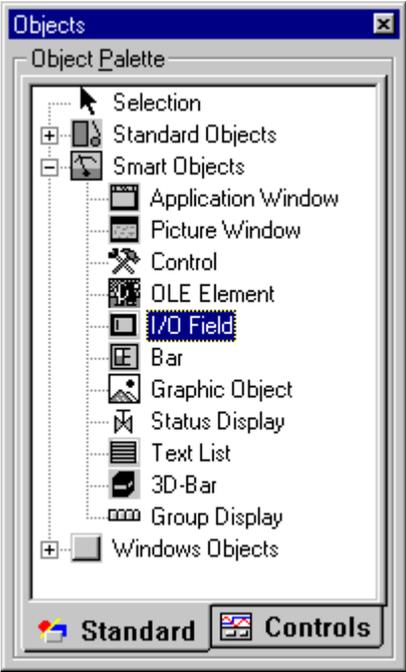
Step	B: Creating the Connection
5	<p>In the <i>FMS Connection</i> tab, specify the desired communication connection.</p> <p>The <i>Connections List</i> shows all connections that have been created in the database file of the communication processor <i>CP 5412 A2</i>. The desired connection can be selected from this list. In this sample, only the FMS connection <i>S5_CP5431_FMS</i> with the index of <i>3</i> exists for the database. Select this connection.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

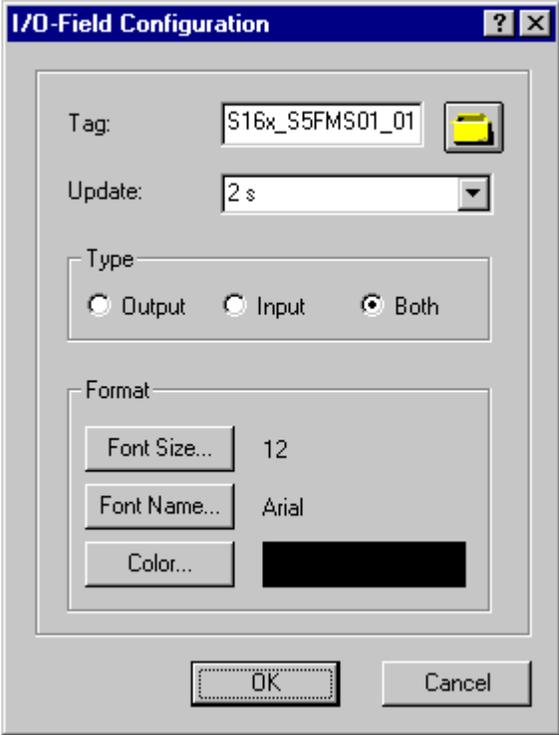
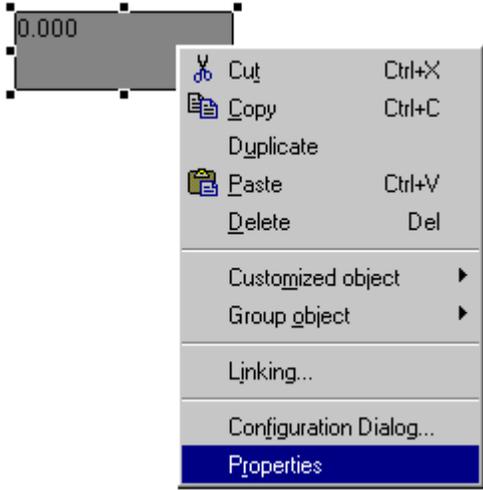
C: Creating the WinCC Tags

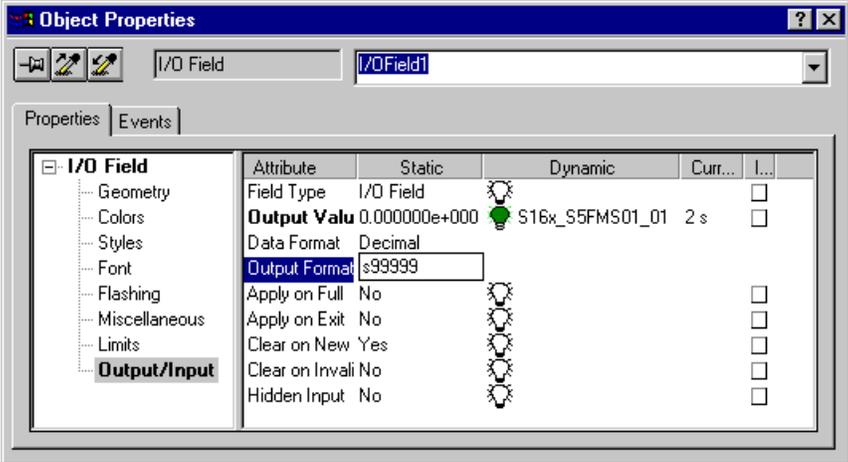
Step	C: Creating the WinCC Tags
1	<p>Creation of the WinCC tags required for the sample.</p> <p>This is done via a  on the newly created connection <i>S5_FMS_01</i> and then selecting <i>New Tag</i> from the pop-up menu.</p> 
2	<p>The properties dialog box of the tag will be displayed. In the sample, the <i>Name</i> of the first tag is <i>S16x_S5FMS01_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type. Click on the <i>Select</i> button to set the <i>Address</i> of the new tag.</p> 

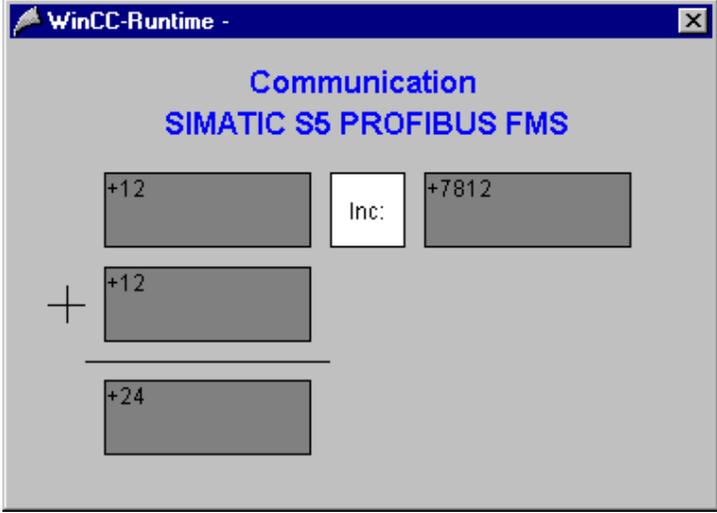
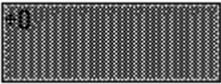
Step	C: Creating the WinCC Tags															
3	<p>The dialog box <i>Address Properties</i> will be displayed.</p> <p>In the <i>Name/Index</i> field, the index of the desired FMS tag is entered. This will be the index that has been defined previously during the creation of the FMS tags in the communication processor <i>CP 5431</i>. If a connection to the communication processor <i>CP 5431</i> already exists, all FMS tags created for this connection will be shown in the <i>List of removed Tags</i> field. This allows for a convenient selection of the desired FMS tags.</p> <p>In this sample, the WinCC tag <i>S16x_S5FMS01_01</i> to be created is assigned the FMS tag with the index <i>100</i>. This is the tag representing the first of the two values to be added.</p> <p>The <i>Address Properties</i> and <i>Tag Properties</i> dialog boxes can be closed by clicking on the <i>OK</i> button.</p> 															
4	<p>Creation of the remaining WinCC tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S5FMS01_01</td> <td>Signed 16-bit value</td> <td>100;0;0</td> </tr> <tr> <td> S16x_S5FMS01_02</td> <td>Signed 16-bit value</td> <td>101;0;0</td> </tr> <tr> <td> S16x_S5FMS01_03</td> <td>Signed 16-bit value</td> <td>102;0;0</td> </tr> <tr> <td> S16x_S5FMS01_04</td> <td>Signed 16-bit value</td> <td>103;0;0</td> </tr> </tbody> </table>	Name	Type	Parameters	 S16x_S5FMS01_01	Signed 16-bit value	100;0;0	 S16x_S5FMS01_02	Signed 16-bit value	101;0;0	 S16x_S5FMS01_03	Signed 16-bit value	102;0;0	 S16x_S5FMS01_04	Signed 16-bit value	103;0;0
Name	Type	Parameters														
 S16x_S5FMS01_01	Signed 16-bit value	100;0;0														
 S16x_S5FMS01_02	Signed 16-bit value	101;0;0														
 S16x_S5FMS01_03	Signed 16-bit value	102;0;0														
 S16x_S5FMS01_04	Signed 16-bit value	103;0;0														

D: Creating the WinCC Screen

Step	D: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	D: Creating the WinCC Screen
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S5FMS01_01</i> via the button displayed below.</p>  <p>Leave the <i>Update</i> of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p>  <p>The <i>I/O-Field Configuration</i> dialog box shows the following settings:</p> <ul style="list-style-type: none"> Tag: S16x_S5FMS01_01 (with a yellow folder icon button) Update: 2 s Type: <input type="radio"/> Output, <input type="radio"/> Input, <input checked="" type="radio"/> Both Format: <ul style="list-style-type: none"> Font Size...: 12 Font Name...: Arial Color...: Black <p>Buttons: <i>OK</i>, <i>Cancel</i></p>
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p>  <p>The context menu for the <i>I/O Field</i> (displaying '0.000') includes the following options:</p> <ul style="list-style-type: none"> Cut (Ctrl+X) Copy (Ctrl+C) Duplicate Paste (Ctrl+V) Delete (Del) Customized object Group object Linking... Configuration Dialog... Properties (highlighted)

Step	D: Creating the WinCC Screen
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits. Close the dialog box by clicking on <i>OK</i>.</p> 
6	<p>Creation of three additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_3_S5FMS_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p> 

Step	D: Creating the WinCC Screen
	<p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the I/O fields. They can be changed by entering values in the individual <i>I/O Fields</i>.</p> <div></div> <p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p> <div></div>

8.4 Diagnosis of the Communication Connection

The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S5_FMS* and the SIMATIC S5 station.

A diagnosis of the sample according to the following description makes only sense, if the checks listed below have been completed successfully.

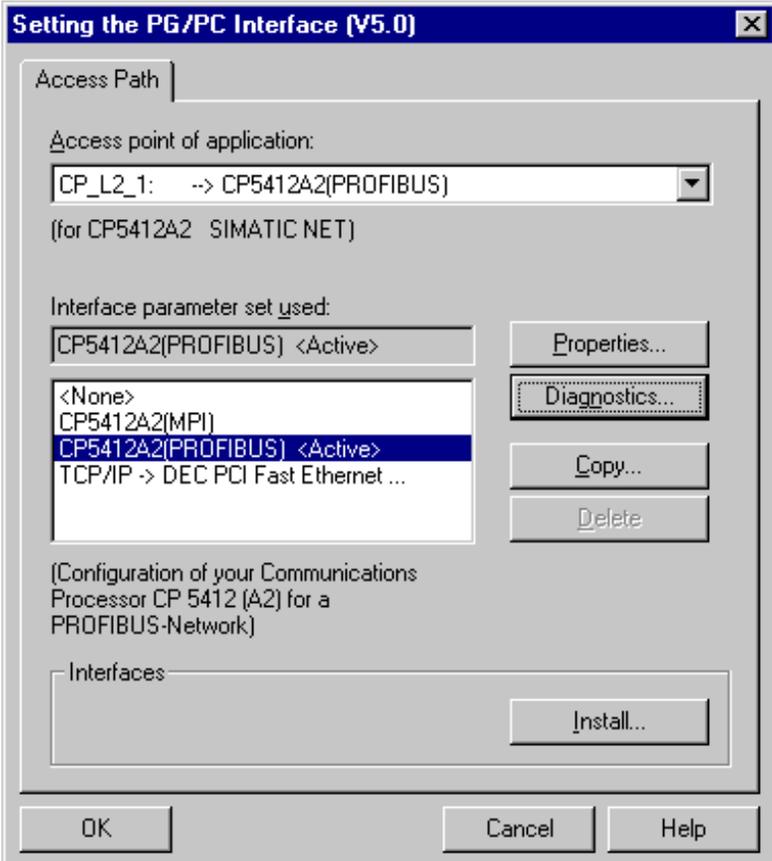
Startup of the Communication Processor CP 5412 A2

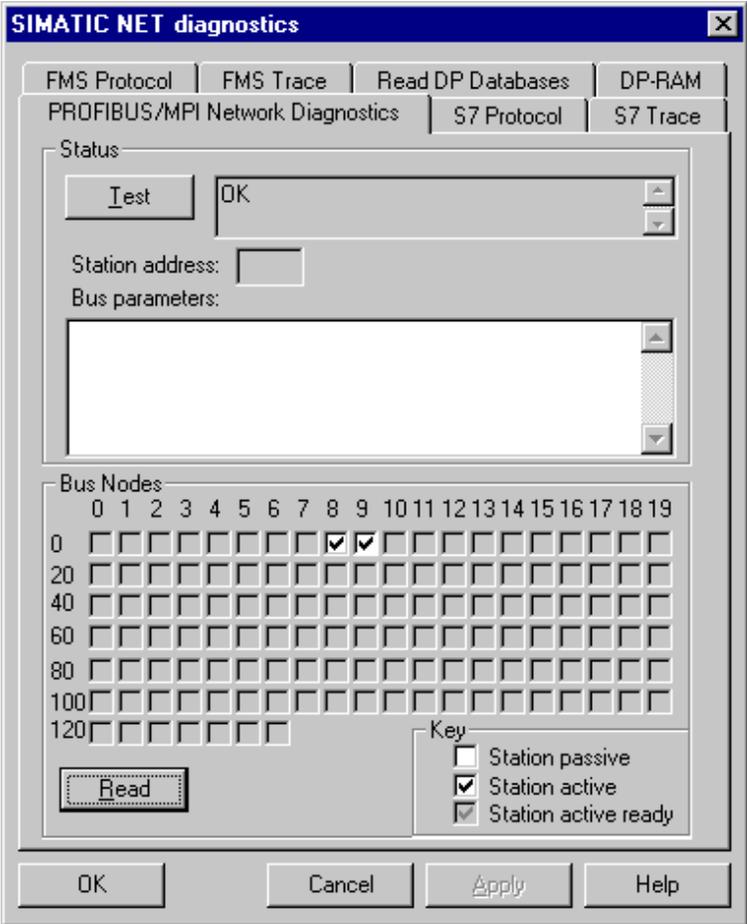
- F: Testing the Communication Processor

Creation of the STEP5 Project S5_FMSst

- D: Starting up the PLC

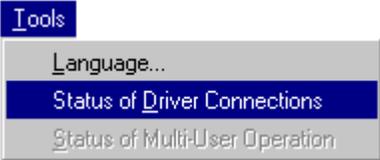
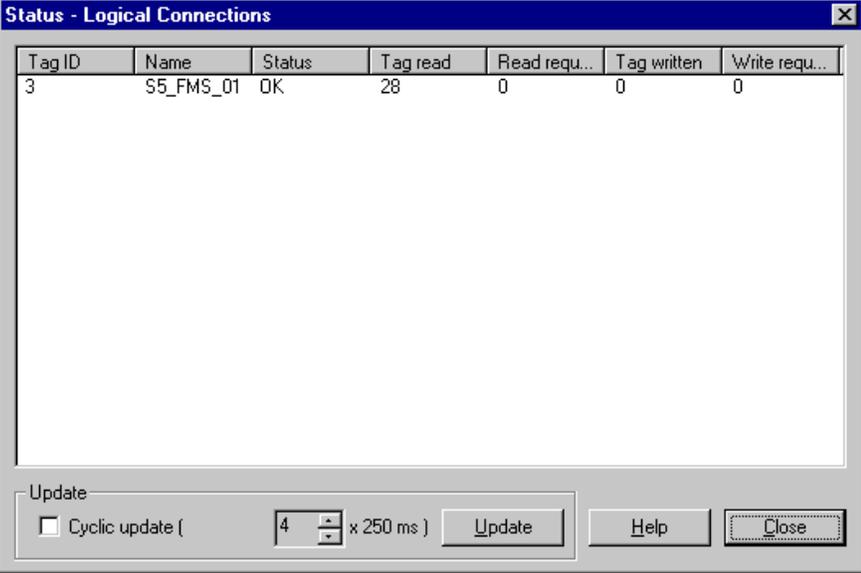
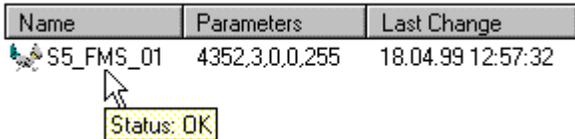
Setting the PG/PC Interface

Step	Setting the PG/PC Interface
1	<p>Diagnosis of the communication connection via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface <i>CP 5412 A2 (PROFIBUS)</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The diagnosis of the communication connection is started by clicking on the <i>Diagnostics</i> button.</p> 

Step	Setting the PG/PC Interface
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>From the <i>PROFIBUS/MPI Network Diagnostics</i> tab, the diagnosis of the communication connection is started by clicking on the <i>Read</i> button. This will display all stations accessible on the bus. For this sample, the address 8 of the communication processor <i>CP 5412 A2</i> as well as the address 9 of the communication processor <i>CP 5431</i> must be marked as occupied.</p> <p>The dialog box can be exited by clicking on <i>OK</i>.</p> 

WinCC Explorer

Step	WinCC Explorer
1	<p>Diagnosis of the communication connection from the <i>WinCC Explorer</i>.</p> <p>Switch the project <i>WinCC_S5_FMS</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar displayed below.</p>  <p>The created WinCC screen <i>com_3_S5FMS_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>

Step	WinCC Explorer
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>S5_FMS_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p> 
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>.</p> <p>The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p> 

Step	WinCC Explorer						
	<p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> <table border="1"><thead><tr><th>Name</th><th>Type</th><th>Parameters</th></tr></thead><tbody><tr><td>S16x_S5FMS01_01</td><td>Signed 16-bit value</td><td>100;0;0</td></tr></tbody></table> <div style="border: 1px solid black; background-color: #ffffcc; padding: 2px;"><p>Process value: 78 Quality: c0 Last Change: 7/5/99 11:52:13 AM</p></div>	Name	Type	Parameters	S16x_S5FMS01_01	Signed 16-bit value	100;0;0
Name	Type	Parameters					
S16x_S5FMS01_01	Signed 16-bit value	100;0;0					

9 Communication to the SIMATIC S5 via PROFIBUS FDL

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder C:\Communication_Manual. You have the option to copy the following components to the hard drive:



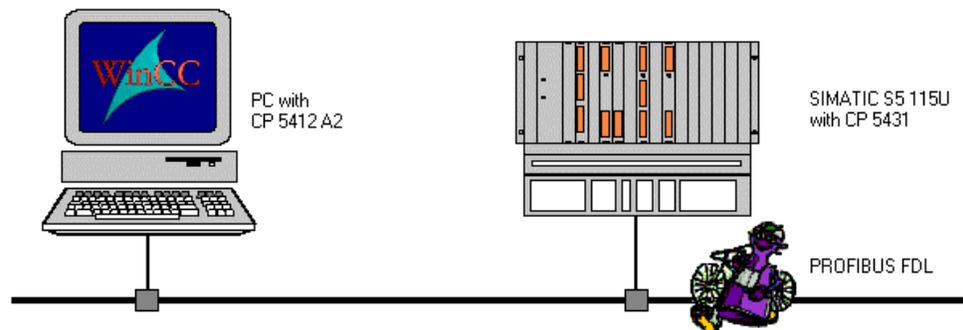
The STEP5 project we will create including the database file of the communication processor CP 5431 FMS/DP.



The WinCC project we will create.

This chapter describes in detail the startup of a communication connection between a SIMATIC S5 and WinCC. The communication connection is implemented via the PROFIBUS, on which the FDL Protocol (Fieldbus Data Link) is running.

Overview of the Structure of the Sample



On the computer side, the connection to the *PROFIBUS* network is established via the communication processor *CP 5412 A2*. To install this communication processor in the computer, the driver *PB DP-5412*, located on the *SIMATIC NET* CD-ROM, is needed. However, it is also possible to use the *PB S7-5412* or *PB FMS-5412* drivers. In the WinCC project, the communication driver *SIMATIC S5 PROFIBUS FDL* must be installed. This communication driver is used to configure the connection to the *SIMATIC S5*.

The PLC *SIMATIC S5 115U* is equipped with the CPU module *CPU 944*. The connection to the network is established via the communication processor *CP 5431 FMS/DP*. For the configuration of this communication processor, the communication package *SINEC NCM for COMs* is required.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Startup of the Communication Processor CP 5412 A2
- Creation of the STEP5 Project S5_FDLst
- Creation of the WinCC Project WinCC_S5_FDL
- Diagnosis of the Communication Connection

Required Software

Name	Description
SIMATIC NET	Driver <i>PB DP-5412</i> from the <i>SIMATIC NET</i> CD-ROM for the installation of the communication processor <i>CP 5412 A2</i> .
STEP5	STEP5 software for the creation of the STEP5 project. Communication package <i>SINEC NCM for COMs</i> for the configuration of the communication processor <i>CP 5431 FMS/DP</i> .
WinCC	WinCC with communication driver <i>SIMATIC S5 PROFIBUS FDL</i> for the creation of the WinCC project and for the configuration of the connection to the PLC.

Required Computer Hardware

Name	Description
Communication Processor	Communication processor <i>CP 5412 A2</i> to establish the connection to the PLC's communication processor.

Required PLC Hardware

Name	Description
Rack	Rack <i>CR 700-3</i> .
Power Supply	Power supply <i>PS 951</i> .
CPU Module	CPU module <i>CPU 944</i> .
Communication Processor	Communication processor <i>CP 5431 FMS/DP</i> .

9.1 Startup of the Communication Processor CP 5412 A2

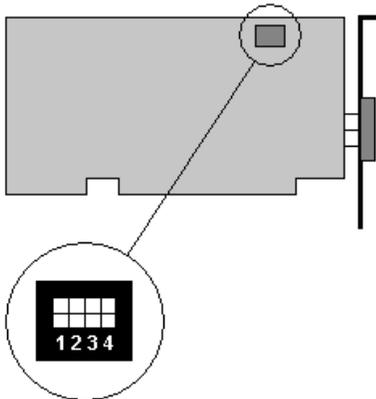
The following description details the configuration steps necessary to successfully start up the communication processor *CP 5412 A2*.

Overview of the Configuration Steps

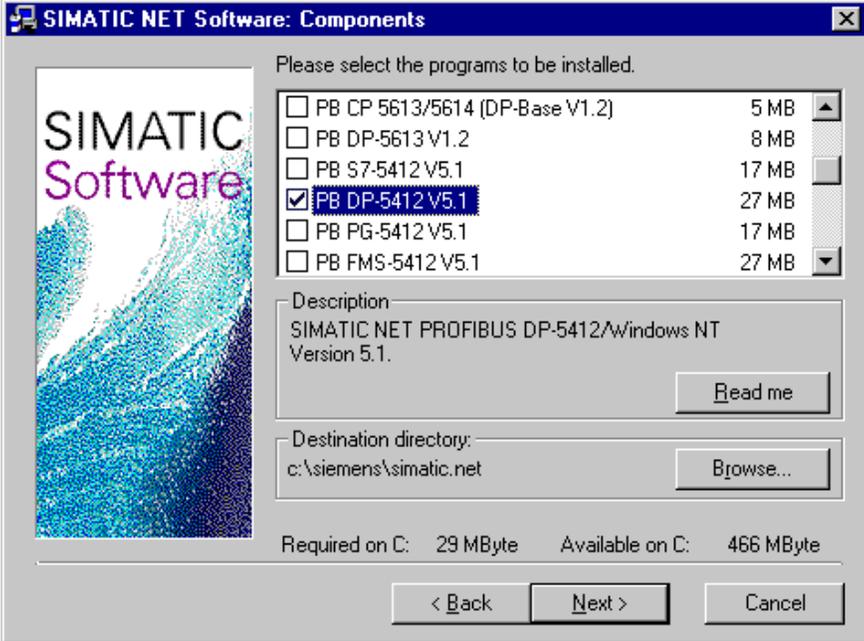
The following lists the configuration steps necessary to start up the communication processor *CP 5412 A2*:

- A: Mounting the Communication Processor in the Computer
- B: Installing the Communication Driver
- C: Installing the Communication Processor
- D: Assigning the Communication Processor
- E: Testing the Communication Processor

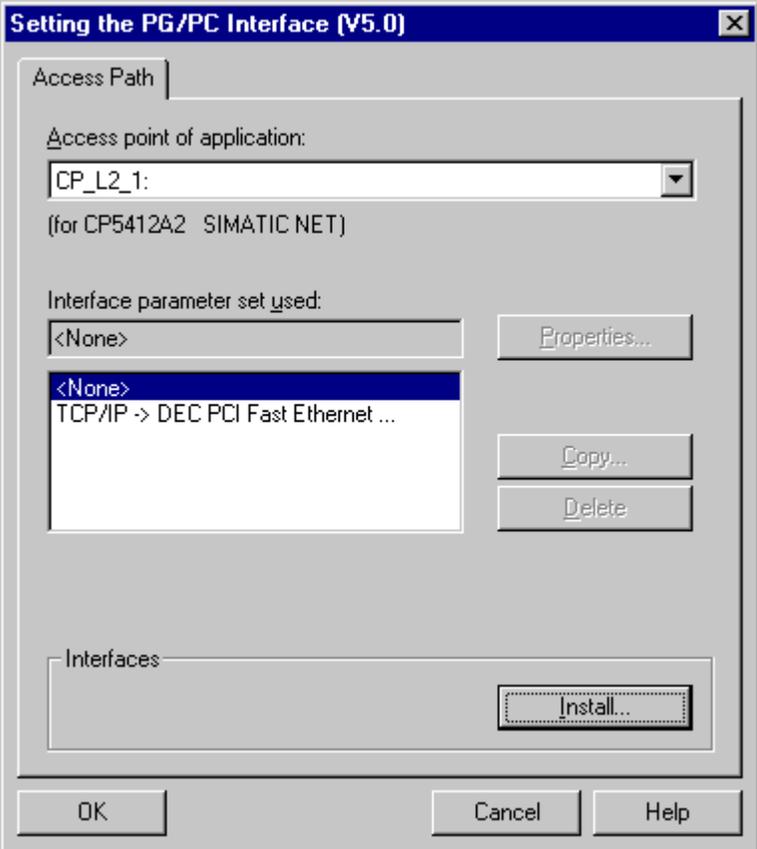
A: Mounting the Communication Processor in the Computer

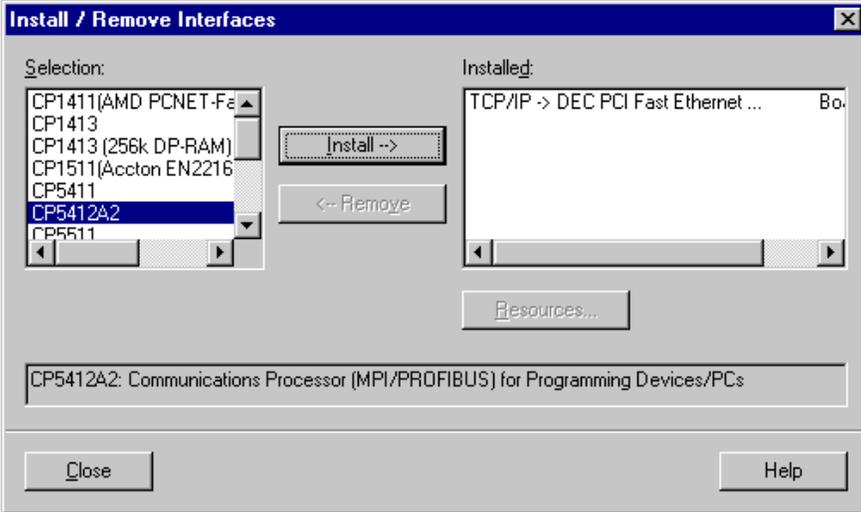
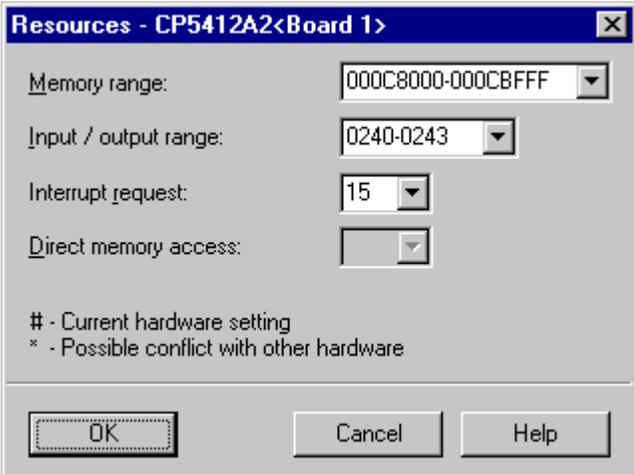
Step	A: Mounting the Communication Processor in the Computer																																		
1	<p>Check the selected jumper settings at the <i>CP 5412 A2</i>.</p> <p>During the installation of the <i>CP 5412 A2</i>, the <i>I/O Range</i> must be specified. The <i>I/O Range</i> is set via <i>jumper</i>s.</p> <p>By default, the <i>I/O Range</i> is set to <i>0240-0243</i>. However, other settings are also possible. The following graphic illustrates the jumper settings necessary for the various <i>I/O Ranges</i>.</p> <div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="border-bottom: 1px solid black;">I/O Area</th> <th style="border-bottom: 1px solid black;">1-2-3-4</th> </tr> </thead> <tbody> <tr><td>0240-0243</td><td>0 0 0 0</td></tr> <tr><td>0244-0247</td><td>0 0 0 1</td></tr> <tr><td>0248-024B</td><td>0 0 1 0</td></tr> <tr><td>024C-024F</td><td>0 0 1 1</td></tr> <tr><td>0280-0283</td><td>0 1 0 0</td></tr> <tr><td>0284-0287</td><td>0 1 0 1</td></tr> <tr><td>0288-028B</td><td>0 1 1 0</td></tr> <tr><td>028C-028F</td><td>0 1 1 1</td></tr> <tr><td>0300-0303</td><td>1 0 0 0</td></tr> <tr><td>0304-0307</td><td>1 0 0 1</td></tr> <tr><td>0308-030B</td><td>1 0 1 0</td></tr> <tr><td>030C-030F</td><td>1 0 1 1</td></tr> <tr><td>0390-0393</td><td>1 1 0 0</td></tr> <tr><td>0394-0397</td><td>1 1 0 1</td></tr> <tr><td>0398-039B</td><td>1 1 1 0</td></tr> <tr><td>039C-039F</td><td>1 1 1 1</td></tr> </tbody> </table> </div> <p style="margin-left: 40px;">Switch Up = 1 Switch Down = 0</p>	I/O Area	1-2-3-4	0240-0243	0 0 0 0	0244-0247	0 0 0 1	0248-024B	0 0 1 0	024C-024F	0 0 1 1	0280-0283	0 1 0 0	0284-0287	0 1 0 1	0288-028B	0 1 1 0	028C-028F	0 1 1 1	0300-0303	1 0 0 0	0304-0307	1 0 0 1	0308-030B	1 0 1 0	030C-030F	1 0 1 1	0390-0393	1 1 0 0	0394-0397	1 1 0 1	0398-039B	1 1 1 0	039C-039F	1 1 1 1
I/O Area	1-2-3-4																																		
0240-0243	0 0 0 0																																		
0244-0247	0 0 0 1																																		
0248-024B	0 0 1 0																																		
024C-024F	0 0 1 1																																		
0280-0283	0 1 0 0																																		
0284-0287	0 1 0 1																																		
0288-028B	0 1 1 0																																		
028C-028F	0 1 1 1																																		
0300-0303	1 0 0 0																																		
0304-0307	1 0 0 1																																		
0308-030B	1 0 1 0																																		
030C-030F	1 0 1 1																																		
0390-0393	1 1 0 0																																		
0394-0397	1 1 0 1																																		
0398-039B	1 1 1 0																																		
039C-039F	1 1 1 1																																		
2	<p>Mount the module according to the installation instructions. Among other things, follow the steps for handling electrostatic sensitive devices (ESD). The module must only be installed while the computer is off.</p> <p>For the communication card <i>CP 5412 A2</i>, a free ISA slot in the computer is required. After the installation of the <i>CP 5412 A2</i>, close the computer's case and start the computer.</p>																																		

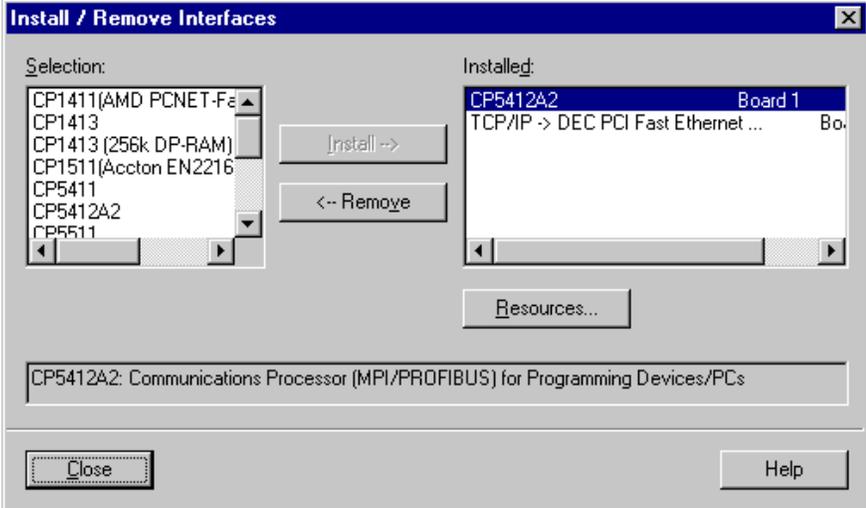
B: Installing the Communication Driver

Step	B: Installing the Communication Driver
1	<p>Installation of the communication driver <i>PB DP-5412</i> from the <i>SIMATIC NET</i> CD-ROM.</p> <p>After inserting the <i>SIMATIC NET</i> CD-ROM, the installation program is automatically started. If this is not the case, open the <i>Windows NT Explorer</i> and start the <i>setup.exe</i> program located on the CD-ROM.</p> <p>The installation of the software is started via the button displayed below.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> SIMATIC NET Software Installieren </div> <p>Follow the instructions of the installation program. On the <i>Components</i> page, the check-box of the driver <i>PB DP-5412</i> to be installed must be selected. Finish the installation.</p> 

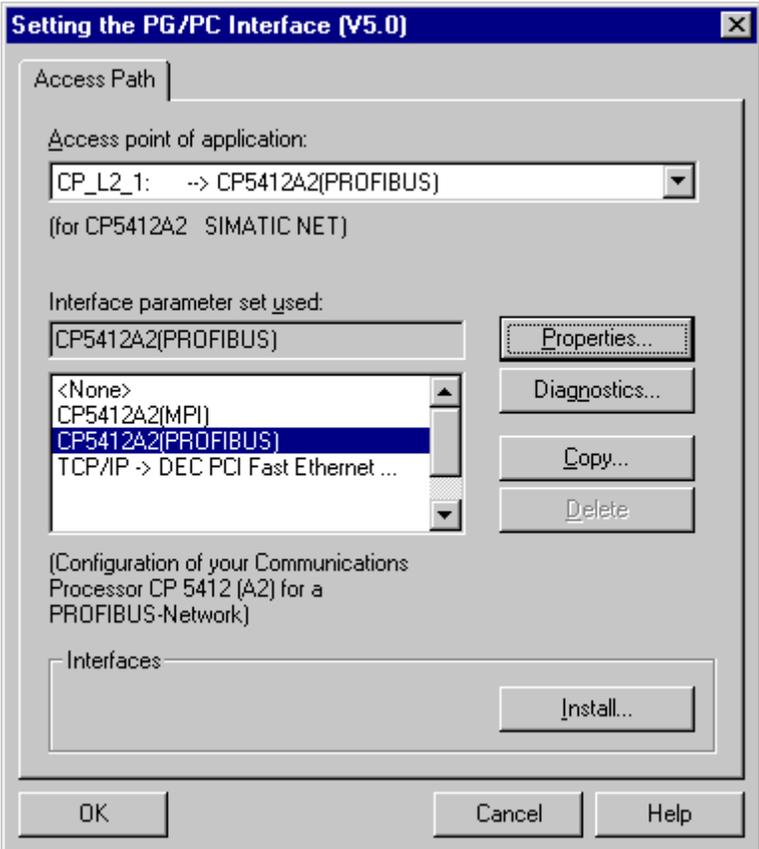
C: Installing the Communication Processor

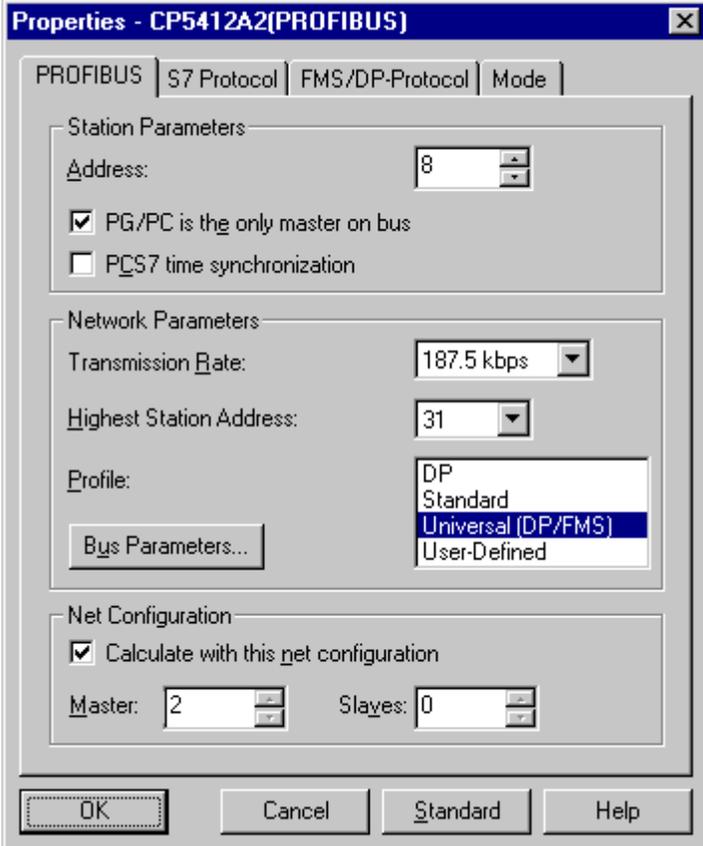
Step	C: Installing the Communication Processor
1	<p>Install the communication processor CP 5412 A2 via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>The dialog box for installing a new interface is opened via the <i>Install</i> button.</p> 

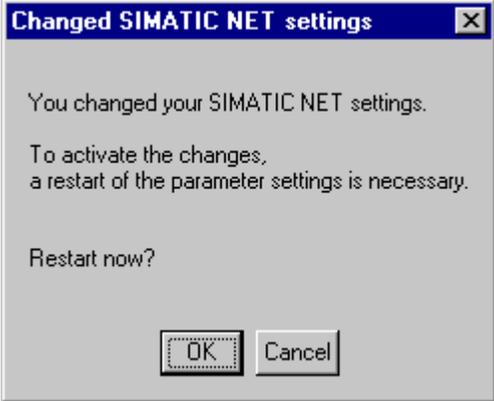
Step	C: Installing the Communication Processor
3	<p>The dialog box <i>Install/Remove Modules</i> will be displayed. The <i>Selection</i> field lists all interfaces that can be installed. Among them will be the entry for the <i>CP 5412 A2</i>, if the communication driver has been installed previously as outlined in step B.</p> <p>From the <i>Selection</i> field, select the entry <i>CP 5412 A2</i>. The installation of the communication processor is started by clicking on the <i>Install -></i> button.</p> 
4	<p>The dialog box <i>Resources - CP 5412 A2</i> will be displayed.</p> <p>The settings for the <i>Memory Range</i>, <i>I/O Range</i> and <i>Interrupt</i> have to be specified.</p> <p>The <i>I/O Range</i> has already been determined via the Jumper Settings at the <i>CP 5412 A2</i>.</p> <p>Make sure that the assigned resources have not already been taken by other modules in the computer. Information about already taken system resources can be obtained from the <i>Resources</i> tab accessed via <i>Start</i> → <i>Programs</i> → <i>Administrative Tools (Common)</i> → <i>Windows NT Diagnostics</i>.</p> <p>Close the <i>Resources</i> tab by clicking on <i>OK</i>.</p> 

Step	C: Installing the Communication Processor
5	<p>In the dialog box <i>Install/Remove Modules</i>, the <i>Installed</i> field will now contain the entry for the <i>CP 5412 A2</i>.</p> <p>Exit the dialog box <i>Install/Remove Modules</i> via the <i>Close</i> button.</p>  <p>The screenshot shows a dialog box titled "Install / Remove Interfaces". It has two main sections: "Selection:" and "Installed:". The "Selection:" list contains the following items: CP1411 (AMD PCNET-Fa), CP1413, CP1413 (256k DP-RAM), CP1511 (Accton EN2216), CP5411, CP5412A2, and CP5511. The "Installed:" list contains: CP5412A2 Board 1 and TCP/IP -> DEC PCI Fast Ethernet ... Bo. There are buttons for "Install ->", "<- Remove", "Resources...", "Close", and "Help". A status bar at the bottom of the dialog box displays "CP5412A2: Communications Processor (MPI/PROFIBUS) for Programming Devices/PCs".</p>

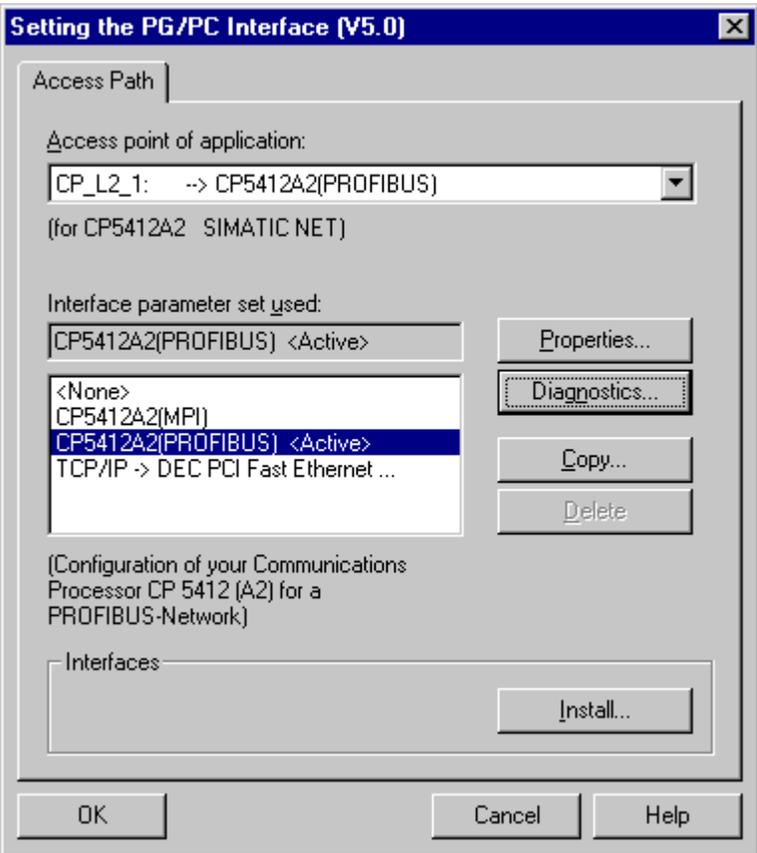
D: Assigning the Communication Processor

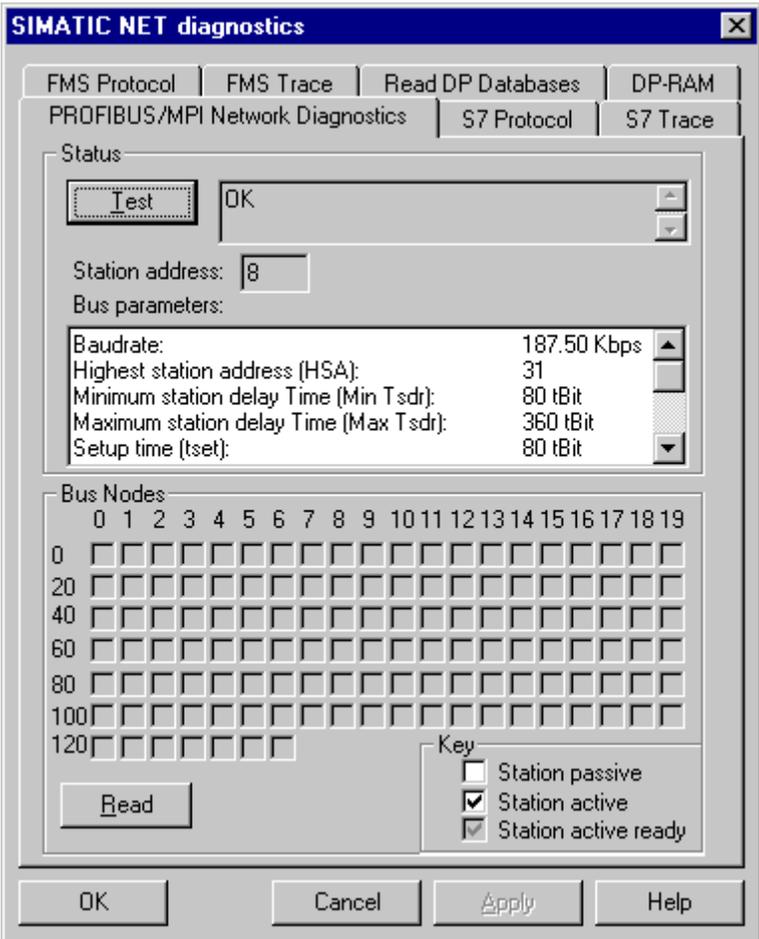
Step	D: Assigning the Communication Processor
1	<p>In the program <i>Setting the PG/PC Interface</i>, assign the access point <i>CP_L2_1</i>: to the just installed interface.</p> <p>The access point <i>CP_L2_1</i>: is the default access point used by WinCC for the communication via the <i>PROFIBUS</i>. It has been created automatically during the installation of the communication driver <i>PB DP-5412</i>.</p> <p>In the field <i>Access Point of the Application</i>, set the entry <i>CP_L2_1</i>:. In the field below, select the entry <i>CP 5412 A2 (PROFIBUS)</i>. This completes the assignment between the access point and the communication processor.</p> 

Step	D: Assigning the Communication Processor
2	<p>Setting the properties of the communication processor <i>CP 5412 A2</i>.</p> <p>The dialog box for setting the properties is opened via the <i>Properties</i> button of the <i>Setting the PG/PC Interface</i> program.</p> <p>The dialog box <i>Properties - CP 5412 (PROFIBUS)</i> will be displayed.</p> <p>In the <i>PROFIBUS</i> tab, station and network related parameters are set.</p> <p>In this sample, the <i>Local Station Address</i> of the communication processor is set to 8.</p> <p>For the <i>PROFIBUS Network</i>, a <i>Baud Rate</i> of 187.5 kBit/s is selected. The <i>Highest Station Address</i> is set to the value of 31. As the <i>Profile</i>, <i>Universal (DP/FMS)</i> is selected.</p> <p>The network settings just made for all stations in the <i>PROFIBUS network</i> must be uniform. They must also be entered as the network parameters in the database file created for the communication processor <i>CP 5431</i>.</p> 

Step	D: Assigning the Communication Processor
3	<p>Exit the program <i>Setting the PG/PC Interface</i> via the <i>OK</i> button.</p> <p>A dialog box will be displayed requesting the restart of the <i>CP 5412 A2</i>.</p> <p>Acknowledge this dialog box by clicking on <i>OK</i>, which will result in the restart of the communication processor <i>CP 5412 A2</i>.</p> <p>This completes the installation of the communication processor.</p> 

E: Testing the Communication Processor

Step	E: Testing the Communication Processor
1	<p>Test the communication processor <i>CP 5412 A2</i> via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface to be checked. In this case, select the entry <i>CP 5412 A2 (PROFIBUS)</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The check for a proper installation is activated by clicking on the <i>Diagnostics</i> button.</p> 

Step	E: Testing the Communication Processor
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>In the <i>PROFIBUS/MPI Network Diagnostics</i> tab, the diagnosis is started via the <i>Test</i> button. The result of the diagnosis will be displayed immediately following.</p> <p>If the result of the diagnosis is positive (correct installation), the dialog box can be exited with <i>OK</i>. In this case, the program <i>Setting the PG/PC Interface</i> can also be closed by clicking on <i>OK</i>. The configuration of the communication to the S5 via <i>PROFIBUS FDL</i> is continued in the following section.</p> <p>However, if the result of the diagnosis is negative (incorrect installation), the error must be localized and corrected. Troubleshooting procedures are described in the section <i>Is the Communication Module in the Computer operational?</i>.</p> 

9.2 Creation of the STEP5 Project S5_FDLst

The following description details the configuration steps necessary to create and start up the STEP5 project *S5_FDLst*.

Overview of the Configuration Steps

The following lists the configuration steps necessary to create the STEP5 project *S5_FDLst*:

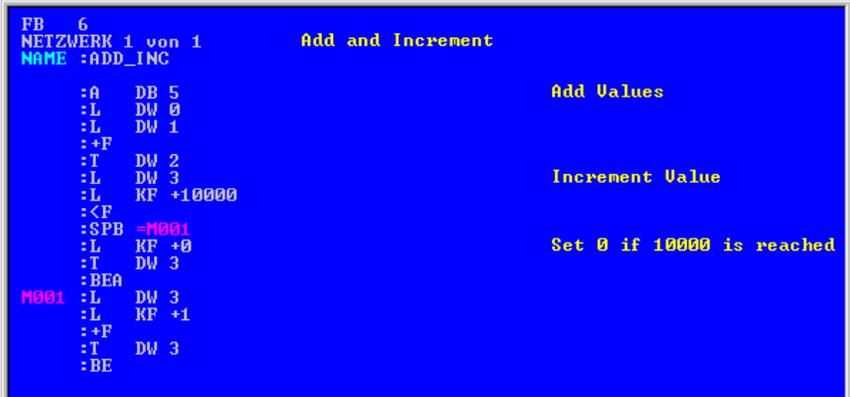
- A: Installing the Hardware and Software
- B: Creating the STEP5 Program
- C: Configuring the Communication Processor
- D: Starting up the PLC

A: Installing the Hardware and Software

Step	A: Installing the Hardware and Software
1	<p>Rack-mounting of the modules used.</p> <p>In this sample, the modules to be installed are the power supply <i>PS 951</i>, the CPU module <i>CPU 944</i> and the communication processor <i>CP 5431</i>.</p> <p>Establishing the connection from the programming device to the programming interface of the CPU module.</p> <p>Establishing the connection from the communication processor <i>CP 5412 A2</i> in the computer to the communication processor <i>CP 5431</i> in the PLC.</p>
2	<p>Installing the communication package SINEC NCM for COMs from the corresponding installation disk. This communication package is required for the configuration of the communication processor <i>CP 5431</i>.</p> <p>The installation disk contains the program file <i>install.exe</i>. Start this program. Follow the instructions of the installation program and complete the installation.</p> <div style="text-align: center;">  <p>Install.exe</p> </div>

B: Creating the STEP5 Program

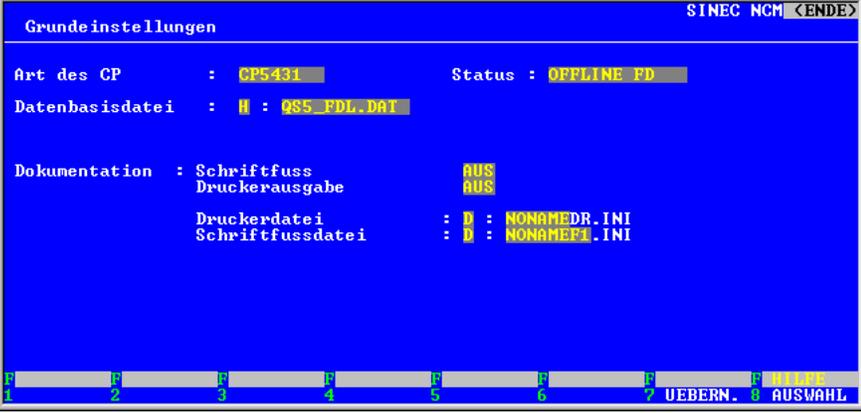
Step	B: Creating the STEP5 Program
1	<p>Creation of a new project with the STEP5 software.</p> <p>Start the STEP5 software. From the <i>Object</i> → <i>Project</i> → <i>Settings</i> → <i>Page1</i> and <i>Page2</i> menus, define the settings for the new project. In the <i>Program File</i> field, specify the name of the new program file to be created. In this sample, the name <i>S5_FDLST.S5D</i> is used. Only the first six characters of the file name can be changed by the user.</p>
2	<p>Creation of a data block.</p> <p>In STEP5, this is accomplished via the <i>Editor</i> → <i>Data Block</i> → <i>menus of</i></p>

Step	B: Creating the STEP5 Program
	<p><i>the program file</i>. As the name of the data block, this sample uses <i>DB5</i>.</p> <p>In this data block, two tags with a length of 16 Bits are created. Their sum is to be determined in <i>OBI</i> and then be written to another tag with a length of 16 Bits. One additional tag with a length of 16 Bits is created, whose value is cyclically incremented in <i>OBI</i>.</p> <p>The tags created in the data block <i>DB5</i> are visualized in the WinCC project. To do so, WinCC tags with corresponding addresses are created there.</p> <p>The following graphic displays the programmed data block <i>DB5</i>.</p> 
3	<p>Creation of a function block, which makes available the functionality of the sample program.</p> <p>Two values stored in the <i>DB5</i> are added and the sum again stored in the <i>DB5</i>. Additionally, a value stored in the <i>DB5</i> is incremented every program cycle. If this value reaches 10000, it is reset back to 0. In STEP5, the creation of a new function block is carried out via the <i>Editor</i> → <i>STEP5 Block</i> → <i>menus of the program file</i>. As the name of the program block, this sample uses <i>FB6</i>.</p> 
4	<p>Transfer of the blocks required for the communication into STEP5. The blocks can be found on the WinCC CD-ROM or they can be copied from the supplied STEP5 project.</p> <p>These are the standard function blocks <i>FB9 L2STARTUP</i> and <i>FB10 L2SNDRCV</i>. They must be transferred into the STEP5 program. The blocks support 5 different FDL connection instruction types.</p> <p>For each of these instruction types, a predefined work-DB is available, which contains various message data. For this sample, only instructions for read and write request from WinCC are required. This requires the transfer of the work-DBs <i>DB11</i> and <i>DB12</i> into STEP5.</p> <p>In the PLC, the handling blocks <i>SEND</i>, <i>RECEIVE</i>, <i>SYNCHRON</i> and <i>CONTROL</i> must be available. For the <i>SIMATIC S5 115U</i> PLC used in this sample, these are the blocks <i>FB244</i>, <i>FB245</i>, <i>FB247</i> and <i>FB249</i>.</p>

Step	B: Creating the STEP5 Program
5	<p>Creation of the startup blocks.</p> <p>The startup blocks define the communication parameters, register the work-DBs and synchronize the communication processor. These steps are all performed by a call of the function block <i>FB9 L2STARTUP</i>.</p> <p>During the call of the function block, the interface number <i>SSNR</i> of the <i>CP 5431</i> is transferred as a parameter. As the <i>RADR</i> parameter, the PROFIBUS address of the communication processor <i>CP 5412 A2</i> in the computer is specified. In this sample, this is 8.</p> <p>In addition, the connection parameters of the instruction types used must be specified. On the one hand, these are the parameters <i>RVC4</i> and <i>RVC5</i>, which indicate the Service Access Points of the WinCC station. These SAPs are specified in WinCC during the creation of the connection. On the other hand, these are the parameters <i>ANR4</i> and <i>ANR5</i>. These are the instruction numbers, which have been set during the configuration of the FDL connections for the communication processor <i>CP 5431</i>. For both instructions, the numbers of the work-DBs must be indicated as well.</p> <p>The remaining call parameters of the <i>FB9</i> are not important for the functionality of this sample.</p> <div style="border: 1px solid black; background-color: #0000FF; color: #00FF00; padding: 5px;"> <pre> OB 21 NETZWERK 1 von 1 Synchronisieren CP 5431 : :SPA FB 9 NAME :L2ANLAUF SSNR : KF +0 SSNR of CP 5431 TIM3 : KT 000.0 nr TIM7 : KT 000.0 nr RADR : KF +8 PROFIBUS-Address WinCC Station RUC3 : KF +0 nr RUC4 : KF +4 SAP WRITE RUC5 : KF +6 SAP READ RUC6 : KF +0 nr RUC7 : KF +0 nr ANR3 : KF +0 nr ANR4 : KF +134 ANR WRITE ANR5 : KF +135 ANR READ ANR6 : KF +0 nr ANR7 : KF +0 nr DBX3 : KY 000,000 nr DBX4 : KY 000,011 Work-DB WRITE DBX5 : KY 000,012 Work-DB READ DBX6 : KY 000,000 nr DBX7 : KY 000,000 nr S/R3 : KF +0 nr : :BE </pre> </div>

Step	B: Creating the STEP5 Program
6	<p>Creation of the <i>OBI</i>.</p> <p>The communication to WinCC via the communication processor <i>CP 5431</i> is carried out by the function block <i>FB10 L2SNDRCV</i>. In this sample, WinCC is able to send and request data. For this purpose, only two transfer parameters are relevant during the call of the <i>FB10</i>. These are the parameters <i>DBX4</i> and <i>DBX5</i>, which indicate the numbers of both work-DBs of the instruction types used.</p> <p>In addition, the previously created block <i>FB6</i> is called in the <i>OBI</i>.</p> <div style="border: 1px solid black; background-color: #000080; color: #008000; padding: 5px;"> <pre> OB 1 NETZWERK 1 von 1 Communication Manual : :SPA FB 10 Communication NAME :L2SNDRCV STR3 : M 0.0 nr STR7 : M 0.0 nr RDY : MB 0 nr FAIL : MB 0 nr TUC3 : T 0 nr TUC7 : T 0 nr DBX3 : KV 000,000 nr DBX4 : KV 000,011 Work-DB WRITE DBX5 : KV 000,012 Work-DB READ DBX6 : KV 000,000 nr DBX7 : KV 000,000 nr : :SPA FB 6 Add and Increment NAME :ADD_INC : :BE </pre> </div>
7	<p>Loading the STEP5 program into the PLC.</p> <p>In STEP5, this is done via the <i>Object</i> → <i>Blocks</i> → <i>Transfer</i> → <i>PLC File</i> menus. In the Selection field, the option <i>All Blocks</i> must be selected to load all previously created blocks to the PLC.</p>

C: Configuring the Communication Processor

Step	C: Configuring the Communication Processor
1	<p>Start the communication package <i>SINEC NCM for COMs</i> to configure the communication processor <i>CP 5431</i>.</p> <p>From STEP5, start the communication package via the <i>Change</i> → <i>Additional</i> → <i>SINEC NCM for COMs</i> menus.</p>
2	<p>This will open the communication package <i>SINEC NCM for COMs</i>.</p> <p>If no database file is set, the <i>Basic Settings</i> entry mask will initially be displayed. This entry mask can also be opened via the <i>File</i> → <i>Select</i> (or <i>Init.</i> → <i>Edit</i>) menus.</p> <p>In the <i>CP Type</i> field, indicate the type of communication processor used. Via the F8 function key, one of the available communication processors can be set. Select the <i>CP 5431</i>. Set the <i>Status</i> field to <i>OFFLINE FD</i> via the F8 function key. This stores the configuration made in the program to a database file. In the <i>Database File</i> field, specify the name of this database file. This name has to start with the letter <i>Q</i>. For this sample, the name <i>QS5_FDL.DAT</i> is used for the database file.</p> <p>The settings made in the <i>Basic Settings</i> entry mask are applied via the F7 function key.</p> 

Step	C: Configuring the Communication Processor
3	<p>The settings for the basic initialization of the communication processor must be made.</p> <p>They are entered in the <i>Basic Initialization</i> entry mask. This entry mask is opened via the <i>Edit</i> → <i>CP Init.</i> menus.</p> <p>In the <i>L2 Address</i> field, the <i>PROFIBUS Address</i> of the communication processor <i>CP 5431</i> is specified. In this sample, the value <i>9</i> has been entered. This value is one of the parameters that have to be specified during the creation of the connection in WinCC.</p> <p>The remaining settings can be seen in the following graphic. The settings made in the <i>Basic Initialization</i> entry mask are applied via the F7 function key.</p> 
4	<p>Setting the global network parameters.</p> <p>This is done in the <i>Global Network Parameters</i> entry mask, which is opened via the <i>Edit</i> → <i>Global Network Parameters</i> menus.</p> <p>The same <i>network parameters</i> must be used that have been specified as the network parameters during the installation of the communication processor <i>CP 5412 A2</i>. Among other things, the <i>Baud Rate</i> is set to <i>18750 Baud</i> and the <i>Highest Station Address (HSA)</i> to <i>31</i>. The value for the <i>Default SAP</i> is set to <i>2</i>.</p> <p>The settings made in the <i>Global Network Parameters</i> entry mask are applied via the F7 function key.</p> 

Step	C: Configuring the Communication Processor
5	<p>Creation of the FDL connections.</p> <p>This is done in the <i>Connection Editor</i> entry mask. This entry mask is opened via the <i>Edit</i> → <i>Connections</i> → <i>Free Layer2 Connections</i> menus.</p> <p>Two connections are needed: One processes the write requests of WinCC, the other one the read requests of WinCC. The priority of both connections is set to <i>Low</i>. For the connection used to process the write requests of WinCC, this sample uses the value 3 for the Service Access Point <i>SSAP</i> and the value 134 for the instruction number <i>ANR</i>. By hitting the F4 function key, the parameters for the next FDL connection can be entered. This connection will be used to process the read requests of WinCC. This sample uses the value 5 for the <i>SSAP</i> and the value 135 for the <i>ANR</i>.</p> <p>The instruction numbers used for the individual FDL connections were already specified in the startup blocks of STEP5. The SAP values are specified as remote parameters during the creation of the connection in WinCC.</p> <p>The settings made in the <i>Connection Editor</i> entry mask are applied via the F7 function key.</p> 
6	<p>Loading the configuration data of the database file to the communication processor <i>CP 5431</i>.</p> <p>This is done via the <i>Load</i> → <i>CP Database Transfer</i> → <i>FD->CP</i> menus. The configuration data can only be uploaded while the communication processor is in the <i>STOP</i> operating mode.</p> <p>Laden</p> 

D: Starting up the PLC

Step	D: Starting up the PLC
1	<p>Starting the individual modules of the PLC.</p> <p>Previously, the STEP5 program and the database file of the communication processor <i>CP 5431</i> must have been loaded to the PLC.</p> <p>First, the operating mode switch of the communication processor <i>CP 5431</i> is set to the RUN position. The status LEDs <i>RUN</i> and <i>STOP</i> will light up at the communication processor, indicating that the module has not be synchronized.</p> <p>Next, the operating mode switch of the CPU module is set to the <i>RN</i> position. During the startup of the CPU module, the communication processor is synchronized by the startup block. The communication processor's status LED <i>STOP</i> go out. At the CPU module, only the status LED <i>RN</i> will be illuminated.</p>

9.3 Creation of the WinCC Project WinCC_S5_FDL

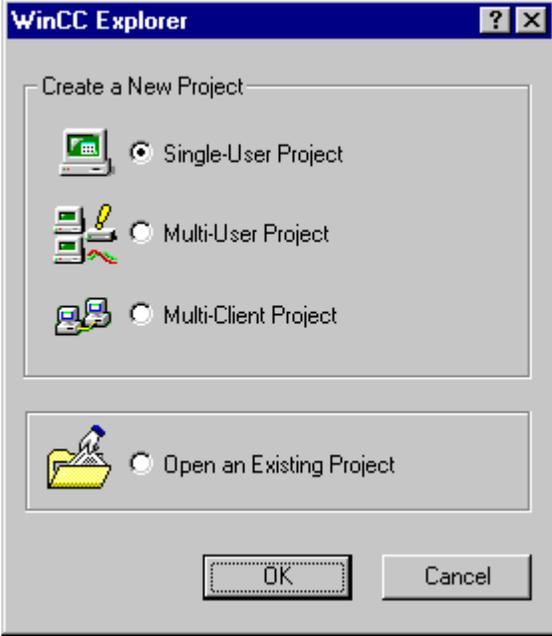
The following description details the configuration steps necessary to create and start up the WinCC project *WinCC_S5_FDL*.

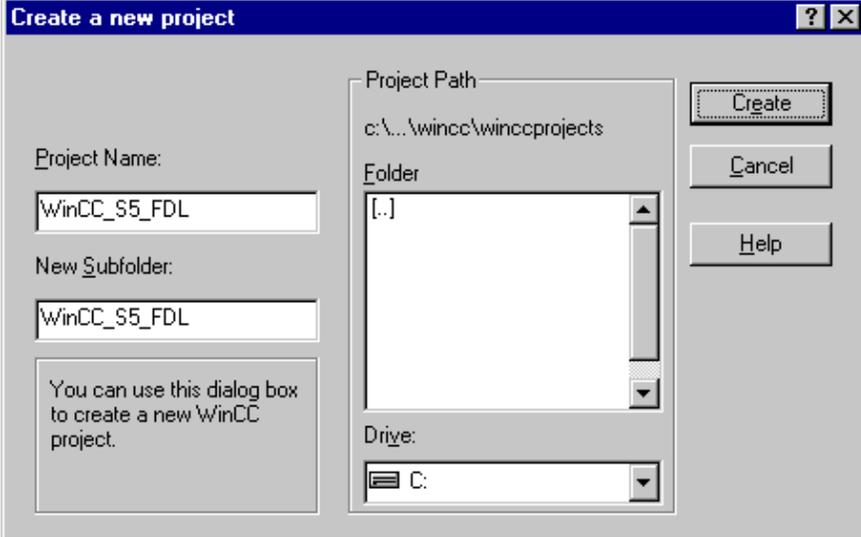
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_S5_FDL*:

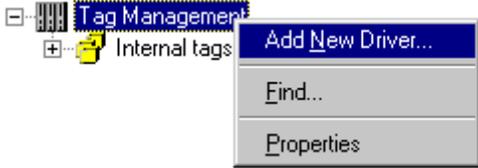
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Tags
- D: Creating the WinCC Screen

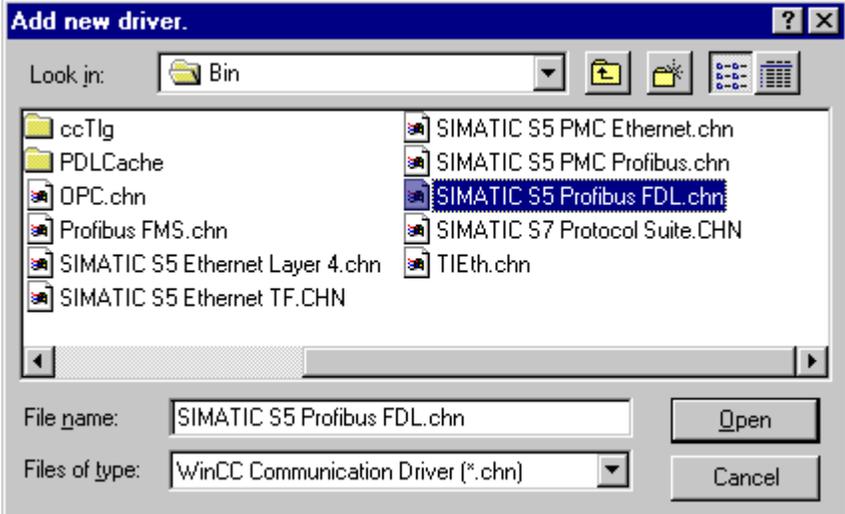
A: Creating the WinCC Project

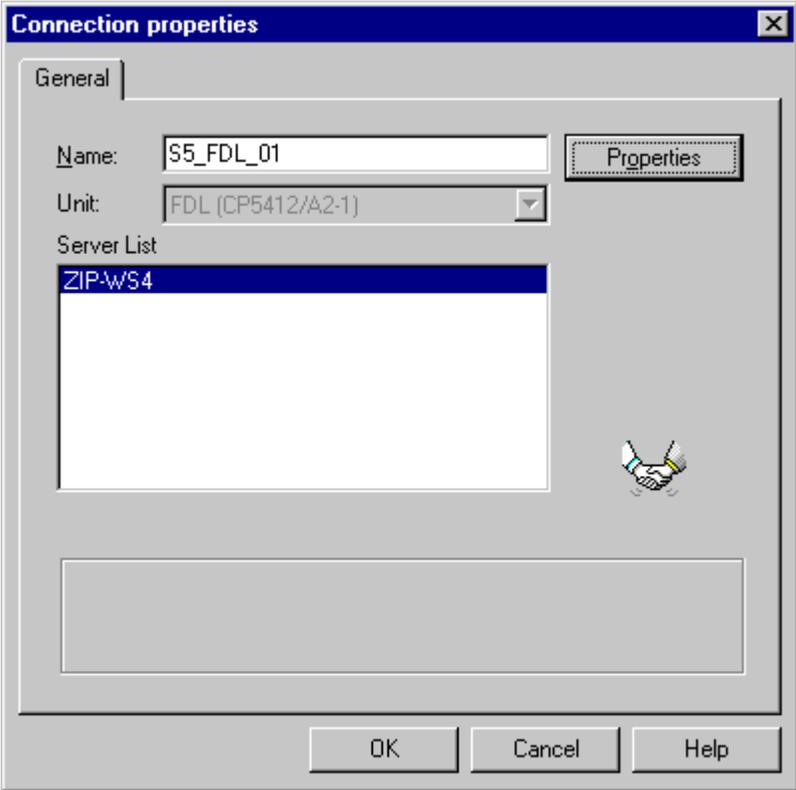
Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>This will display the <i>WinCC Explorer</i>.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_S5_FDL</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

B: Creating the Connection

Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

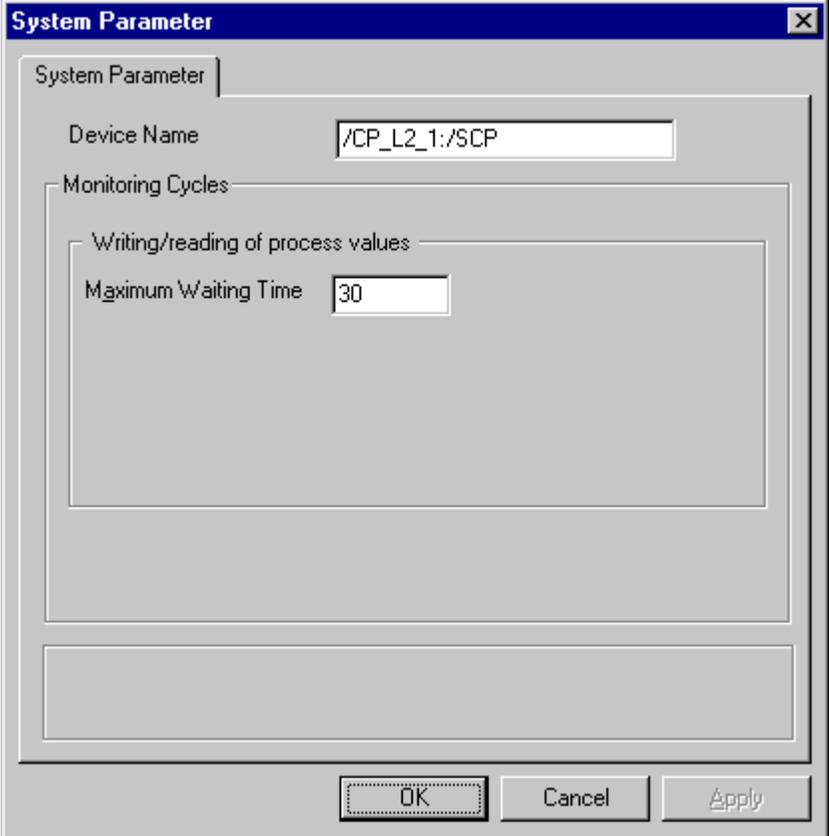
Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. For the communication to the <i>SIMATIC S5</i> via <i>PROFIBUS FDL</i>, the driver <i>SIMATIC S5 PROFIBUS FDL</i> is required. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added driver <i>SIMATIC S5 PROFIBUS FDL</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The driver contains a channel unit named <i>FDL (CP5412/A2-1)</i>. Create a new connection for this channel unit by  on <i>FDL (CP5412/A2-1)</i> and then selecting <i>New Driver Connection</i> from the pop-up menu.</p> 

Step	B: Creating the Connection
4	<p>The properties dialog box of the connection will be displayed.</p> <p>In the <i>General</i> tab, the <i>Name</i> of the new connection is entered. In this sample, this is <i>S7_FDL_01</i>.</p> <p>Click on the <i>Properties</i> button to define the connection properties.</p> 

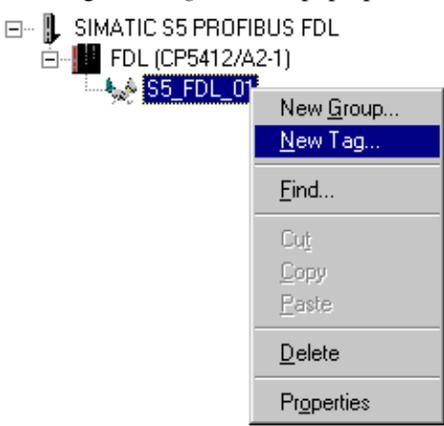
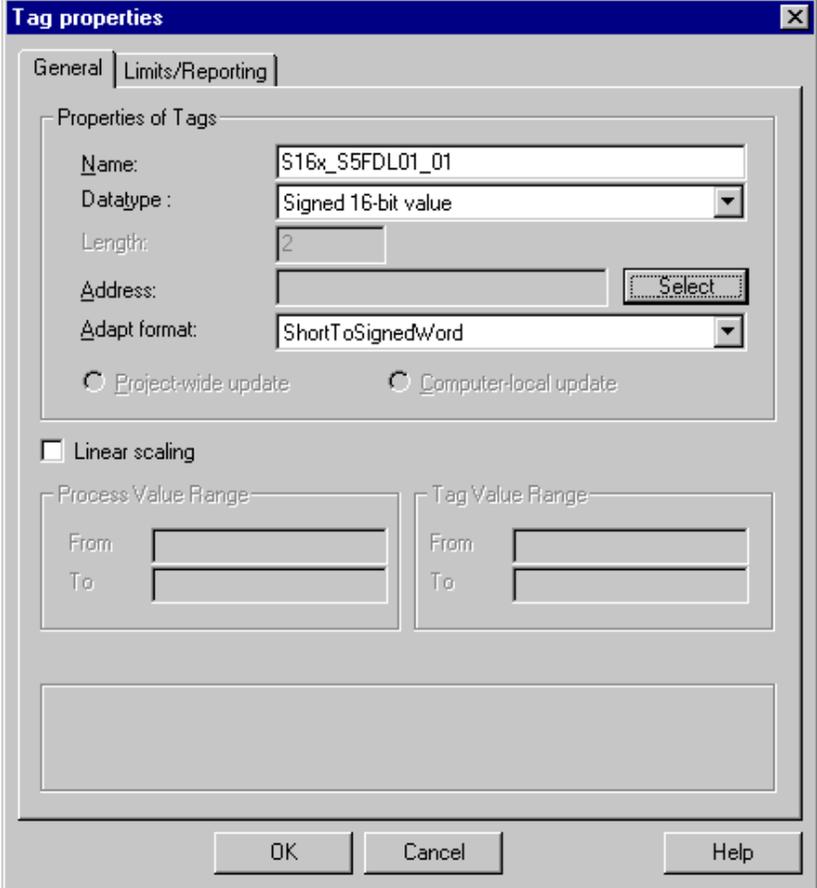
Step	B: Creating the Connection
5	<p>The dialog box <i>Connection Properties</i> will be displayed.</p> <p>In the <i>Connection</i> tab, the parameters of the desired communication connection are defined.</p> <p>In the <i>Profibus</i> field, the PROFIBUS address of the PLC is entered. In this sample, the <i>PLC Station Address</i> has the value 9. The <i>Priority</i> is set to <i>Low</i>.</p> <p>In the <i>READ Function</i> area, the connection settings for reading data from the PLC are made. In order for WinCC to request the data actively, the radio-button <i>OS active, WinCC is the active Partner</i> must be selected. The values for the local Service Access Point and the remote Service Access Point must be defined. In this sample, the value 6 is entered in the <i>Local SAP</i> field and the value 5 in the <i>Remote SAP</i> field.</p> <p>In the <i>WRITE Function</i> area, the connection settings for writing data to the PLC are made. The values for the local Service Access Point and the remote Service Access Point must be defined. In this sample, the value 4 is entered in the <i>Local SAP</i> field and the value 3 in the <i>Remote SAP</i> field.</p> <p>The values entered in this dialog box for the remote SAP have been defined during the creation of the FDL connections for the communication processor <i>CP 5431</i>. The values for the local SAP were already entered in the startup blocks during the creation of the STEP5 program.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p>

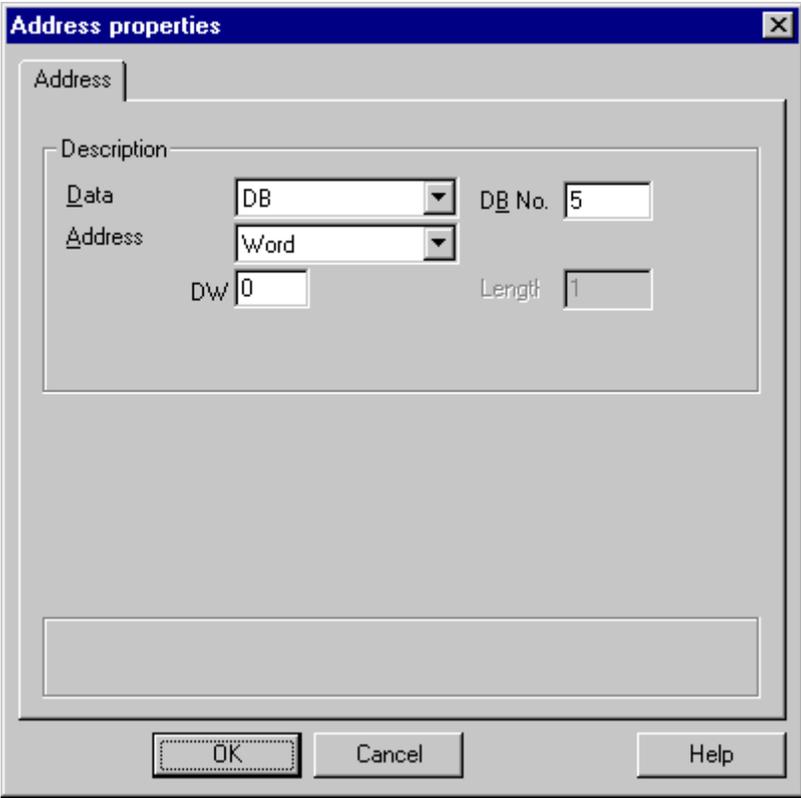
The screenshot shows the 'Connection Parameters' dialog box with the following settings:

- Connection Tab:**
 - Profibus:**
 - PLC Station Address: 9
 - Priority: Low
 - READ - Funktion:**
 - OS active, WinCC is the active partn
 - OS passive, WinCC is the passive partn
 - Own SAP: 6
 - Foreign SA: 5
 - WRITE - Funktion:**
 - Own SAP: 4
 - Foreign SA: 3
- Buttons:** OK, Cancel, Help

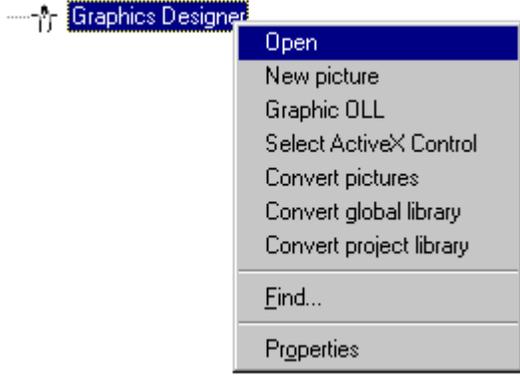
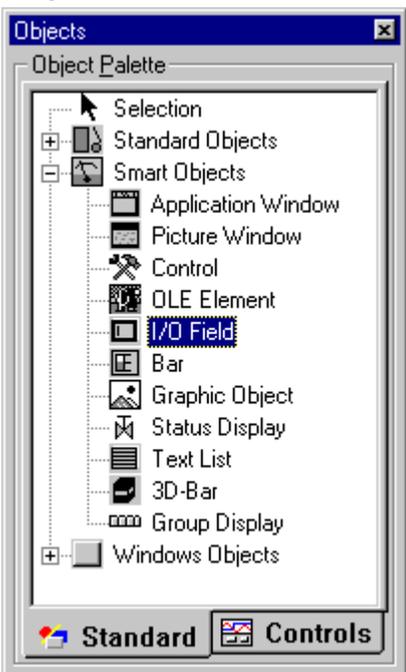
Step	B: Creating the Connection
6	<p>Setting the system parameters of the channel unit.</p> <p>These settings are made in the System Parameters dialog box, which is accessed via a  on the <i>FDL (CP5412/A2-1)</i> entry and then selecting <i>System Parameters</i> from the pop-up menu.</p> <p>In the displayed dialog box, the access point used by WinCC to access the PLC is defined in the <i>Device Name</i> field. By default, the access point <i>CP_L2_1:</i> is set. Previously, during the installation of the communication processor in the computer, the <i>CP 5412 A2</i> has been assigned to the access point <i>CP_L2_1:</i>.</p> <p>Close the dialog box by clicking on <i>OK</i>.</p> 

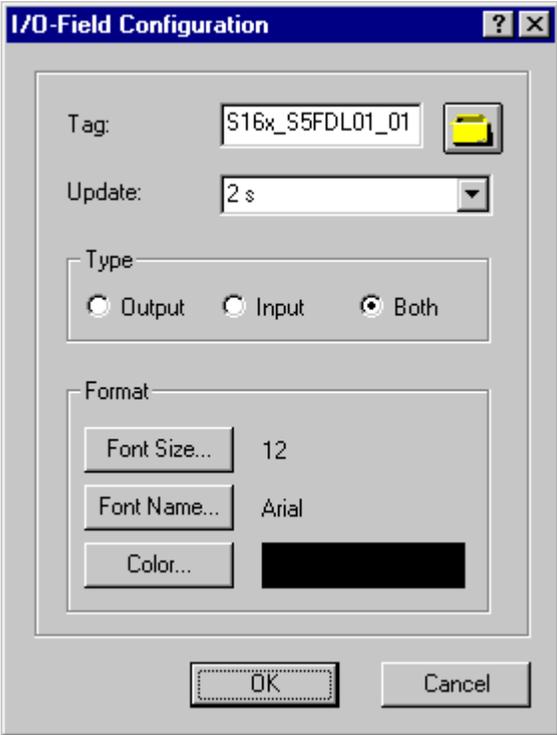
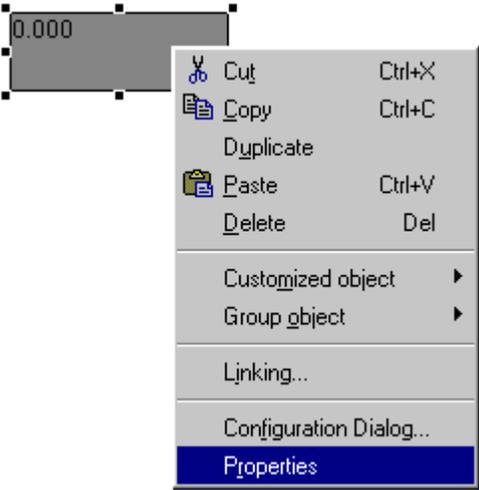
C: Creating the WinCC Tags

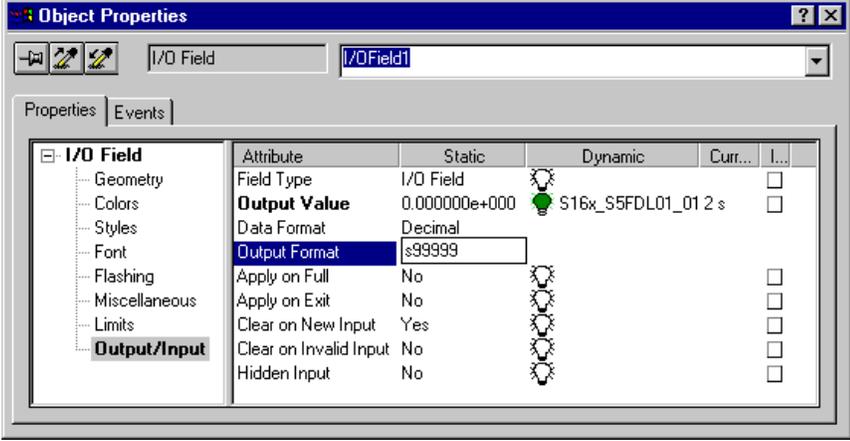
Step	C: Creating the WinCC Tags
1	<p>Creation of the WinCC tags required for the sample.</p> <p>This is done via a  on the newly created connection <i>S5_FDL_01</i> and then selecting <i>New Tag</i> from the pop-up menu.</p> 
2	<p>The properties dialog box of the tag will be displayed. In the sample, the <i>Name</i> of the first tag is <i>S16x_S5FDL01_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type. Click on the <i>Select</i> button to set the <i>Address</i> of the new tag.</p> 

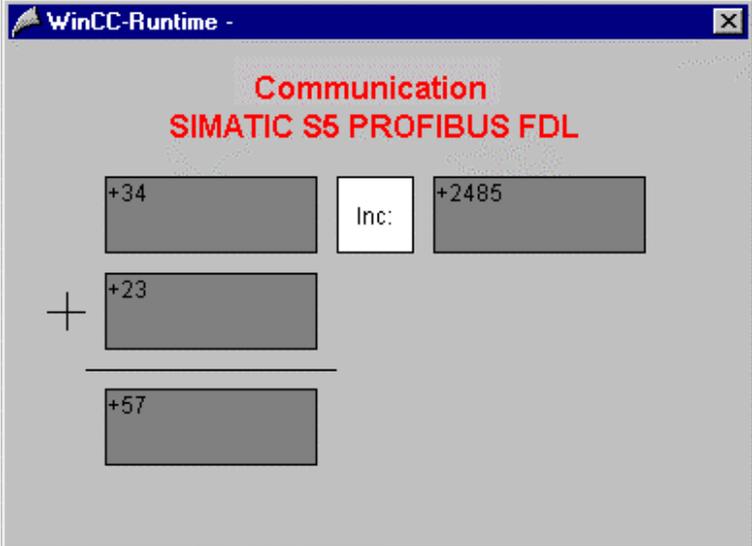
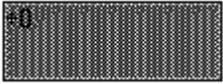
Step	C: Creating the WinCC Tags															
3	<p>The dialog box <i>Address Properties</i> will be displayed.</p> <p>Set <i>DB</i> as the <i>Data Range</i> and the value <i>5</i> as the <i>DB No.</i>. Set <i>Word</i> in the <i>Address</i> field and the value <i>0</i> in the <i>DW</i> field. Close the dialog box by clicking on <i>OK</i>. The properties dialog box of the tag is also closed by clicking on <i>OK</i>.</p> <p>The just created WinCC tag is addressed in the range of the <i>DB5</i>, where the first of the two values to be added is located.</p> <p>The <i>Address Properties</i> and <i>Tag Properties</i> dialog boxes can be closed by clicking on the <i>OK</i> button.</p> 															
4	<p>Creation of the remaining WinCC tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16x_S5FDL01_01</td> <td>Signed 16-bit value</td> <td>DB5,DW0</td> </tr> <tr> <td> S16x_S5FDL01_02</td> <td>Signed 16-bit value</td> <td>DB5,DW1</td> </tr> <tr> <td> S16x_S5FDL01_03</td> <td>Signed 16-bit value</td> <td>DB5,DW2</td> </tr> <tr> <td> S16x_S5FDL01_04</td> <td>Signed 16-bit value</td> <td>DB5,DW3</td> </tr> </tbody> </table>	Name	Type	Parameters	 S16x_S5FDL01_01	Signed 16-bit value	DB5,DW0	 S16x_S5FDL01_02	Signed 16-bit value	DB5,DW1	 S16x_S5FDL01_03	Signed 16-bit value	DB5,DW2	 S16x_S5FDL01_04	Signed 16-bit value	DB5,DW3
Name	Type	Parameters														
 S16x_S5FDL01_01	Signed 16-bit value	DB5,DW0														
 S16x_S5FDL01_02	Signed 16-bit value	DB5,DW1														
 S16x_S5FDL01_03	Signed 16-bit value	DB5,DW2														
 S16x_S5FDL01_04	Signed 16-bit value	DB5,DW3														

D: Creating the WinCC Screen

Step	D: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>S16x_S5FDL01_01</i> via the button displayed below.</p> 

Step	D: Creating the WinCC Screen
	<p>Leave the <i>Update</i> of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p> 

Step	D: Creating the WinCC Screen																																																												
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits. Close the dialog box by clicking on <i>OK</i>.</p>  <table border="1"> <thead> <tr> <th>I/O Field</th> <th>Attribute</th> <th>Static</th> <th>Dynamic</th> <th>Curr...</th> <th>I...</th> </tr> </thead> <tbody> <tr> <td>Geometry</td> <td>Field Type</td> <td>I/O Field</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Colors</td> <td>Output Value</td> <td>0.000000e+000</td> <td> S16x_S5FDL01_01 2 s</td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Styles</td> <td>Data Format</td> <td>Decimal</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Font</td> <td>Output Format</td> <td>s99999</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Flashing</td> <td>Apply on Full</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Miscellaneous</td> <td>Apply on Exit</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Limits</td> <td>Clear on New Input</td> <td>Yes</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Output/Input</td> <td>Clear on Invalid Input</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td></td> <td>Hidden Input</td> <td>No</td> <td></td> <td></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>	I/O Field	Attribute	Static	Dynamic	Curr...	I...	Geometry	Field Type	I/O Field			<input type="checkbox"/>	Colors	Output Value	0.000000e+000	S16x_S5FDL01_01 2 s		<input type="checkbox"/>	Styles	Data Format	Decimal				Font	Output Format	s99999				Flashing	Apply on Full	No			<input type="checkbox"/>	Miscellaneous	Apply on Exit	No			<input type="checkbox"/>	Limits	Clear on New Input	Yes			<input type="checkbox"/>	Output/Input	Clear on Invalid Input	No			<input type="checkbox"/>		Hidden Input	No			<input type="checkbox"/>
I/O Field	Attribute	Static	Dynamic	Curr...	I...																																																								
Geometry	Field Type	I/O Field			<input type="checkbox"/>																																																								
Colors	Output Value	0.000000e+000	S16x_S5FDL01_01 2 s		<input type="checkbox"/>																																																								
Styles	Data Format	Decimal																																																											
Font	Output Format	s99999																																																											
Flashing	Apply on Full	No			<input type="checkbox"/>																																																								
Miscellaneous	Apply on Exit	No			<input type="checkbox"/>																																																								
Limits	Clear on New Input	Yes			<input type="checkbox"/>																																																								
Output/Input	Clear on Invalid Input	No			<input type="checkbox"/>																																																								
	Hidden Input	No			<input type="checkbox"/>																																																								
6	<p>Creation of three additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>																																																												
7	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_3_S5FDL_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p> 																																																												

Step	D: Creating the WinCC Screen
	<p>If the screen is in runtime, the PLC started and the network connection established, the current values of the PLC will be displayed in the I/O fields. They can be changed by entering values in the individual <i>I/O Fields</i>.</p>  <p>The screenshot shows a window titled 'WinCC-Runtime -' with a red title 'Communication SIMATIC S5 PROFIBUS FDL'. It contains several input fields: a top row with '+34', an 'Inc:' button, and '+2485'; a middle row with a '+' sign, a field with '+23', and a horizontal line; and a bottom row with a field containing '+57'.</p> <p>If there is no connection to the PLC, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p>  <p>The second screenshot shows a single grayed-out field containing the value '+0'.</p>

9.4 Diagnosis of the Communication Connection

The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_S5_FDL* and the SIMATIC S5 station.

A diagnosis of the sample according to this description makes only sense, if the checks listed below have been completed successfully.

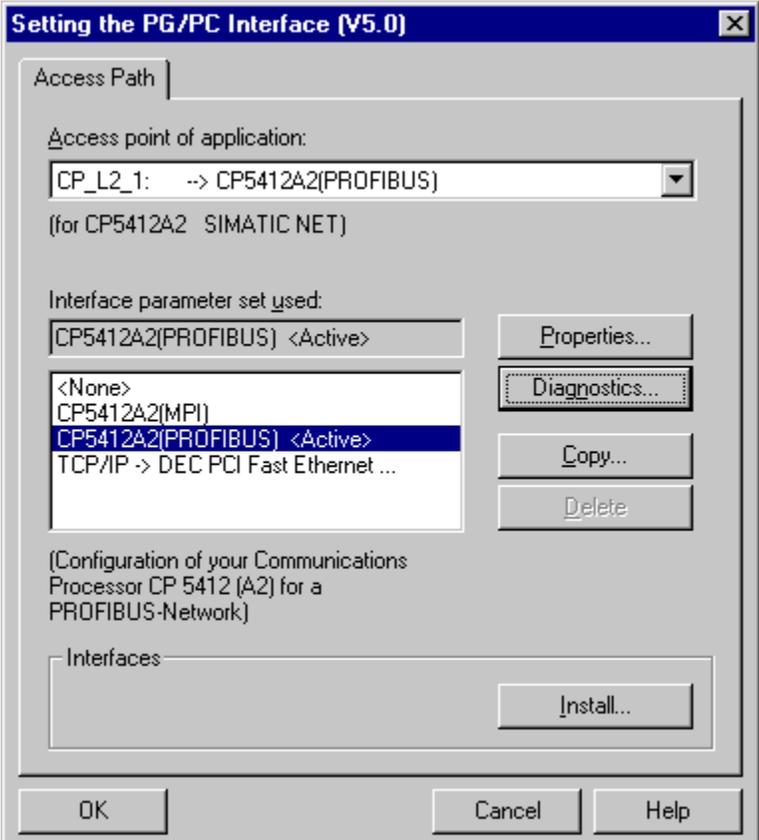
Startup of the Communication Processor CP 5412 A2

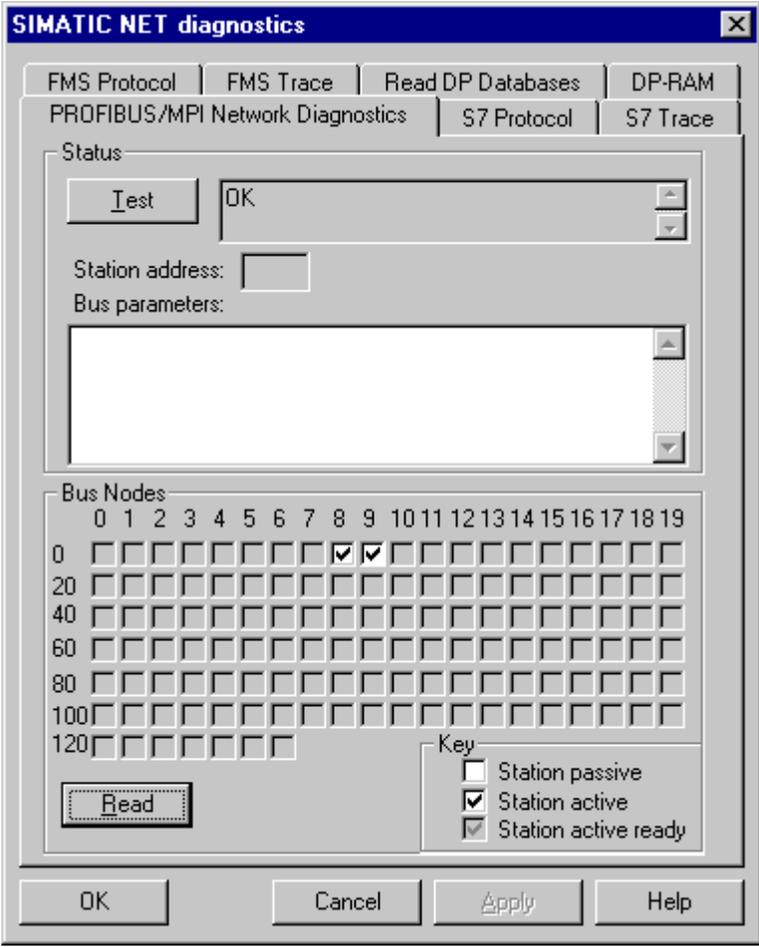
- E: Testing the Communication Processor

Creation of the STEP5 Project S5FDLst

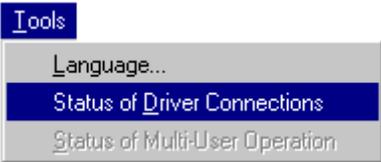
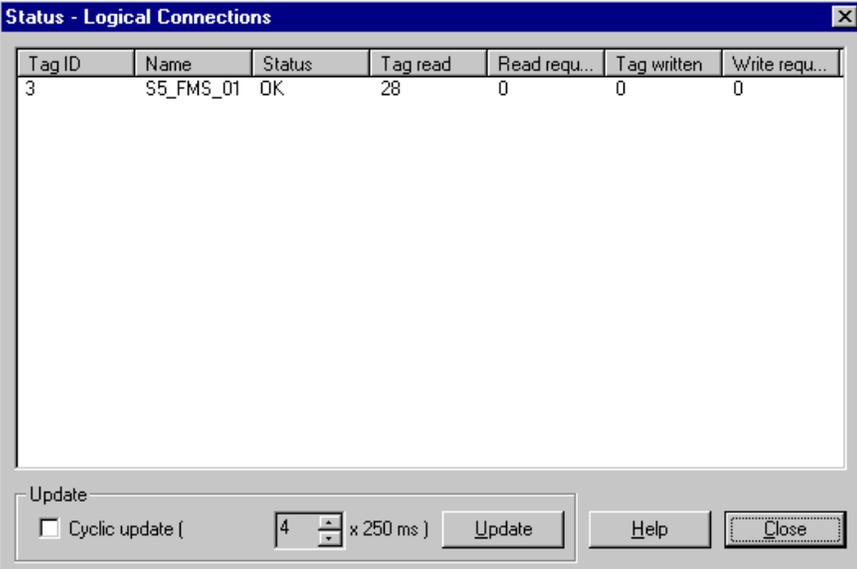
- D: Starting up the PLC

Setting the PG/PC Interface

Step	Setting the PG/PC Interface
1	<p>Diagnosis of the communication connection via the program <i>Setting the PG/PC Interface</i>.</p> <p>This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Setting the PG/PC Interface</i>.</p>  <p>Setting the PG/PC Interface</p>
2	<p>The program <i>Setting the PG/PC Interface</i> will be displayed.</p> <p>Select the interface <i>CP 5412 A2 (PROFIBUS)</i>. Make sure that the assignments between access points and the interfaces are not changed.</p> <p>The diagnosis of the communication connection is started by clicking on the <i>Diagnostics</i> button.</p> 

Step	Setting the PG/PC Interface
3	<p>The dialog box <i>Simatic NET Diagnostics</i> will be displayed.</p> <p>From the <i>PROFIBUS/MPI Network Diagnostics</i> tab, the diagnosis of the communication connection is started by clicking on the <i>Read</i> button. This will display all stations accessible on the bus. For this sample, the address 8 of the communication processor <i>CP 5412 A2</i> as well as the address 9 of the communication processor <i>CP 5431</i> must be marked as occupied.</p> <p>The dialog box can be exited by clicking on <i>OK</i>.</p> 

WinCC Explorer

Step	WinCC Explorer														
1	<p>Diagnosis of the communication connection from the <i>WinCC Explorer</i>.</p> <p>Switch the project <i>WinCC_S5_FDL</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below.</p>  <p>The created WinCC screen <i>com_3_S5FDL_01.pdl</i> can also be switched directly from the <i>Graphics Designer</i> into runtime.</p>														
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 														
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>S5_FDL_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p>  <table border="1"> <thead> <tr> <th>Tag ID</th> <th>Name</th> <th>Status</th> <th>Tag read</th> <th>Read requ...</th> <th>Tag written</th> <th>Write requ...</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>S5_FMS_01</td> <td>OK</td> <td>28</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>Update <input type="checkbox"/> Cyclic update (4 × 250 ms) Update Help Close</p>	Tag ID	Name	Status	Tag read	Read requ...	Tag written	Write requ...	3	S5_FMS_01	OK	28	0	0	0
Tag ID	Name	Status	Tag read	Read requ...	Tag written	Write requ...									
3	S5_FMS_01	OK	28	0	0	0									

Step	WinCC Explorer										
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>. The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Parameters</th> <th>Last Change</th> </tr> </thead> <tbody> <tr> <td> S5_FDL_01</td> <td>9,6,5,4,3,0,0</td> <td>17.04.99 13:09:14</td> </tr> </tbody> </table> <p style="text-align: center;"> Status: OK</p> <p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td> S16x_S5FDL01_01</td> <td>Signed 16-bit value</td> </tr> </tbody> </table> <p style="text-align: center;"> Process value: 76 Quality: c0 Last Change: 7/5/99 12:46:41 PM</p>	Name	Parameters	Last Change	 S5_FDL_01	9,6,5,4,3,0,0	17.04.99 13:09:14	Name	Type	 S16x_S5FDL01_01	Signed 16-bit value
Name	Parameters	Last Change									
 S5_FDL_01	9,6,5,4,3,0,0	17.04.99 13:09:14									
Name	Type										
 S16x_S5FDL01_01	Signed 16-bit value										

10 Communication WinCC-WinCC via OPC

The projects created in this chapter can also be copied directly from the online document to your hard drive. By default, they will be copied to the folder C:\Communication_Manual. You have the option to copy the following components to the hard drive:



The server WinCC project we will create.

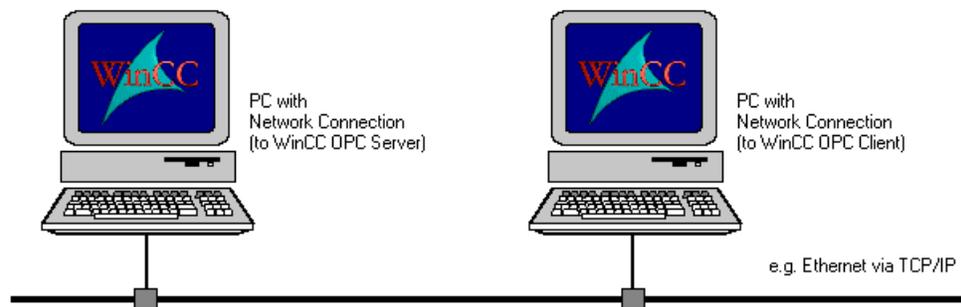


The client WinCC project we will create.

This chapter describes in detail the startup of a communication connection between two *WinCC Stations* via *OPC*.

On the computer acting as the server, the *WinCC OPC Server* is installed, which makes the data of a WinCC project available to other applications on the same computer and to applications on computers that are accessible from the network.

Overview of the Structure of the Sample



On the computer designated as the server, the *WinCC OPC Server* from the *WinCC CD-ROM* must be installed. This can be done during the installation of WinCC. On the computer designated as the client, the *WinCC OPC Client* from the *WinCC CD-ROM* must be installed. This can be done during the installation of WinCC as well. Both WinCC stations can be connected to each other using any type of network connection.

Overview of the Configuration Steps

The following lists all configuration steps necessary for the creation of the communication connection:

- Configuration of the WinCC Stations
- Creation of the WinCC Project WinCC_OPC_SERVER
- Creation of the WinCC Project WinCC_OPC_CLIENT
- Diagnosis of the Communication Connection

Required Software

Name	Description
WinCC	WinCC with <i>OPC Server</i> and <i>OPC Client</i> for the creation of the WinCC projects.

Required Compute Hardware

Name	Description
Network Access	Any type of network access to establish a connection to the network.

10.1 Configuration of the WinCC Stations

The following description contains notes that should be observed during the configuration of the WinCC stations.

In general, three configurations for the access from a WinCC client station to an OPC server are possible. These configurations differ, depending on where both components are located:

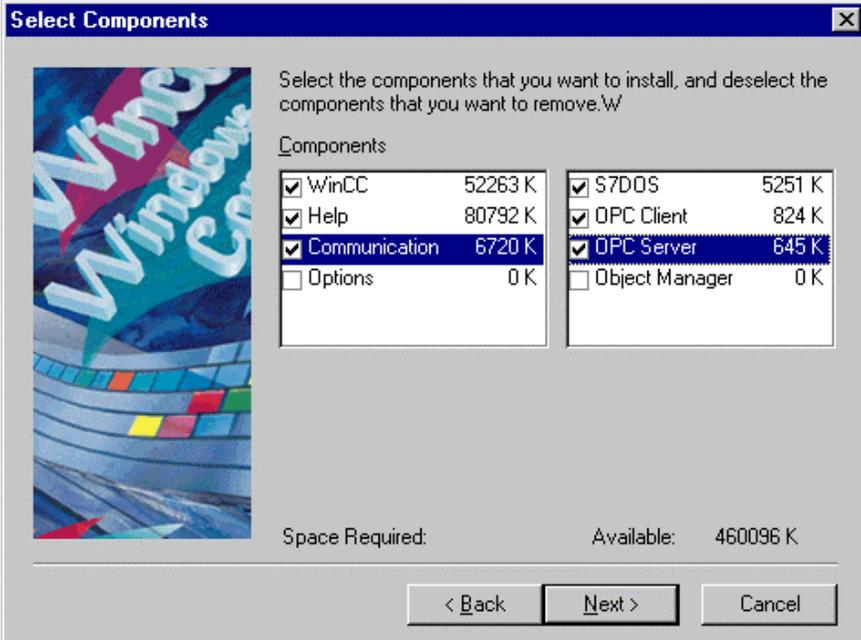
- Server and client are located on the same computer
- Server and client are located on different computers of the same workgroup
- Server and client are located on different computers within the same domain or in different domains with trust setting

The first of the configurations mentioned is not practical for the communication between a WinCC OPC server and a WinCC OPC client. However, this configuration can be applied to other cases, e.g. for the communication to the S7 OPC Server.

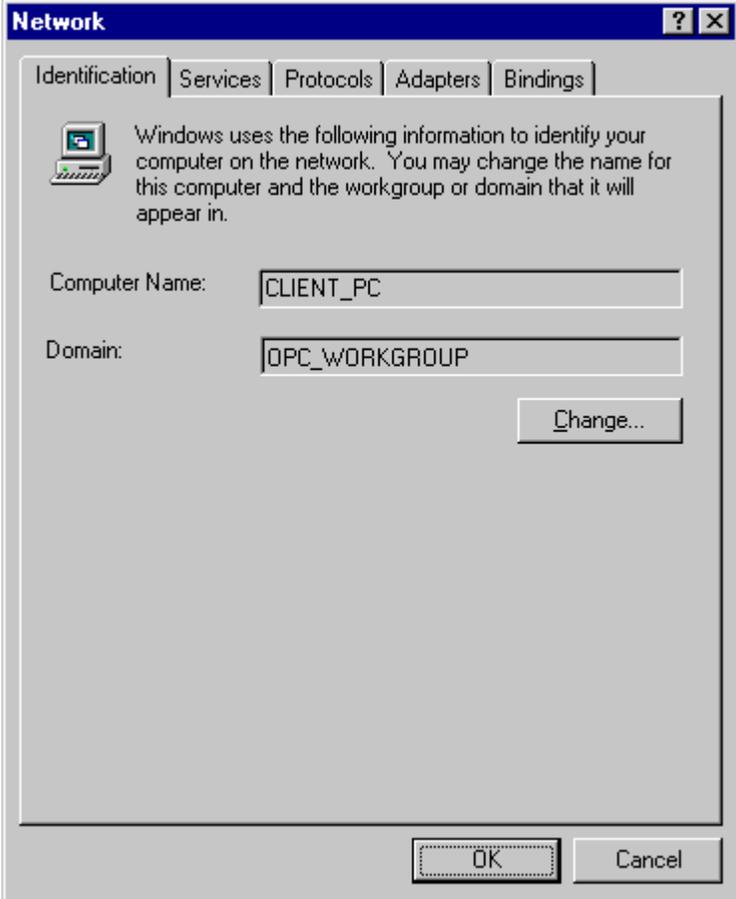
For the steps described below, the conditions existing on site must be considered.

- A: Installing the Software Components
- B: Organization of the Network
- C: Organization of the User Structure
- D: Setting the DCOM Configuration

A: Installing the Software Components

Step	A: Installing the Software Components																
1	<p>The <i>OPC Server</i> and the <i>OPC Client</i> from WinCC are required. Both components are located on the WinCC installation CD-ROM.</p> <p>On the computer designated as the server, the <i>OPC Server</i> must be installed. This can be done during the installation of WinCC or at a later time.</p> <p>On the computer designated as the client, the <i>OPC Client</i> must be installed. This can also be done during the installation of WinCC.</p> <p>After these components have been installed on the respective computers, they must be restarted.</p>  <p>Select Components</p> <p>Select the components that you want to install, and deselect the components that you want to remove.</p> <p>Components</p> <table border="1"> <tbody> <tr> <td><input checked="" type="checkbox"/> WinCC</td> <td>52263 K</td> <td><input checked="" type="checkbox"/> S7DOS</td> <td>5251 K</td> </tr> <tr> <td><input checked="" type="checkbox"/> Help</td> <td>80792 K</td> <td><input checked="" type="checkbox"/> OPC Client</td> <td>824 K</td> </tr> <tr> <td><input checked="" type="checkbox"/> Communication</td> <td>6720 K</td> <td><input checked="" type="checkbox"/> OPC Server</td> <td>645 K</td> </tr> <tr> <td><input type="checkbox"/> Options</td> <td>0 K</td> <td><input type="checkbox"/> Object Manager</td> <td>0 K</td> </tr> </tbody> </table> <p>Space Required: Available: 460096 K</p> <p>< Back Next > Cancel</p>	<input checked="" type="checkbox"/> WinCC	52263 K	<input checked="" type="checkbox"/> S7DOS	5251 K	<input checked="" type="checkbox"/> Help	80792 K	<input checked="" type="checkbox"/> OPC Client	824 K	<input checked="" type="checkbox"/> Communication	6720 K	<input checked="" type="checkbox"/> OPC Server	645 K	<input type="checkbox"/> Options	0 K	<input type="checkbox"/> Object Manager	0 K
<input checked="" type="checkbox"/> WinCC	52263 K	<input checked="" type="checkbox"/> S7DOS	5251 K														
<input checked="" type="checkbox"/> Help	80792 K	<input checked="" type="checkbox"/> OPC Client	824 K														
<input checked="" type="checkbox"/> Communication	6720 K	<input checked="" type="checkbox"/> OPC Server	645 K														
<input type="checkbox"/> Options	0 K	<input type="checkbox"/> Object Manager	0 K														

B: Organization of the Network

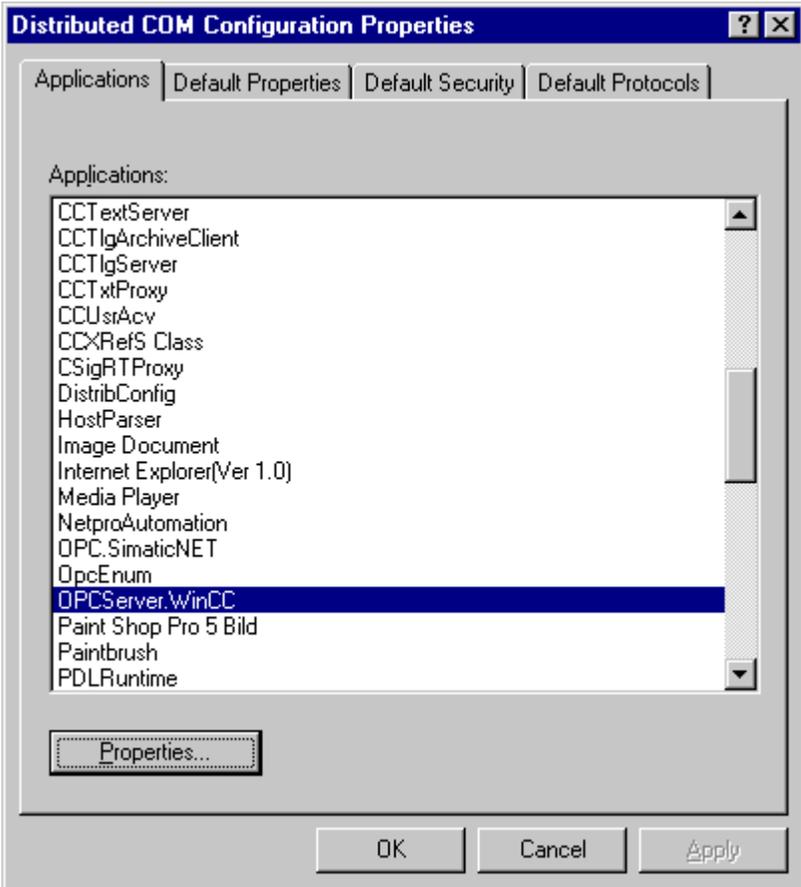
Step	B: Organization of the Network
1	<p>Organization of the network.</p> <p>The settings required on each computer for the organization of the network are made in the <i>Network</i> program of the Windows Control Panel. This program is accessed via <i>Start</i> → <i>Settings</i> → <i>Control Panel</i> → <i>Network</i>.</p> <p>In the <i>Identification</i> tab, the assignment of the computer to either a workgroup or a domain can be changed via the <i>Change</i> button.</p> 

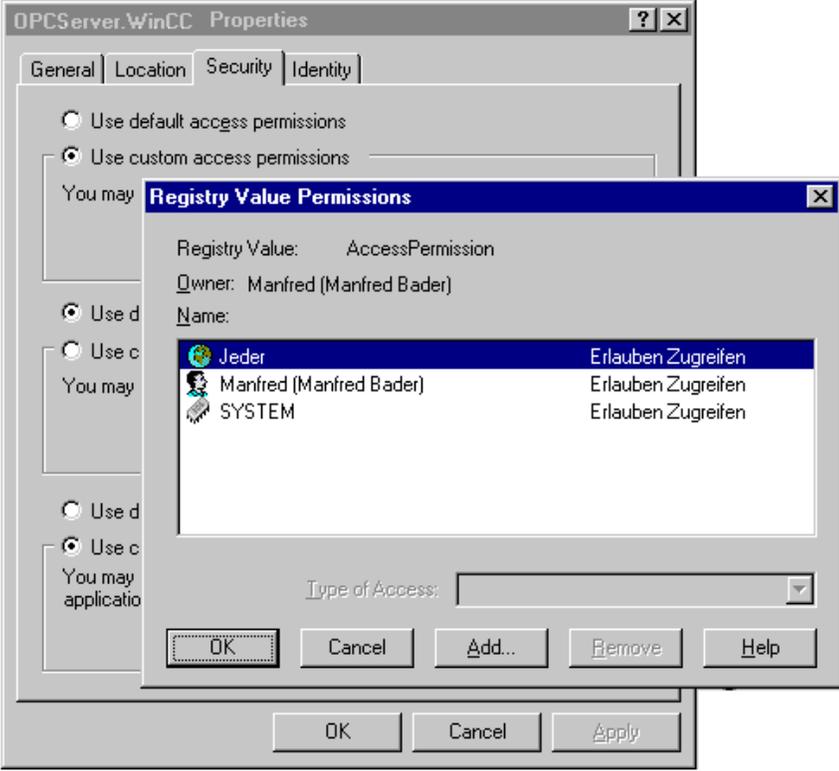
C: Organization of the User Structure

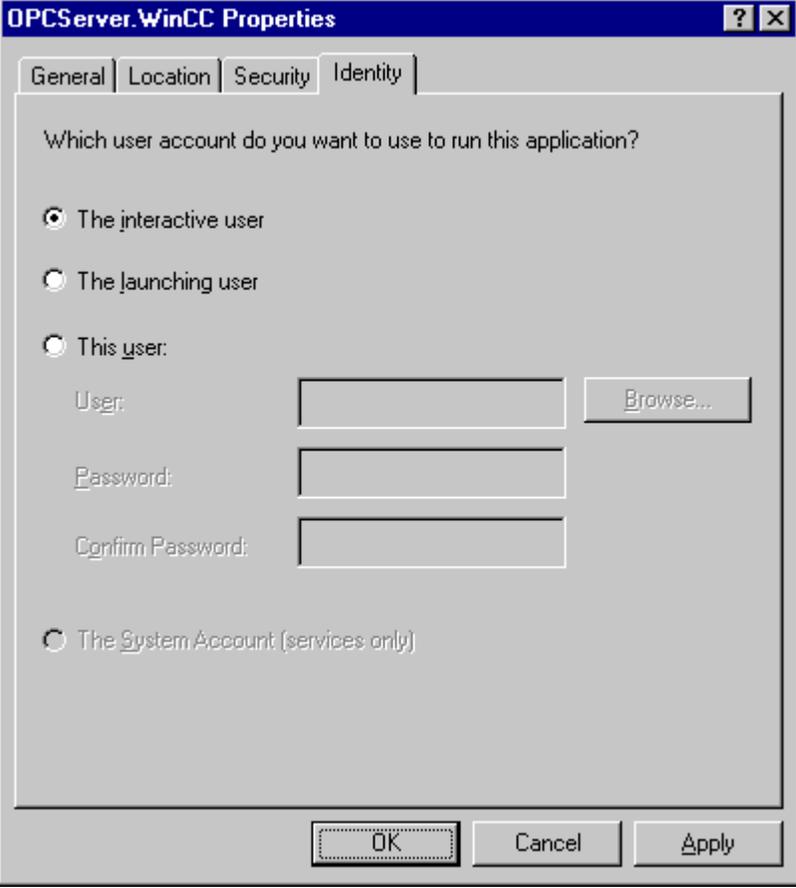
Step	C: Organization of the User Structure
1	<p>Definition of the users on both computers.</p> <p>This is done for each computer in the <i>User Manager</i> program. This program is started via <i>Start</i> → <i>Programs</i> → <i>Administrative Tools (Common)</i> → <i>User Manager</i>.</p> <p>If a workgroup is used, ensure that the user of the client station is known on the server station. Additionally, the user of the server station must also be known on the client station in order for the full functionality of <i>OPC</i> to be utilized.</p> <p>If the domain concept is used, this must not be remembered, because all users are known in the entire domain. However, for the access to a server station across domains, a mutual trust setting on both domains is required.</p>

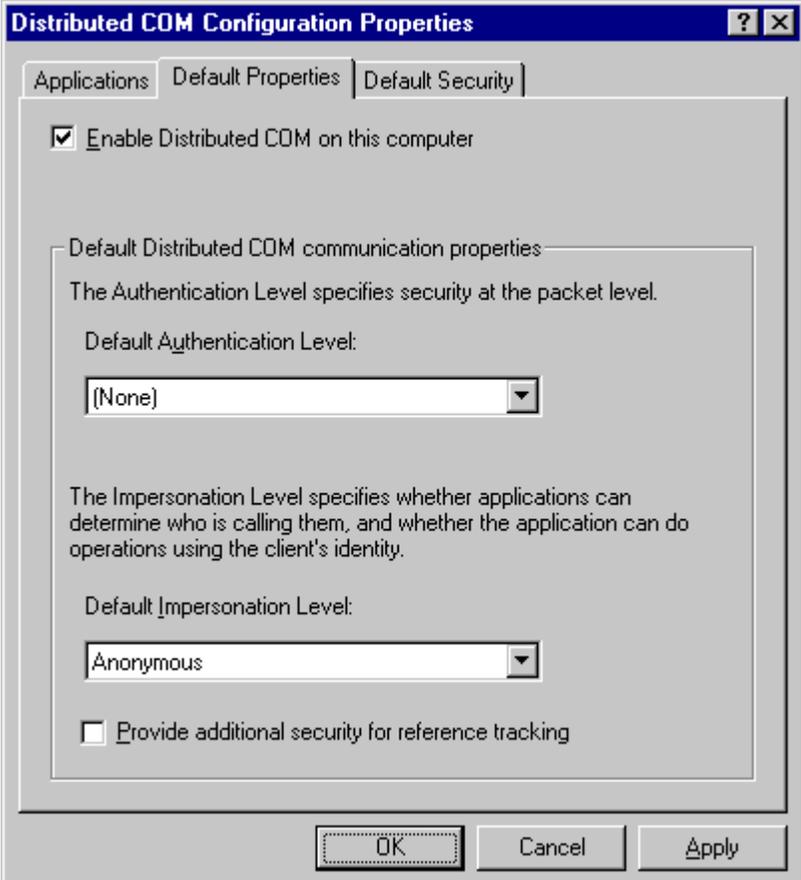
D: Setting the DCOM Configuration

Step	D: Setting the DCOM Configuration
1	<p>Setting the DCOM configuration for the <i>WinCC OPC Server</i>.</p> <p>The DCOM configuration is set via the program <i>DCOM Configuration Properties</i>. This program is started via <i>Start</i> → <i>Run</i> and then entering the program file name <i>dcomcnfg.exe</i>.</p> 

Step	D: Setting the DCOM Configuration
2	<p>The program <i>DCOM Configuration Properties</i> will be displayed.</p> <p>In the <i>Applications</i> tab, select the entry of the <i>WinCC OPC Server</i>. This is the entry <i>OPCServer.WinCC</i>.</p> <p>Clicking on the <i>Properties</i> button will open its properties dialog box.</p>  <p>The screenshot shows the 'Distributed COM Configuration Properties' dialog box with the 'Applications' tab selected. The 'Applications' list contains the following entries: CCTextServer, CCTlgArchiveClient, CCTlgServer, CCTxtProxy, CCUstrAcv, CCXRefS Class, CSigRTProxy, DistribConfig, HostParser, Image Document, Internet Explorer(Ver 1.0), Media Player, NetproAutomation, OPC.SimaticNET, OpcEnum, OPCServer.WinCC (highlighted), Paint Shop Pro 5 Bild, Paintbrush, and PDLRuntime. A 'Properties...' button is located below the list. At the bottom of the dialog are 'OK', 'Cancel', and 'Apply' buttons.</p>

Step	D: Setting the DCOM Configuration
3	<p>The dialog box <i>OPCServer.WinCC Properties</i> will be displayed.</p> <p>In the <i>Security</i> tab, specify who has access to the <i>WinCC OPC Server</i>. The radio-button <i>Use custom access permissions</i> is selected. By clicking on the now enabled <i>Edit</i> button, the access permissions can be set. Among other things, the <i>System</i> must be accessible.</p> <p>During the configuration phase it makes sense to give access permissions to everybody to rule out problems due to insufficient access rights. After the successful commissioning of the communication, you can still limit the access rights of certain users if necessary.</p>  <p>The screenshot shows the 'OPCServer.WinCC Properties' dialog box with the 'Security' tab selected. The 'Use custom access permissions' radio button is chosen. A 'Registry Value Permissions' dialog box is overlaid, showing the registry value 'AccessPermission' owned by 'Manfred (Manfred Bader)'. The permissions list includes 'Jeder', 'Manfred (Manfred Bader)', and 'SYSTEM', all with 'Erlauben Zugreifen' permissions. The 'Type of Access' dropdown is set to 'All'. Buttons for 'OK', 'Cancel', 'Add...', 'Remove', and 'Help' are visible at the bottom of the permissions dialog, and 'OK', 'Cancel', and 'Apply' are visible at the bottom of the main properties dialog.</p>

Step	D: Setting the DCOM Configuration
4	<p>In the <i>Identity</i> tab, the radio-button <i>The interactive user</i> is selected. The dialog box <i>OPCServer.WinCC Properties</i> can be closed by clicking on <i>OK</i>.</p> 

Step	D: Setting the DCOM Configuration
5	<p>In the <i>Default Properties</i> tab, the general properties of the DCOM communication are defined.</p> <p>DCOM must be activated on the computer. Via the <i>Default Authentication Level</i> list box, the desired security at the packet level can be defined. Via the <i>Default Impersonation Level</i> list box, you can specify if accessing clients can be identified.</p> <p>During the configuration phase it makes sense to choose the lowest security level for both settings. This rules out problems caused by these settings from the beginning.</p> <p>The program <i>DCOM Configuration Properties</i> can also be exited by clicking on <i>OK</i>.</p> 

10.2 Creation of the WinCC Project WinCC_OPC_SERVER

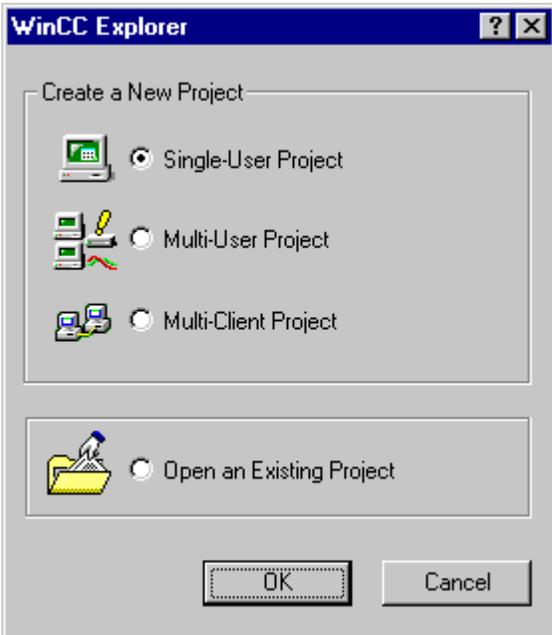
The following description details the configuration steps necessary to create and successfully start up the WinCC project *WinCC_OPC_SERVER*.

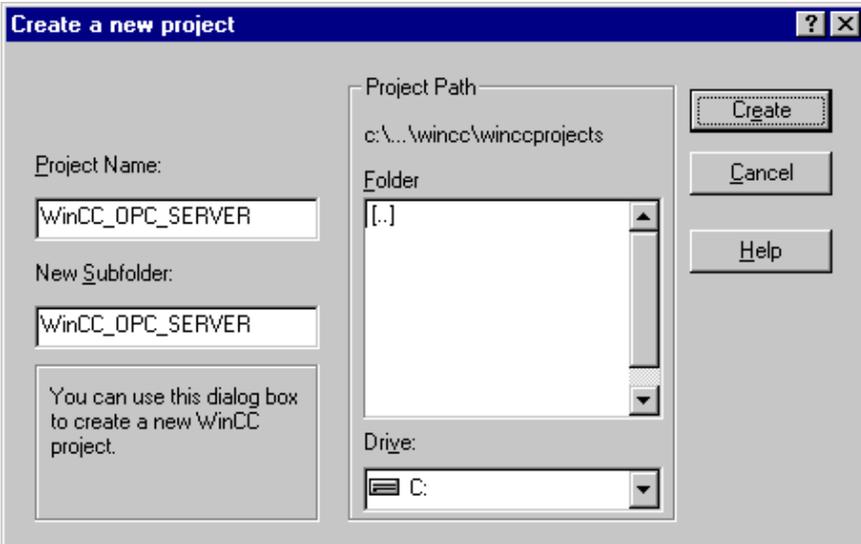
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_OPC_SERVER*:

- A: Creating the WinCC Project
- B: Creating the Internal Tags
- C: Creating the WinCC Screen

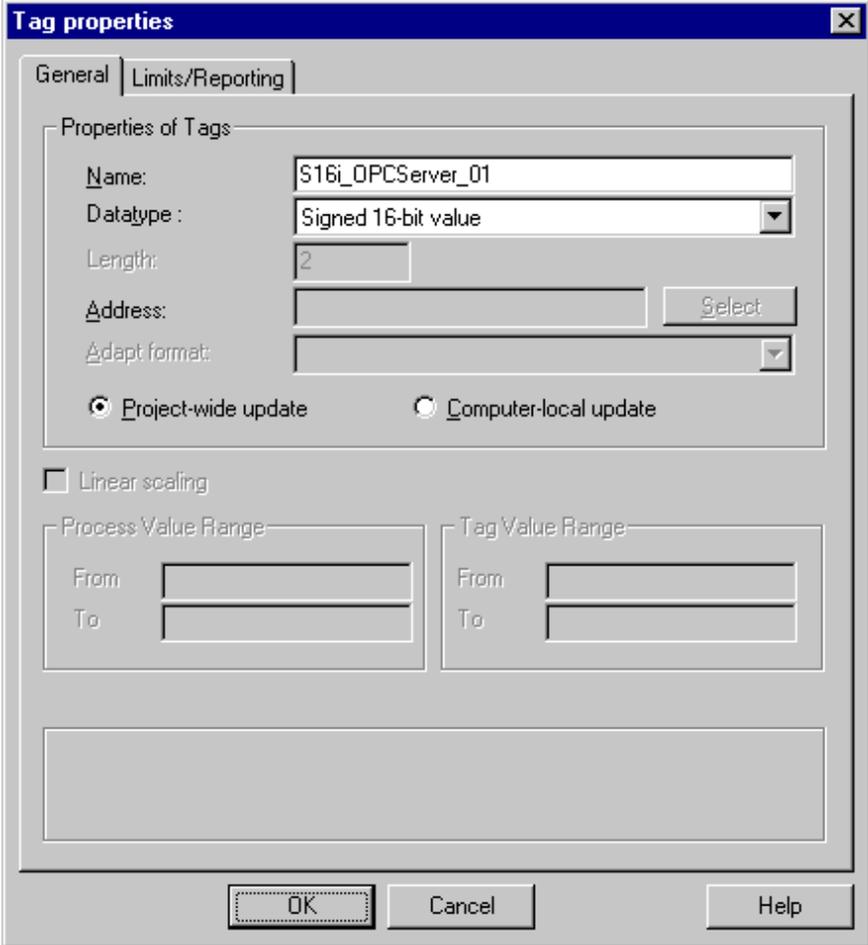
A: Creating the WinCC Project

Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>The <i>WinCC Explorer</i> will be displayed.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

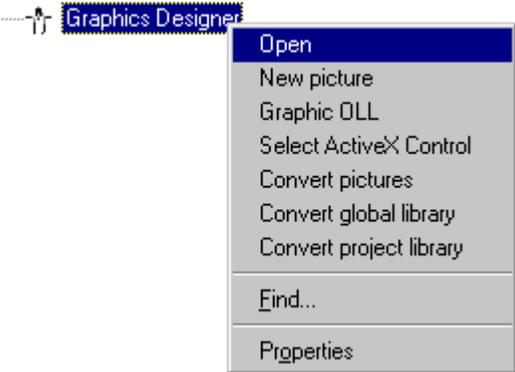
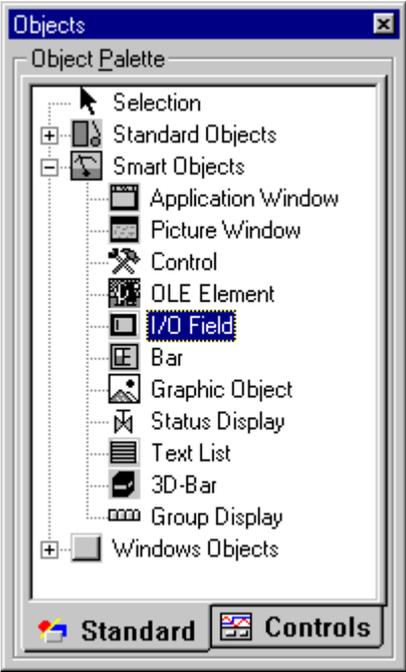
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_OPC_SERVER</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

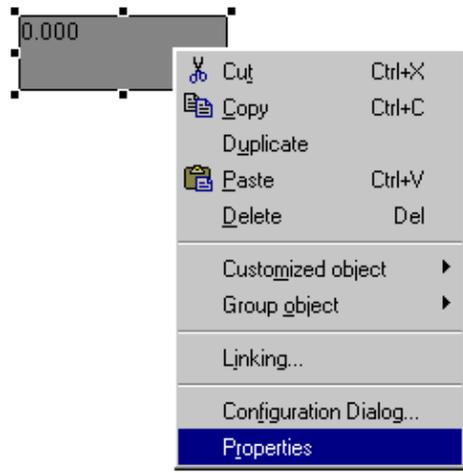
B: Creating the Internal Tags

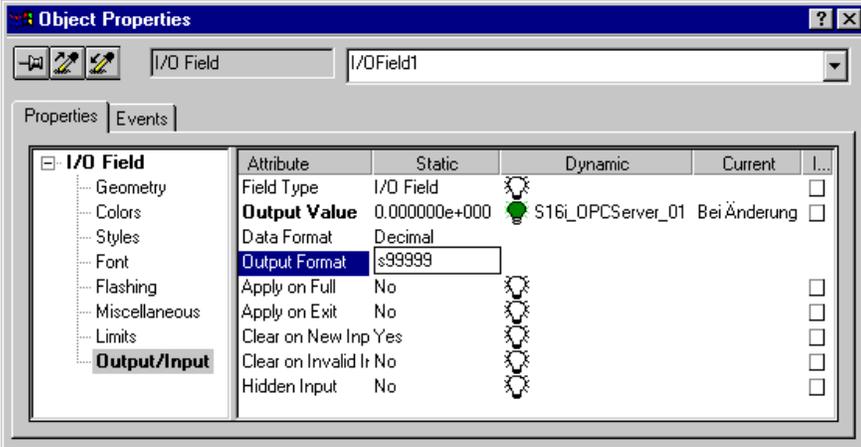
Step	B: Creating the Internal Tags
1	<p>Creation of the internal tags required for the sample.</p> <p>This is done in <i>Tag Management</i> via a  on the <i>Internal Tags</i> entry and then selecting <i>New Tag</i> from the pop-up menu.</p> 

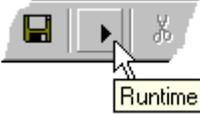
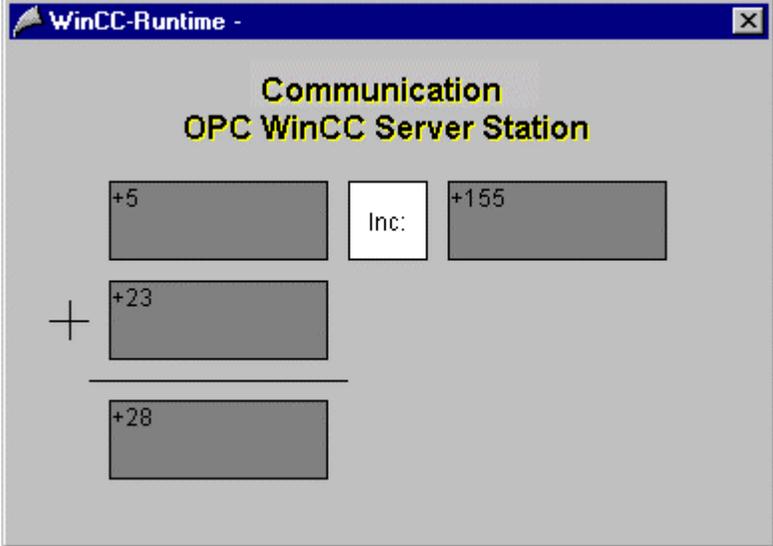
Step	B: Creating the Internal Tags															
2	<p>The properties dialog box of the tag will be displayed.</p> <p>In the sample, the <i>Name</i> of the first tag is <i>S16i_OPCTServer_01</i>. The tag is of the <i>Signed 16-Bit Value</i> data type.</p> 															
3	<p>Creation of the remaining tags required.</p> <p>Follow steps 1 to 3 for the creation of the remaining tags. The names, data types and addresses of the tags used in this sample are listed in the following graphic.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td> S16i_OPCTServer_01</td> <td>Signed 16-bit value</td> <td>Internal tag</td> </tr> <tr> <td> S16i_OPCTServer_02</td> <td>Signed 16-bit value</td> <td>Internal tag</td> </tr> <tr> <td> S16i_OPCTServer_03</td> <td>Signed 16-bit value</td> <td>Internal tag</td> </tr> <tr> <td> S16i_OPCTServer_04</td> <td>Signed 16-bit value</td> <td>Internal tag</td> </tr> </tbody> </table>	Name	Type	Parameters	 S16i_OPCTServer_01	Signed 16-bit value	Internal tag	 S16i_OPCTServer_02	Signed 16-bit value	Internal tag	 S16i_OPCTServer_03	Signed 16-bit value	Internal tag	 S16i_OPCTServer_04	Signed 16-bit value	Internal tag
Name	Type	Parameters														
 S16i_OPCTServer_01	Signed 16-bit value	Internal tag														
 S16i_OPCTServer_02	Signed 16-bit value	Internal tag														
 S16i_OPCTServer_03	Signed 16-bit value	Internal tag														
 S16i_OPCTServer_04	Signed 16-bit value	Internal tag														

C: Creating the WinCC Screen

Step	C: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	C: Creating the WinCC Screen
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>SERVER_PC_S16i_OPCTServer_01</i> via the button displayed below.</p>  <p>The <i>Update</i> of the tag is set to <i>Upon Change</i>. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p>  <p>The dialog box titled "I/O-Field Configuration" has the following settings: Tag: S16i_OPCTServer_0 (with a yellow folder icon), Update: Bei Änderung, Type: Both (selected), Format: Font Size: 12, Font Name: Arial, Color: Black. Buttons for OK and Cancel are at the bottom.</p>
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p>  <p>The image shows a rectangular I/O field containing the text "0.000". A context menu is open over it, listing: Cut (Ctrl+X), Copy (Ctrl+C), Duplicate, Paste (Ctrl+V), Delete (Del), Customized object, Group object, Linking..., Configuration Dialog..., and Properties (highlighted in blue).</p>

Step	C: Creating the WinCC Screen
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p> 
6	<p>Creation of three additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>
7	<p>Creation of a simple tag simulation.</p> <p>The sum of the tags <i>S16i_OPCTServer_01</i> and <i>S16i_OPCTServer_02</i> is to be stored in the tag <i>S16i_OPCTServer_03</i>.</p> <p>The value of the tag <i>S16i_OPCTServer_04</i> is to be incremented every 250ms.</p> <p>These tasks are performed by to <i>C Actions</i>. These actions are configured at the <i>Properties</i> → <i>Geometry</i> → <i>Position X</i> of the <i>I/O Fields</i> displaying the results.</p> <p>For a detailed description of the <i>C Actions</i> used, refer to section at the end.</p>

Step	C: Creating the WinCC Screen
8	<p>Save the screen.</p> <p>In the sample project, the screen is saved under the name <i>com_3_OPCTServer_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p>  <p>By entering values in the individual <i>I/O Fields</i>, the tag values can be changed.</p> 

C Action for Generating the Sum

```
#include "apdefap.h"
long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
    //get tag values
    int iValue_01 = GetTagSDWord("S16i_OPCTServer_01");
    int iValue_02 = GetTagSDWord("S16i_OPCTServer_02");

    //calculate sum and set tag value
    SetTagSDWord("S16i_OPCTServer_03", (iValue_01 + iValue_02));

    //return constant property value
    return GetLeft(lpszPictureName, lpszObjectName);
}
```

- The *C Action* displayed above is configured for the *I/O Field3* object at *Properties* → *Geometry* → *Position X*. The *C Action* is triggered upon the change of the tags *S16i_OPCTServer_01* and *S16i_OPCTServer_02*.
- The values of the tags *S16i_OPCTServer_01* and *S16i_OPCTServer_02* are read and their sum written into the tag *S16i_OPCTServer_03*.
- The *C Action* is configured at an object property, which only serves for providing a trigger. The current value of the property is returned back to it.

C Action to Increment

```
#include "apdefap.h"
long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
    //get tag value
    int iValue = GetTagSDWord("S16i_OPCTServer_04");
    if (iValue < 10000)
    {
        //increment and set tag value
        SetTagSDWord("S16i_OPCTServer_04", ++iValue);
    }
    else
    {
        //reset tag value
        SetTagSDWord("S16i_OPCTServer_04", 0);
    }

    //return constant property value
    return GetLeft(lpszPictureName, lpszObjectName);
}
```

- The *C Action* displayed above is configured for the *I/O Field4* object at *Properties* → *Geometry* → *Position X*. The *C Action* is triggered every 250ms.
- The value of the tag *S16i_OPCTServer_04* is read. If this value has not reached 10000, it will be incremented and written back to the tag. Otherwise the tag value is set to zero.
- The *C Action* is configured at an object property, which only serves for providing a trigger. The current value of the property is returned back to it.

10.3 Creation of the WinCC Project WinCC_OPC_CLIENT

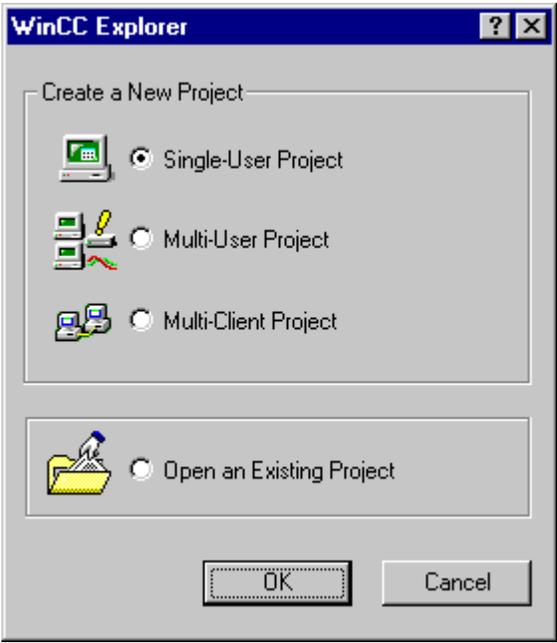
The following description details the configuration steps necessary to create and successfully start up the WinCC project *WinCC_OPC_CLIENT*.

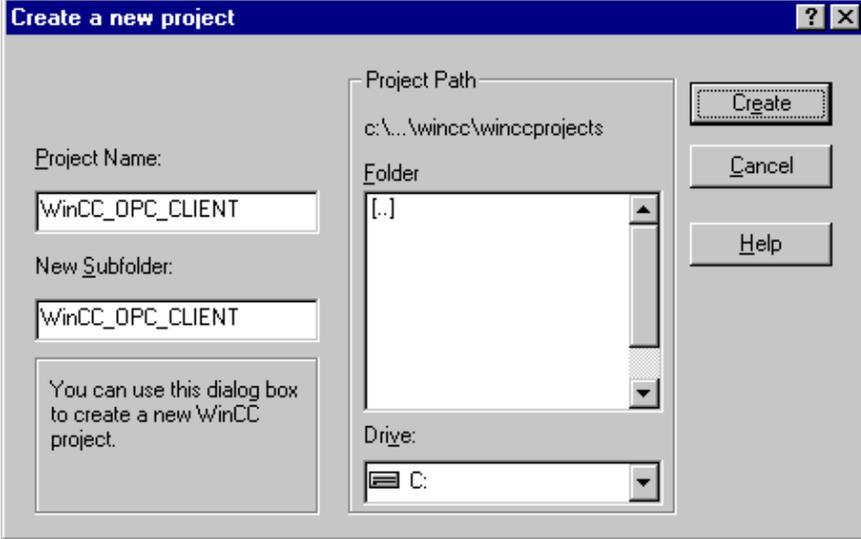
Overview of the Configuration Steps

The following lists the configuration steps necessary to create the WinCC project *WinCC_OPC_CLIENT*:

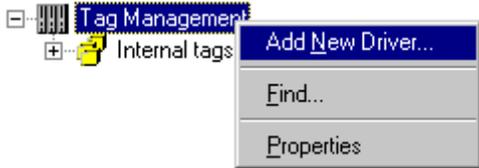
- A: Creating the WinCC Project
- B: Creating the Connection
- C: Creating the WinCC Screen

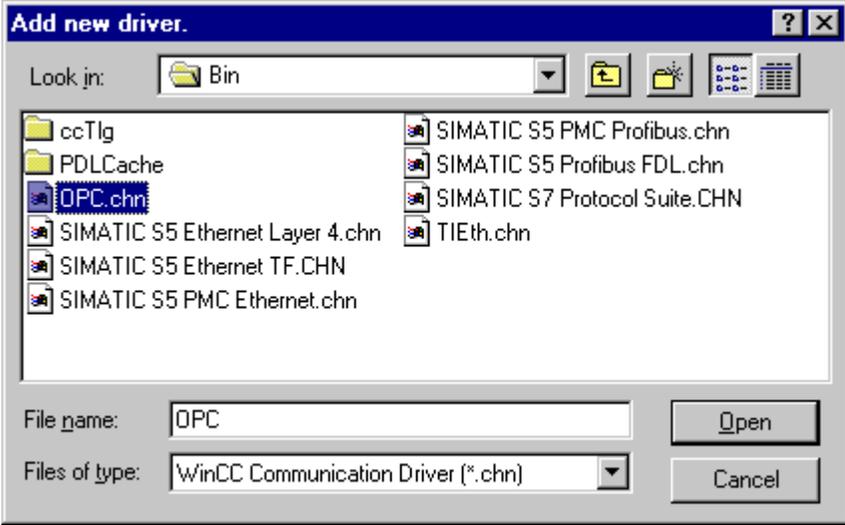
A: Creating the WinCC Project

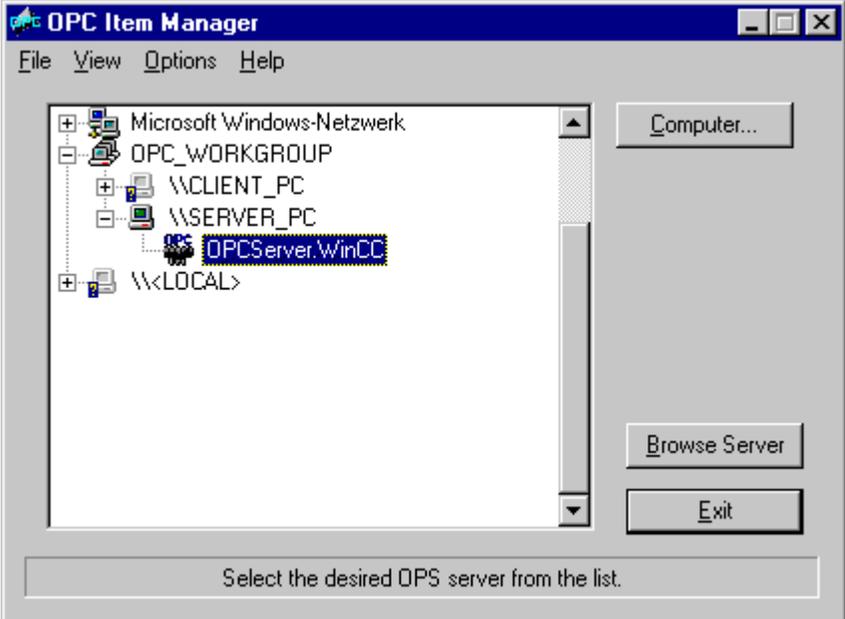
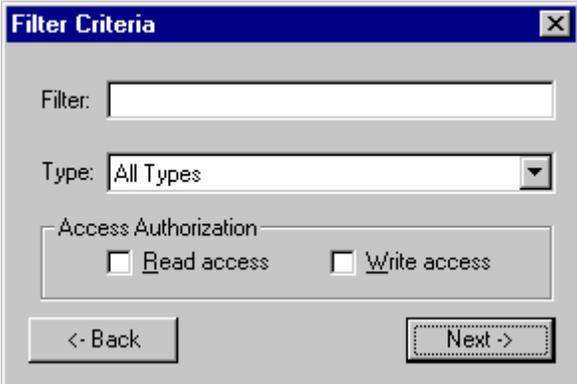
Step	A: Creating the WinCC Project
1	<p>Creation of a new WinCC project in the <i>WinCC Explorer</i>.</p> <p>The WinCC Explorer is started via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Windows Control Center</i>.</p>  <p>WinCC Explorer</p>
2	<p>The <i>WinCC Explorer</i> will be displayed.</p> <p>Via the menus <i>File</i> → <i>New</i>, the dialog box for specifying the properties of a new WinCC project will be opened.</p> <p>For this sample project, a <i>Single-User Project</i> is created.</p> <p>Exit the dialog box by clicking on <i>OK</i>.</p> 

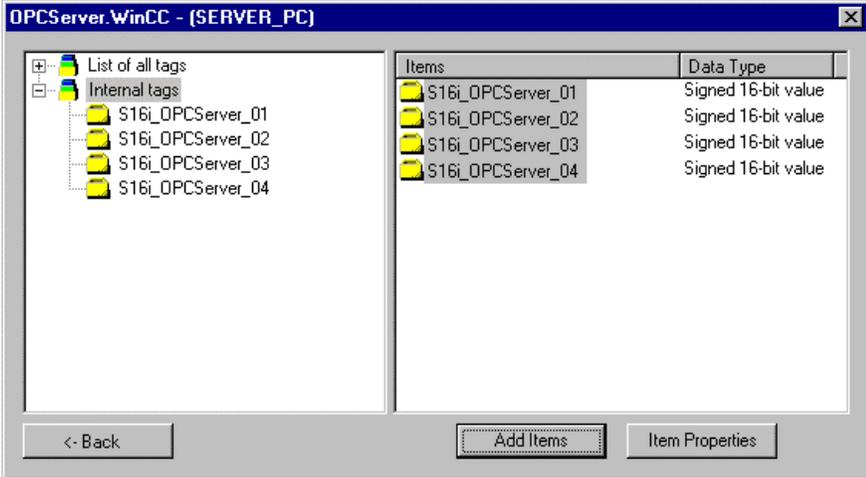
Step	A: Creating the WinCC Project
3	<p>The dialog box <i>Create a new Project</i> will be displayed.</p> <p>Specify a <i>Project Name</i> for the new project. The names of the WinCC projects created within the framework of this manual all start with <i>WinCC</i> and also include a reference to the communication partner and communication type used. The project of this sample has the name <i>WinCC_OPC_CLIENT</i>.</p> <p>In the <i>Project Path</i> field, set the storage location of the new project.</p> <p>The dialog box <i>Create a new Project</i> is concluded by clicking on the <i>Create</i> button.</p> 

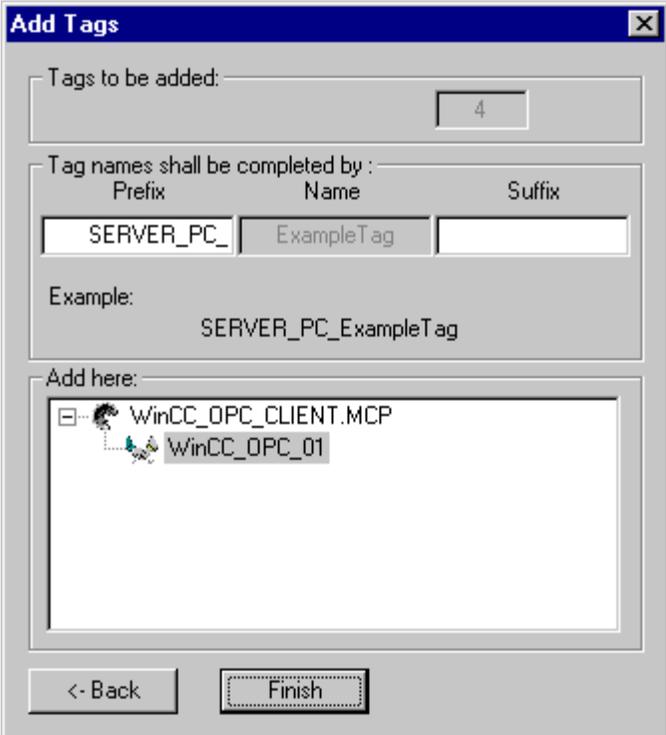
B: Creating the Connection

Step	B: Creating the Connection
1	<p>The new project will be displayed in the <i>WinCC Explorer</i>.</p> <p>Installation of the required communication driver. This is performed via a  on <i>Tag Management</i> and selecting <i>Add New Driver</i> from the pop-up menu.</p> 

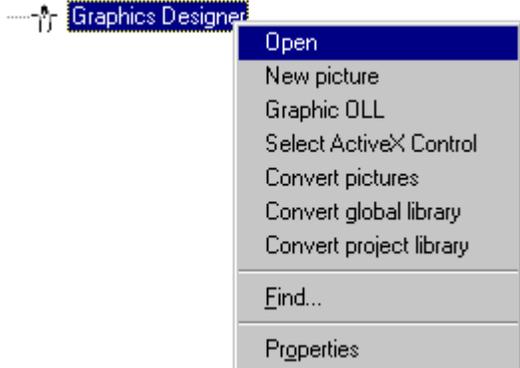
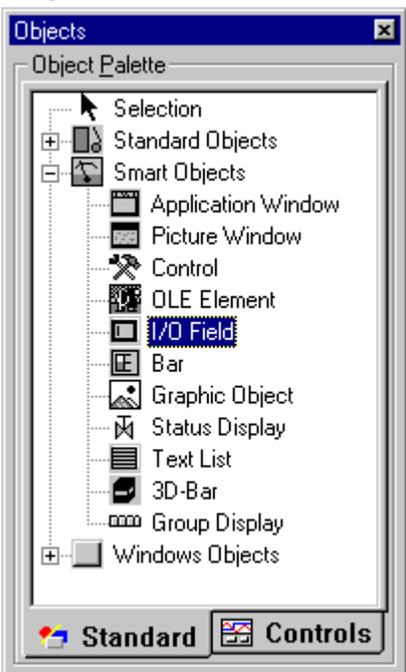
Step	B: Creating the Connection
2	<p>The dialog box <i>Add New Driver</i> will be displayed.</p> <p>This dialog box lists all communication drivers that can be installed. This sample requires the communication driver <i>OPC</i>. Select this driver from the dialog box. Exit the dialog box by clicking on <i>Open</i>.</p> 
3	<p>The newly added communication driver <i>OPC</i> will be displayed as a sub-entry to <i>Tag Management</i>.</p> <p>The communication driver <i>OPC</i> contains one channel unit.</p> <p>The creation of a connection to a certain OPC server and the selection of the items required by this server can be carried out via the <i>OPC Item Manager</i>. The OPC Item Manager is started via MR on the channel unit <i>OPC Groups</i> (<i>OPCHN Unit #1</i>) and then selecting <i>System Parameters</i> from the pop-up menu.</p> 

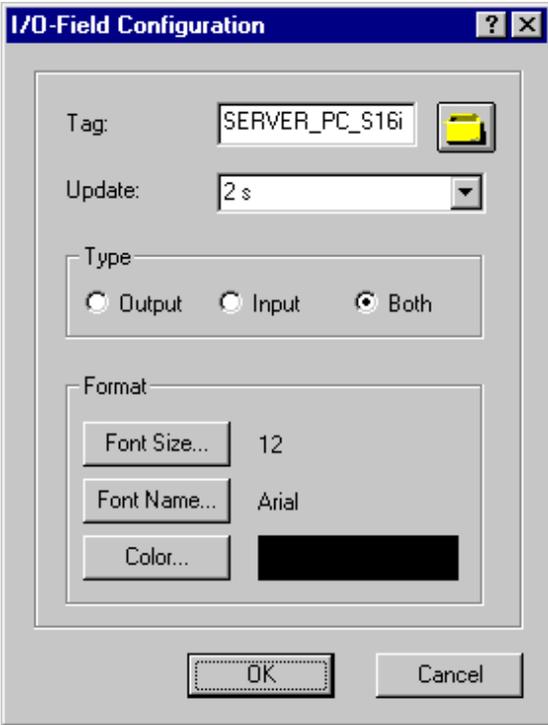
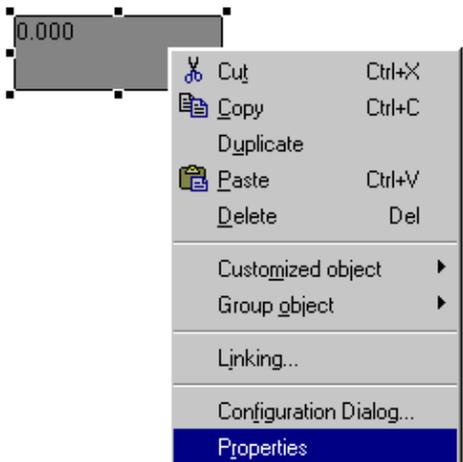
Step	B: Creating the Connection
4	<p>The <i>OPC Item Manager</i> will be displayed.</p> <p>The desired OPC server can be selected from here. This server can be located on the local computer or on another computer accessible by the network. As illustrated below, the desired OPC server of this sample is located on the <i>SERVER_PC</i> computer in the <i>OPC_WORKGROUP</i> workgroup.</p> <p>Via a  on the entry of a workgroup or domain, all available computers contained in it will be listed. Via a  on the entry of a computer, all available OPC servers configured on it will be listed.</p> <p>From the desired server station, select the entry <i>OPCServer.WinCC</i> of the <i>WinCC OPC Server</i>. Via the <i>Browse Server</i> button, a listing of all items made available by this <i>WinCC OPC Server</i> can be displayed. However, this will only be the case if the WinCC project has been opened on the server station.</p> 
5	<p>The dialog box <i>Filter Criteria</i> will be displayed.</p> <p>Using this dialog box, the type of the desired items can be specified more exactly. If you want to display all available items, no settings are required. The dialog box can be closed by clicking on <i>Continue-></i>.</p> 

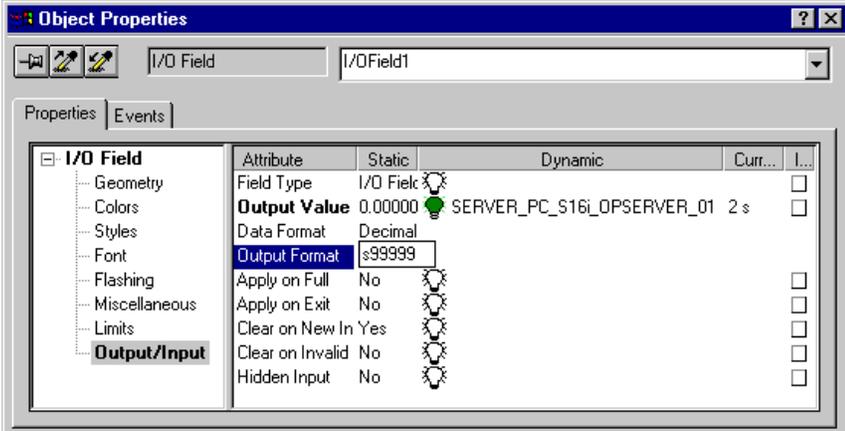
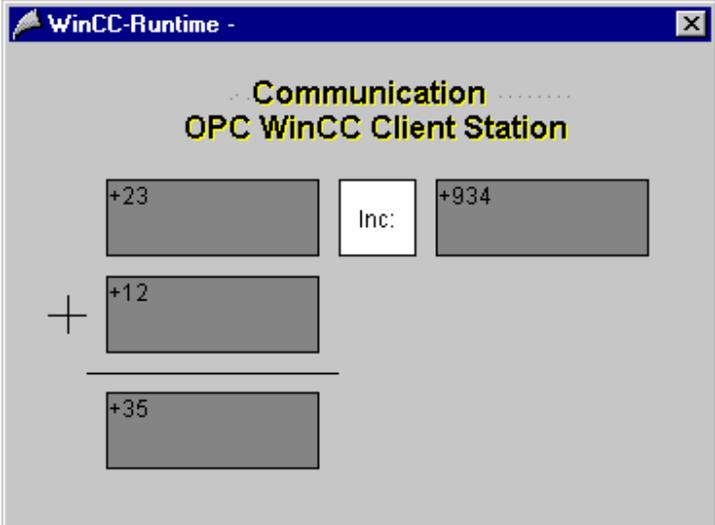
Step	B: Creating the Connection
6	<p>A dialog box for selecting the desired items will be displayed.</p> <p>The four internal tags previously created in the server project will be offered for selection as items of the <i>WinCC OPC Server</i>. However, this will only be the case if the WinCC project on the server station is in runtime.</p> <p>Select these four items from the right window. By clicking on the button <i>Add Items</i>, they will be inserted into the WinCC project.</p> 
7	<p>This requires the creation of a new connection into which these items can be inserted as WinCC tags.</p> <p>This connection can be created automatically by the <i>OPC Item Manager</i>. The dialog box <i>New Connection</i> will be displayed. In this dialog box, only the name of the new connection must be entered. In this sample, the name <i>WinCC OPC_01</i> is used. Close the dialog box by clicking on <i>OK</i>.</p> 

Step	B: Creating the Connection															
8	<p>The dialog box <i>Add Tags</i> will be displayed.</p> <p>In this dialog box, the connection is defined to which the tags are added. In this sample, the tags are added to the connection <i>WinCC_OPC_01</i> created previously. This connection is selected from the field <i>Add Here</i> at the bottom.</p> <p>Optionally, a <i>Prefix</i> and a <i>Suffix</i> can be added to the tag names used by the <i>OPC Item Manager</i>. In this sample, the <i>prefix SERVER_PC_</i> is placed in front of the tag names.</p> <p>Clicking on the <i>Finish</i> button creates the WinCC tags.</p> <p>The dialog box for the selection of the desired items can be exited via the <i><-Back</i> button. The <i>OPC Item Manager</i> can be exited via the <i>Close</i> button.</p> 															
9	<p>The following graphic lists the WinCC tags created by the <i>OPC Item Manager</i>.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td>SERVER_PC_S16i_OPCTServer_01</td> <td>Signed 16-bit value</td> <td>"S16i_OPCTServer_01", "", 2</td> </tr> <tr> <td>SERVER_PC_S16i_OPCTServer_02</td> <td>Signed 16-bit value</td> <td>"S16i_OPCTServer_02", "", 2</td> </tr> <tr> <td>SERVER_PC_S16i_OPCTServer_03</td> <td>Signed 16-bit value</td> <td>"S16i_OPCTServer_03", "", 2</td> </tr> <tr> <td>SERVER_PC_S16i_OPCTServer_04</td> <td>Signed 16-bit value</td> <td>"S16i_OPCTServer_04", "", 2</td> </tr> </tbody> </table>	Name	Type	Parameters	SERVER_PC_S16i_OPCTServer_01	Signed 16-bit value	"S16i_OPCTServer_01", "", 2	SERVER_PC_S16i_OPCTServer_02	Signed 16-bit value	"S16i_OPCTServer_02", "", 2	SERVER_PC_S16i_OPCTServer_03	Signed 16-bit value	"S16i_OPCTServer_03", "", 2	SERVER_PC_S16i_OPCTServer_04	Signed 16-bit value	"S16i_OPCTServer_04", "", 2
Name	Type	Parameters														
SERVER_PC_S16i_OPCTServer_01	Signed 16-bit value	"S16i_OPCTServer_01", "", 2														
SERVER_PC_S16i_OPCTServer_02	Signed 16-bit value	"S16i_OPCTServer_02", "", 2														
SERVER_PC_S16i_OPCTServer_03	Signed 16-bit value	"S16i_OPCTServer_03", "", 2														
SERVER_PC_S16i_OPCTServer_04	Signed 16-bit value	"S16i_OPCTServer_04", "", 2														

C: Creating the WinCC Screen

Step	C: Creating the WinCC Screen
1	<p>Creation of a WinCC screen in which the previously created tags are visualized.</p> <p>Open the <i>Graphics Designer</i> editor via a  and then selecting <i>Open</i> from the pop-up menu.</p> 
2	<p>This will open the <i>Graphics Designer</i> editor with a new (blank) screen.</p> <p>To display the first tag, configure a <i>Smart Object</i> → <i>I/O Field</i>. To do so, select the <i>I/O Field</i> object from the <i>Object Palette</i> and place it on the screen using the mouse.</p> 

Step	C: Creating the WinCC Screen
3	<p>After placing the <i>I/O Field</i> on the screen, its <i>Configuration</i> dialog box will be displayed.</p> <p>In the <i>Tag</i> field, set the tag <i>SERVER_PC_S16i_OPCTServer_01</i> via the button displayed below.</p>  <p>Leave the <i>Update</i> of the tag at 2 s. Keep the default settings for the remaining options. Close the dialog box by clicking on <i>OK</i>.</p> 
4	<p>Changing the output format of the <i>I/O Field</i>.</p> <p>For this, open its properties dialog box via a  on the <i>I/O Field</i> and then select <i>Properties</i> from the pop-up menu.</p> 

Step	C: Creating the WinCC Screen
5	<p>The dialog box <i>Object Properties</i> will be displayed.</p> <p>On the left side of the <i>Properties</i> tab, select the entry <i>Output/Input</i>. Via a  on the output format set, the field can be edited. Select the new format <i>s99999</i>. This format enables the <i>I/O Field</i> to display signed values with a maximum of 5 digits.</p> 
6	<p>Creation of three additional <i>I/O Fields</i> for the display of the remaining tags. Follow steps 2 to 5 to create the remaining <i>I/O fields</i>.</p>
7	<p>Save the screen. In the sample project, the screen is saved under the name <i>com_3_OPC Client_01.pdl</i>. The screen can be switched directly to runtime from the <i>Graphics Designer</i> via the button displayed below.</p>  <p>If the screen is in runtime and the network connection established, the current values of the server project will be displayed in the <i>I/O fields</i>. They can be changed by entering values in the individual <i>I/O Fields</i>. The server project must, of course, also be in runtime.</p> 

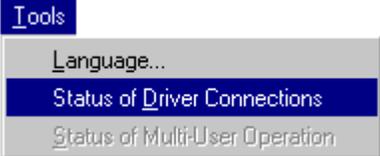
Step	C: Creating the WinCC Screen
	<p>If there is no connection, the <i>I/O Fields</i> will be displayed grayed out. In this case an error is present at some point of the communication connection.</p> 

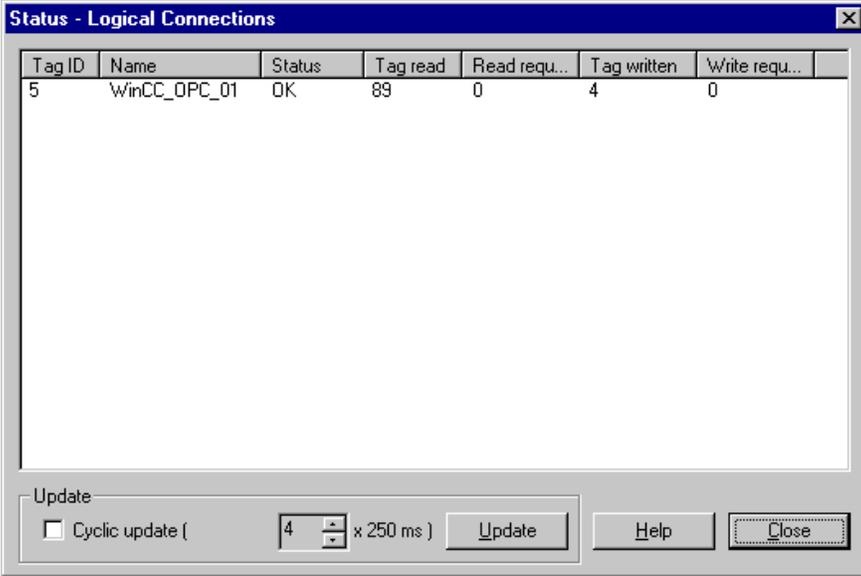
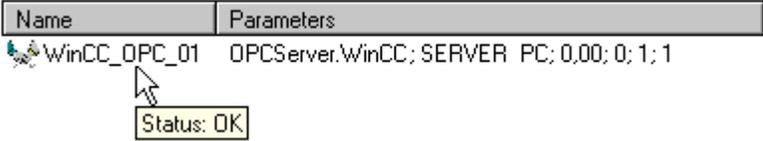
10.4 Diagnosis of the Communication Connection

The following describes the options available for diagnosing the communication connection between the WinCC project *WinCC_OPC_SERVER* and the WinCC project *WinCC_OPC_CLIENT*.

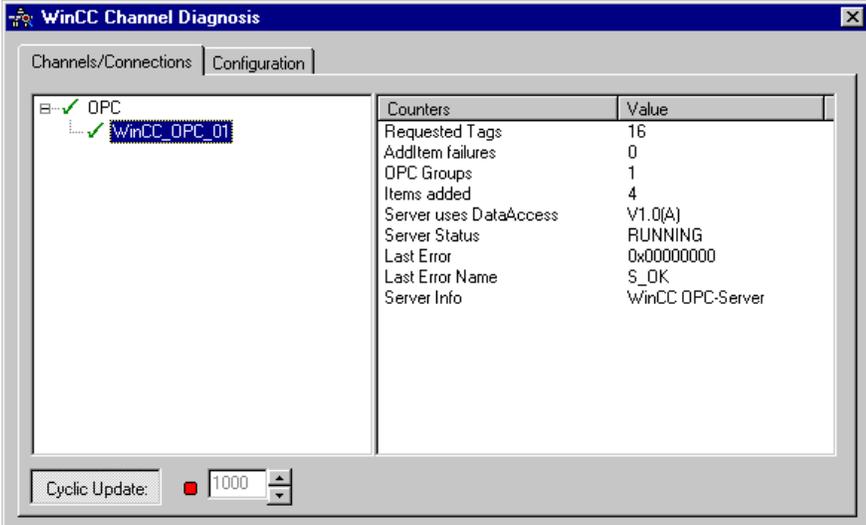
Depending on the transport protocol used (e.g. TCP/IP), timeout times of up to 6 minutes can occur. Because of this, corrections may only show effects after several minutes.

WinCC Explorer

Step	WinCC Explorer
1	<p>Diagnosis of the communication connection from the <i>WinCC Explorer</i>. Switch the project <i>WinCC_OPC_CLIENT</i> into runtime. This is done from the <i>WinCC Explorer</i> via the toolbar button displayed below. The project <i>WinCC_OPC_SERVER</i> must also be in runtime.</p> 
2	<p>In the <i>WinCC Explorer</i>, a dialog box for monitoring all configured connections can be accessed via the <i>Tools</i> → <i>Status of Driver Connections</i> menu. This menu point is only accessible if the project is in runtime.</p> 

Step	WinCC Explorer
3	<p>The dialog box <i>Status - Logical Connections</i> will be displayed.</p> <p>This dialog box lists all configured connections. For this sample, only the connection <i>WinCC_OPC_01</i> will be displayed.</p> <p>The displayed values correspond to the status at the moment the dialog box was opened. By selecting the appropriate check-box, a <i>Cyclic Update</i> of the display can be achieved.</p> 
4	<p>Another way to obtain information about the connection status in general and about the connection status of individual tags is provided by <i>Tag Management</i>.</p> <p>The status of a configured connection can be displayed as a tooltip by simply pointing the mouse on the connection in question.</p>  <p>The current process value of a certain tag as well as its status can be displayed as a tooltip by pointing the mouse on it. This allows you to detect errors concerning an individual tag and not the entire connection.</p> 

Channel Diagnosis

Step	Channel Diagnosis																				
1	<p>Diagnosis of the communication connection via the program <i>WinCC Channel Diagnosis</i>.</p> <p>Start this program via <i>Start</i> → <i>Simatic</i> → <i>WinCC</i> → <i>Channel Diagnosis</i>.</p>  <p>Channel Diagnosis</p>																				
2	<p>The program <i>WinCC Channel Diagnosis</i> will be displayed.</p> <p>The <i>Channels/Connections</i> tab displays detailed information about the status of each configured connection. By default, the display is updated every second. The update cycle can be changed in the input field located at the bottom.</p>  <p>The screenshot shows the <i>WinCC Channel Diagnosis</i> window with the <i>Channels/Connections</i> tab selected. It displays a tree view with <i>OPC</i> and <i>WinCC_OPC_01</i> (checked). A table of counters is shown on the right, and a <i>Cyclic Update</i> field is at the bottom.</p> <table border="1"> <thead> <tr> <th>Counters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Requested Tags</td> <td>16</td> </tr> <tr> <td>AddItem failures</td> <td>0</td> </tr> <tr> <td>OPC Groups</td> <td>1</td> </tr> <tr> <td>Items added</td> <td>4</td> </tr> <tr> <td>Server uses DataAccess</td> <td>V1.0(A)</td> </tr> <tr> <td>Server Status</td> <td>RUNNING</td> </tr> <tr> <td>Last Error</td> <td>0x00000000</td> </tr> <tr> <td>Last Error Name</td> <td>S_OK</td> </tr> <tr> <td>Server Info</td> <td>WinCC OPC-Server</td> </tr> </tbody> </table>	Counters	Value	Requested Tags	16	AddItem failures	0	OPC Groups	1	Items added	4	Server uses DataAccess	V1.0(A)	Server Status	RUNNING	Last Error	0x00000000	Last Error Name	S_OK	Server Info	WinCC OPC-Server
Counters	Value																				
Requested Tags	16																				
AddItem failures	0																				
OPC Groups	1																				
Items added	4																				
Server uses DataAccess	V1.0(A)																				
Server Status	RUNNING																				
Last Error	0x00000000																				
Last Error Name	S_OK																				
Server Info	WinCC OPC-Server																				

Index

A

Access Point 2-8
 Industrial Ethernet 2-8, 2-38
 PROFIBUS 6-7
Access Rights 5-36
Addressing 2-40

B

Bindings 3-11

C

Central Processor Module 3-22
COM PROFIBUS 8-5
COML S7 5-29
Communication Processor 3-3
 CP 1411 3-3
 CP 1413 2-3
 CP 5412 A2 6-1
 Restart 2-10
Configuration Dialog Box 2-42
Connection Parameters 2-36
 Industrial Ethernet 2-36
 PROFIBUS 6-35
 TCP/IP 4-39

D

Data Block 2-27
Database File 5-30
DCOM 5-34
Diagnosis 2-12
 IE Network Diagnosis 2-12
 Industrial Ethernet 2-26
Diagnosis Buffer 2-24

E

ESD 2-3
Ethernet Address 2-9, 2-20

F

FDL 9-1
FMS 8-1

H

Handling Block 7-13
 RECEIVE 7-13
 SEND 7-13
Hardnet
 Industrial Ethernet 2-1
Hardware Catalog 2-18
HWConfig 2-17

I

I/O Field 2-41
Identity 5-37
Interactive User 5-37
IP Address 4-13, 4-23
ISA Slot 2-3

J

Jumper Setting 2-3
 CP 1413 2-3
 CP 5412 A2 6-3

L

LAD/STL/SCF 2-27
Load 2-28

M

MAC Address 2-9, 2-20
Module State 2-25
 Central Module 2-24
 Communication Processor 2-25

N

NCM S7 2-14
 Industrial Ethernet 2-14
 PROFIBUS 6-12

O

OPC 5-41
 Group 5-41

- Item 5-41
- OPC Item Manager 5-47
- OPC Scout 5-40
- S7 OPC Server 5-1
- WinCC OPC Server 10-1
- Operation Block 2-27

P

- Power Supply Unit 3-23
- PROFIBUS
 - PROFIBUS FDL 9-1
 - PROFIBUS FMS 8-1
- Protocol
 - Installation 3-9

R

- Rack 3-22
- Rack Number 2-19
- Read Cyclically 2-37
- Runtime 2-43

S

- S7 Protocol 5-32
- Setting the PG/PC Interface 2-4
- SIMATIC Manager 3-18
- SIMATIC S5
 - Industrial Ethernet 7-1
 - PROFIBUS FDL 9-1

- PROFIBUS FMS 8-1
- SIMATIC S7
 - Industrial Ethernet 2-1, 3-1
 - OPC 5-1
 - PROFIBUS 6-1
 - TCP/IP 4-1, 4-37
- SINEC NCM 7-2
- Single Station Project 2-32
- Slot Number 2-19
- Softnet
 - Industrial Ethernet 3-1
- State LED 2-23
- Subnet 3-23
- Subnet Mask 4-13, 4-23
- System Parameters 2-37

T

- Tag Table 2-30, 2-31
 - Control Value 2-31
 - State Value 2-31
- TCP/IP 4-1
- TSAP 5-30

U

- Update Cycle 2-42

W

- WinCC Explorer 2-32