# SIEMENS

# SIMATIC HMI

# WinCC V6 Communication Manual

Manual

Preface	
Basics Part	1
Decision Support	2
Project Examples	3

Order number of this manual is 6AV6392-1CA06-0AB0

# Edition 12/2004

A5E00391331-01

#### **Safety Guidelines**

This manual contains notices which should be observed for your own personal safety as well as for the protection of property. Personal safety notices are indicated by a warning triangle while notices for property only are posted without any warning triangle. Warning notices are posted in descending order of risk level as follows:



### Danger

Indicates an imminently hazardous situation which **will** result in serious injury or death unless precautionary measures are complied with.



#### Warning

Indicates an imminently hazardous situation which **may** result in serious injury or death unless precautionary measures are complied with.



#### Caution

Indicates an imminently hazardous situation which **may** result in minor to moderate injury unless precautionary measures are complied with.

#### Caution

Without a warning triangle indicates that property damage may occur unless precautionary measures are complied with.

#### Attention

Indicates that an unwanted event or status may occur unless the respective notice is complied with.

#### Note

Contains important information on product, product handling, or a particular part of the documentation to be noted.

Upon the occurrence of several risk levels at the same time, the warning notice for the highest risk level shall be used at all times. If a warning notice with triangle warns of personal dangers, the same warning notice may also have attached a warning for property damages.

#### **Qualified Personnel**

Implementation and operation of this software shall be permitted for **qualified personnel** only. Qualified personnel in the sense of this documentation shall be persons capable of giving due consideration to safety engineering standards during system usage of this software.

#### Brands

Registered trademarks of Siemens AG are listed in the preface.

#### Copyright Siemens AG 2004 All rights reserved

Transmission and reproduction of this documentation, as well as utilization and communication of its contents are not permitted unless expressly granted. Violators shall be liable for damages. All rights reserved, especially in the case of granting of patent or registration by GM.

Siemens AG Dept. of Automation & Drives Business Sector SIMATIC HMI P.O. Box 4848, D-90327 Nürnberg / Germany

Siemens Aktiengesellschaft

#### Exclusion of liability

The contents of this publication has been checked for compliance with the described hardware and software. However, some discrepancies cannot be avoided, resulting in no guarantee for complete compliance. The information in this publication is checked regularly, and any necessary corrections are included in subsequent editions. Any suggestions for improvements would be gratefully appreciated.

© Siemens AG 2004 Technical data subject to change.

Order number 6AV6392-1CA06-0AB0

# Preface

#### Purpose

This Communication Manual is part of the WinCC documentation. It is concerned with planning, installation, and commissioning of a communication link from WinCC to an automation device.

This Communication Manual was created with the goal of supporting the user in the selection of optimized communication, its configuration and installation, all the way to its implementation. In addition, problems are supposed to be solved in the quickest way possible.

The Communication Manual is divided into three main chapters:

General Part:

This first part provides the reader with a general view of the topic of communication, especially communication using WinCC. It provides the necessary technical background knowledge, it discusses applicable components, and it explains general procedures during configuration.

• Decision Support:

The second part guides the reader during the selection of optimized types of communication for his particular application. General circumstances are discussed which must be taken into consideration during the decision making process.

Project Examples:

The third part contains detailed descriptions of a multitude of project examples on various communication options, discussing the path from hardware installation all the way to successful commissioning of connections in single steps.

Diagnostics of communication link: The project examples each contain instructions on error search and error elimination, in case there are problems during commissioning of the communication link.

#### Changes from previous versions

Edition	Comment
09/1999	WinCC Communication Manual V5.0

This Communication Manual was upgraded to the state of WinCC V6.0 SP2.

The Manual was expanded by the following topics:

OPC Historical Data Access (OPC HDA)

OPC Alarms & Events (OPC A&E)

OPC eXtensible Markup Language DA (OPC XML-DA)

PROFINET

Documentation	Content
Installation Notes	Contains important information on scope of delivery, installation, and operation of WinCC.
WinCC V6	Provides information on
Basic	WinCC in general
Documentation	Working with projects
	Working with tags
	Creating process pictures
	Dynamizing process pictures
	<ul> <li>Creating procedures and actions using VBS</li> </ul>
	Creating C functions and actions in Global Script
	Setting up a message system
	<ul> <li>Archiving messages and process values</li> </ul>
	<ul> <li>Documenting configuration and Runtime data</li> </ul>
	Setting up multi-language projects
	Setting up user administration
	<ul> <li>Automated configuration using VBA</li> </ul>
	Process communication
Reference data on VBS	Contains reference data on VBS
КНВ	Provides information on planning, installation, and commissioning of a communication link from WinCC to an automation device.
WinCC V6 options	Provides information on options
(User Archives,	User Archives: Creating and operating user archives
Server, Redundancy)	<ul> <li>Server: Set-up and operation of WinCC in multi-user system</li> </ul>
	<ul> <li>Redundancy: Set-up and operation of redundant systems</li> </ul>
ProAgent	Provides information on ProAgent option (process diagnostics)
	Configuration of system-specific process diagnostics
	Determination of process errors and their causes

Documentation	Content	
WebNavigator Dat@Monitor	<ul> <li>Provides information on WebNavigator and Dat@Monitor options</li> <li>Configuration of web project</li> </ul>	
	Access to process pictures of web projects using intranet/internet	
	<ul> <li>Functions to display archive data and current process values in Excel</li> </ul>	
	<ul> <li>Functions to display archive data from WinCC Historian in tables and trends</li> </ul>	
	<ul> <li>Monitoring function for process pictures</li> </ul>	
Connectivity Pack	Provides information on Connectivity Pack option	
	<ul> <li>Installation of Connectivity Pack Server and Client</li> </ul>	
	Access to archive data using WinCC OLE DB Provider	
	Access to archive data using Visual Basic	
Basic Process Control	Provides information on controlling options of WinCC  Picture Tree Manager	
	Audio Alarm	
	Chip card	
	Lifebeat Monitoring	
	Time Synchronization	
	OS Project Editor	
Process Control Runtime	Provides information on controlling options of WinCC for operation in Runtime	
Operations Manual PCS 7 OS Process Control	Provides information on safe operation during process operation and monitoring using the SIMATIC PCS 7 process control system.	
Open Development Kit	Enables programmer to utilize API functions of WinCC and access to data	

#### Conventions

The Communication Manual uses the following conventions:

Convention	Description
Þ	Indicates an operation using the left mouse button.
ſ_R	Indicates an operation using the right mouse button.
ீ	Indicates an operation using a double-click of the left mouse button.
Italics	Indicates terms from the WinCC environment, as well as terms referring to elements of the programming user interface.
Blue	Cross references are indicated in blue, with color codes only in the online document.

#### Locating information

In the printed version of the Communication Manual, information may be found as follows:

- The Table of Contents lists information by topic.
- The Index lists information by key words.

An online version of the Communication Manual is located in Technical Support.

An online version of the Communication Manual is located in Comprehensive Support.

- The Contents register tab contains information listed by topic.
- The Index register tab contains information listed by key word.
- The Search register tab permits word searches throughout the entire document.

#### Trademarks

The following names are registered trademarks of Siemens AG:

SIMATIC<sup>®</sup>, SIMATIC HMI<sup>®</sup>, SIMATIC Multi Panel<sup>®</sup>, SIMATIC Panel PC<sup>®</sup>,

SIMATIC Multifunctional Panel<sup>®</sup>, HMI<sup>®</sup>, WinCC<sup>®</sup>, ProTool<sup>®</sup>, ProTool/Lite<sup>®</sup>,

ProTool/Pro<sup>®</sup>

Other names in this document might be trademarks for which use by third parties for their own purposes may constitute an infringement of trademark ownership rights.

#### Service & Support Online Services

SIMATIC Customer Support offers comprehensive additional information on SYMATIC products using online services:

General current information may be obtained online under

http://www.siemens.com/simatic

 Current product information, FAQ (Frequently Asked Questions), Tips and Tricks, and downloads may be obtained online under

http://www.siemens.com/automation/service&support

#### **Training Center**

Siemens offers a number of training courses to provide easier familiarization with automation systems. Please contact your regional training center, or our central training center in D-90327 Nuremberg.

Telephone:	+49 (0) 911-895-3200
Internet:	http://www.sitrain.com
Email:	info@sitrain.com

#### **Additional Support**

For any additional questions concerning SIMATIC HMI products, please contact your Siemens representative in your respective agencies or branch offices.

The addresses may be found:

- In the Siemens catalog ST 80
- Online under
   <u>http://www.siemens.com/automation/partner</u>
- In the interactive catalog CA01 <u>http://www.siemens.com/automation/ca01</u>

Preface

# Contents

1	Basics I	Part	1
	1.1	Basics of Communication	1
	1.1.1	Basic Terms of Communication	2
	1.1.2	Network Topology	5
	1.1.3	Classification of Networks	8
	1.1.4	Access Methods	9
	1.1.5	ISO-OSI Reference Model	10
	1.1.6	Connection of Bus Systems	
	1.2	Communication Networks	
	1.2.1	Overview of Industrial Communication	
	1.2.2	Sub-Networks in Industrial Communication	
	1.2.3	Industrial Communication Using MPI	
	1.2.4	Industrial Communication Using PROFIBUS	22
	1.2.4.1	Access Method in PROFIBUS	
	1.2.4.2	Protocol Architecture of PROFIBUS	
	1.2.4.3	Transfer Media	
	1.2.5	Industrial Communication Using Ethernet	
	1.2.5.1	Protocol Profiles of Industrial Ethernet	
	1.2.5.2	Transport Protocols	
	1.2.5.3	Transfer Media	
	1.2.5.4	PROFINET	30
	1.3	Interface Standard OPC	32
	1.3.1	OPC Data Access (OPC DA)	33
	1.3.2	OPC Historical Data Access (OPC HDA)	
	1.3.3	OPC Alarms & Events (OPC A&E)	
	1.3.4	OPC eXtensible Markup Language DA (OPC XML-DA)	35
	1.4	Communication Configuration	
	1.4.1	WinCC Process Communication	
	1.4.2	WinCC Communication Configuration	
2	Docisio	n Support	13
2		Project Analysis	<b>43</b>
	2.1	Ouoptity Structure	
	2.1.1	Notoo on Configuration	
	2.1.2	Cycle of Data Undates	
	2.1.2.1	Type of Data Undates	
	2.1.2.2	Organization of Data	
	2.1.2.3	Diganization of Data	
	2.2	Process Communication	
	2.2.1	Comparison of Communication Systems	
	2.2.2	Sorial Communication	
	2.2.3 2.2.1	Communication Using MPI	ບວ ເລ
	2.2.4	Communication Processors	
	2.2. <del>4</del> .1 2.2.4.1		
	L.L.H.L		

	2.2.5	Communication Using PROFIBUS	66
	2.2.5.1	Communication Processors	66
	2.2.5.2	Communication Driver	67
	2.2.5.3	PROFIBUS DP	69
	2.2.5.4	PROFIBUS FMS	70
	2.2.5.5	SIMATIC S7 PROTOCOL SUITE	71
	2.2.5.6	SIMATIC S5 PROFIBUS FDL	72
	2.2.6	Communication Using Industrial Ethernet	73
	2.2.6.1	Communication Processors	73
	2.2.6.2	Communication Driver	74
	2.2.6.3	Communication Using SIMATIC S5	76
	2.2.6.4	Communication Using SIMATIC S7	78
•	Data in a f		~
3	Project E	xamples	. 81
	3.1	Installation of SIMATIC NET Software	82
	3.2	Communication with SIMATIC S7 Using Industrial Ethernet	
		(Hard Net)	84
	3.2.1	Commissioning of CP 1613 Communication Processor	86
	3.2.2	Creating the STEP7 Project S7_IEH	92
	3.2.3	Creating WinCC Project WinCC_S7_IEH	110
	3.2.4	Diagnostics of Communication Link Using Industrial Ethernet	
		(Hard Net)	125
	3.3	Communication with SIMATIC S7 Using Industrial Ethernet	
		(Soft Net)	129
	3.3.1	Commissioning of Communication Processor CP 1612	131
	3.3.2	Creating STEP7 Project S7_IES	136
	3.3.3	Creating WinCC Project WinCC_S7_IES	155
	3.3.4	Diagnostics of Communication Link Using Industrial Ethernet	470
	0.4		170
	3.4	Communication with SIMATIC S7 Using TCP/IP	174
	3.4.1	Commissioning of CP 1612 Communication Processor	1/6
	3.4.2	Creating STEP7 Project S7_IETCP	181
	3.4.3	Creating WINCC Project WINCC_S7_IETCP	201
	3.4.4	Diagnostics of Communication Links Using TCP/IP	217
	3.5		221
	3.5.1	Configuring winCC Stations	223
	3.5.2	Commissioning of Communication Processor CP 5611	231
	3.5.3		237
	3.5.4	Configuring S7-OPC Server	263
	3.5.5	Creating WINCC Project WINCC_S7_OPC	2/1
	3.5.6	Diagnostics of Communication Link Using OPC	287
	3.6	Communication with SIMATIC S7 Using PROFIBUS	290
	3.6.1	Commissioning of CP 5613 Communication Processor	292
	3.6.2	Creating STEP7 Project S7_PB	297
	3.6.3	Creating WinCC Project WinCC_S/_PB	324
	3.6.4	Diagnostics of Communication Link Using PROFIBUS	340
	3.7	Regundant Communication with SIMATIC Highly Available	244
	074	Inrough CP 1613	344
	3.7.1	Commissioning of CP 1013 Communication Processor	340
	3.1.2	Creating STEP/ Project S/_Kedundancy	353
	3.1.3	Discussed in the second s	383
	3.7.4	Diagnostics of Regundant Communication Connection	000
		Using industrial Ethernet	396

3.8	Communication WinCC - SlotPLC	399
3.8.1	Installation of WinAC Basis	401
3.8.2	Creating STEP7 Project S7_SlotPLC	406
3.8.3	Creating WinCC Project WinCC_SlotPLC	419
3.8.4	Diagnostics of Communication Link Using SlotPLC	433
3.9	Communication WinCC - WinCC Using OPC DA	435
3.9.1	Configuring WinCC Stations for OPC (WinCC - WinCC)	437
3.9.2	Creating WinCC Project WinCC_OPC_SERVER	445
3.9.3	Creating WinCC Project WinCC_OPC_CLIENT	455
3.9.4	Diagnostics of Communication Link Using OPC	467
3.10	Communication WinCC - WinCC Using OPC XML	471
3.10.1	Requirement for Utilization of OPC XML	473
3.10.2	Configuration of WinCC Stations for OPC XML	474
3.10.3	Creating WinCC Project WinCC_OPC_XML_SERVER	478
3.10.4	Creating WinCC Project WinCC_OPC_XML_CLIENT	488
3.10.5	Diagnostics of Communication Link Using OPC XML	501
3.10.6	Error Diagnostics (OPC XML)	505
3.11	Communication Using WinCC Web Navigator	507
3.11.1	Configuring WinCC Stations for Web Navigator	509
3.11.2	Creating WinCC Project WinCC_Web_Server	512
3.11.3	Configuring WinCC Web Navigator Server	522
3.11.4	Commissioning of WinCC Web Client	531
3.11.5	Error Diagnostics (WinCC Web Navigator)	533
	· · · · · · · · · · · · · · · · · · ·	

Contents

1

# 1 Basics Part

#### Introduction

This chapter will allow you a general view on the subject of communication, in particular communication with WinCC. It will provide you with the necessary technical background, address the applicable components, and describe the general procedures during configuration.

This chapter is divided into the following sections:

- Basics of Communication
- Communication Networks
- Communication Project Planning

# **1.1 Basics of Communication**

#### Introduction

This section of the manual will provide you with basic information on the subject of communication. It will provide you with generally accepted knowledge which maintains validity beyond the specific subject matter of communication using WinCC.

This present section gives information on the following topics.

- Basic Terms of Communication
- Network Topology
- Classification of Networks
- Access Procedures
- ISO-OSI Reference Model
- Linkage of Bus Systems

# 1.1.1 Basic Terms of Communication

#### Introduction

This section will explain basic terms on the subject of communication. Primarily those areas are discussed which are concerned with the exchange of information between a PLC and WinCC.

The following explains the most important communication terms which are important for the exchange of information between a PLC and WinCC.

#### Communication

The transfer of data between two communication partners is described as communication.

The transferred data may serve several purposes. During communication between a PLC and WinCC, the following options exist:

- Control of communication partners
- Status display of communication partners
- Message of unexpected statuses in communication partner
- Archiving



#### **Communications partners**

Communications partners are modules capable of exchanging data with each other. This may be central modules and communication processors in the PLC, or communication processors in the PC.

#### Station

A station is a device which, as a unit, may be attached to one or several subnets. This may be a PLC or a PC, for example.

#### Subnet

A subnet describes the unit of all physical components necessary to build a data transfer route, as well as the necessary procedures for data exchange.

#### Network

A network represents a unit consisting of one or several, similar or different, subnets connected with each other. The net encompasses all stations capable of communicating with each other.

#### Connection

A connection is a configured logical assignment of two communication partners to implement a certain communication service.

Each connection has two endpoints which contain the necessary information to address the communication partner, as well as additional attributes for establishing the connection.

#### **Communication functions**

Communication functions are functions offered by a software interface which make use of a communication service.

Communication functions are capable of transferring data between communication partners with different performance data. They are capable of controlling the communication partner or may inquire about its current operational status.

#### **Communication service**

A communication service describes communication functions with defined performance features, such as data exchange, controlling, or monitoring of equipment.

#### Software interface

Software interfaces offer communication services in end-user systems. A software interface not necessarily offers all communication functions of a communication service.

A communication service may be provided in the respective end-user system (PLC, computer) using different software interfaces.

#### Protocol

A protocol is an exact bit agreement between communication partners to implement a certain communication service.

The protocol defines the structural contents of data transmission on the physical link. Among others, it specifies operation mode, procedure during establishment of connection, data safety, and transmission rate.

# 1.1.2 Network Topology

#### Introduction

This section explains the different structures within a subnet.

If several independent automation components exchange information between each other, these structures must physically be connected. This physical connection may be structured quite differently. The term network topology describes the principal geometric arrangement of this structure. Individual communication partners form the nodes of this structure.

#### **Point-to-Point**

The simplest structure is obtained if the network consists of exactly two communication participants. This arrangement is described as

"Point-to-Point connection".



#### Line

A network arrangement with line structure is based on a main line, the so-called bus. All communication partners are connected to the main line by an access line.

It is not possible that several communication partners communicate at the same time. It must be specified that only one participant communicates at any given time. This requires regulations which are called bus access procedures. These are also required for the structures described in the following.

Failure of one communication partner hardly has any effect on the entire network.



### Ring

In this structure, the communication partners are connected such that they form a ring.

A ring may be structured such that it consists of serial "Point-to-Point connections". In such a structured network, each node may also function as an amplifier. This will allow to bridge larger distances.

Failure of one communication partner in a ring structure, however, will cause greater problems than in a line structure.



#### Star

In a star structure, all communication partners are connected to a central star coupler. This star coupler will control the entire communication.

Failure of the star coupler will generally cause a network failure. Failure of another communication partner hardly has any effect on the entire network.



#### Tree

A tree structure is a hierarchical connection of several line structures. These may be of different dimensions but also of different types.

The elements linking the individual lines are of special importance. If the linked parts are of the same type, they may be pure amplifiers. However, if the linked parts are of different types, transformers are necessary.



# 1.1.3 Classification of Networks

#### Introduction

This section explains network classes which are dependent upon geographical extent of the networks.

With respect to geographical extent of the networks, these may be divided into three classes. These are:

- LAN (Local Area Network): Extent < 5km</li>
- MAN (Metropolitan Area Network): Extent < 25km
- WAN (Wide Area Network): Extent > 25km

An exact assignment to these classes, however, cannot be made in each case due to diffuse boundaries between them.

#### Topology

Because of different distances to be bridged, a statement on topologies used may be made as well.

Topology of a WAN will be dictated by geographic conditions. For economic reasons, mostly irregularly meshed networks in tree structure are created. In contrast, topology of a LAN is more clearly structured since the focus is less on line economy and more on overall functionality. Typical topologies for LAN are line, ring and star.

#### **Transfer Medium**

The choice of physical transmittal medium depends especially on desired network extent, intended interference protection and transfer rate.

The following transfer media are listed by increasing complexity and performance:

- Two-conductor untwisted, unshielded
- Two-conductor twisted, unshielded
- Two-conductor twisted, shielded
- Coax cable
- Fiber optic conductor

# 1.1.4 Access Methods

#### Introduction

This section explains mechanisms used to regulate bus access to individual communication partners.

On a bus, only a single node may telegram at any given time. The access method regulates which communication partner may telegram at what times. The number of listening receivers is of no importance.

#### Master/Slave

In a Master/Slave method, the master controls the entire bus communication. It sends data to the connected slaves and requests them to send data in return.

Direct communication between slaves is usually not intended. This process is characterized especially by simple and therefore efficient bus control.

The Master/Slave method is also used in the area of field buses, such as Profibus-DP.

#### **Token Passing**

In the Token Passing method, a token circulates through the communication network as a message of transmitting authorization. Here, the token describes a fixed bit pattern.

The owner of a token may transmit. However, he must pass on the token no later than a previously specified time.

Bus access by the master in the PROFIBUS network is regulated using the Token Passing method.

#### CSMA/CD

In the CSMA/CD method (Carrier Sense Multiple Access with Collision Detection), each participant may transmit at any time. However, the condition is that no other bus participant transmits.

Conflicts arise because of transmittal run times if two communication partners transmit simultaneously upon a free bus. In this case, the participants recognize the collision and stop their transmittal. They will attempt another transmittal after a certain amount of time.

The Industrial Ethernet uses the CSMA/CD method.

### 1.1.5 ISO-OSI Reference Model

#### Introduction

During data exchange between two sites using a common bus system, the transfer system and access method must be defined. For this reason, the International Standardization Organization (ISO) defined a 7 layer model.

#### **General Information**

For sufficient and secure communication, layers 1, 2 and 4 are required.

- Layer 1 specifies the physical conditions, such as current and voltage level.
- Layer 2 specifies the access mechanism and addressing of partners.
- Layer 4 is responsible for data security and data consistency. This layer is also called the transport layer. Aside from transport control, the transport layer also handles tasks for data flow control, blocking and acknowledgment.

#### **ISO-OSI Reference Model**

Layers defined in the ISO-OSI Reference Model regulate the behavior of communication partners. The layers are arranged in horizontal tiles. Layer 7 is the top layer. Communication partners may only communicate within the same layer.

The Reference Model does not specify how the individual layers are realized in each case. This is up to the specific implementation.

Individual layers are specified as follows.

Layer	Name	Description
7	Application Layer	Supplies the application-specific communication services.
6	Presentation Layer	Transforms the data from the standard display of the communication system to the site-specific form.
5	Session Layer	Responsible for connecting, disconnecting, and monitoring of communication link.
4	Transport Layer	Responsible for transport control.
3	Network Layer	Responsible for data path from one address to another.
2	Data Link Layer	Responsible for error recognition and error elimination. Specifies bus access method.
1	Physical Layer	Specifies physics of data transmission.

#### Physical Layer (Bit transfer layer)

This layer is responsible for the transparent transmission of bits through the physical medium. It specifies the electrical and mechanical properties, as well as transmittal types.

#### Data Link Layer (Connection layer)

This layer ascertains the transmittal of bit sequences between two systems. This includes recognition, elimination and passing on of transmittal errors, as well as flow control. In local networks, the connection layer is additionally responsible for the exclusive access to the transfer medium.

The connection layer is separated into two partial layers. These are referred to as Layer 2a and Layer 2b.

- Medium Access Control (MAC)
- Logic Link Control (LLC)

#### Network Layer (Exchange layer)

This layer is concerned with the exchange of data between end systems. End systems are sender and receiver of a message whose path may go through several transit systems under certain circumstances. The network layer will determine the optimum path (Routing).

#### Transport Layer (Transport layer)

This layer provides the user with a reliable End-to-End connection. Services offered include establishment of a transport connection, data transmittal, and termination of the connection. The service user may typically demand a particular quality of service (QoS, Quality of Service). Quality parameters, for example, are transmission rate or remaining error rate.

#### Session Layer (Communication control layer)

The main task of the communication control layer is synchronization of communication links. Using the services of the communication control layer, synchronization points may be set during a longer transmittal. During an unwanted disconnect, the transmittal process may be reestablished from a certain synchronization point on.

#### Presentation Layer (Presentation layer)

This layer is responsible for the transformation of data into the application-required format. Furthermore, it compresses texts and converts different codes used by the communication partners. A particular feature of this layer is also the realization of a common communication language.

#### **Application Layer (Application layer)**

The application layer encompasses the application-specific services of different communication applications. Since there is a multitude of applications, it is particularly difficult to achieve a unified standard.

# 1.1.6 Connection of Bus Systems

#### Introduction

For a continuous flow of information between two different subnets, special connection elements are required. The following section contains information on different types of these connection elements.

#### **General Information**

Depending on the extent of connection and subnets to be connected, respectively, network connections differentiate between Repeaters, Bridges, Routers and Gateways.

These connection elements may be projected onto the ISO Reference Model based on their tasks.

#### Repeater

A Repeater copies the information received on the line to the respective other side, and amplifies it in the process. A Repeater functions transparently for all layers of the communicating participants, i.e., the physical layers of both networks must be identical.

Repeaters are often not used for connecting two equal subnets but are used to expand or extend an existing subnet, e.g. a bus system.

#### Bridge

The Bridge is used to connect subnets which work with the same protocols at the connection layer (Logical Link Control, LLC). The transfer media and bus access methods (Medium Access Control, MAC) of the subnets may be different.

The Bridge is primarily used to connect local networks of different topologies, or to connect specific structures to subnets by special applications.

#### Router

The Router serves to connect ISO networks which differ in layers 1 and 2.

The Router determines the optimum path (communication path) of a message through an existing network (Routing). Criteria for the optimum path may, for example, be the path length or the least delay in transmission. In order to fulfill its task, the Router will change target address and source address of network layers for incoming data packages before passing on the data.

Since Routers must perform a much more complex task than Bridges, they offer a slower processing speed.

#### Gateway

A Gateway serves to connect networks of different architecture. This allows to connect two arbitrary subnets. With respect to the ISO Reference Model, the task of a Gateway is the compilation of communication protocols of all layers. A Gateway also allows the connection of an ISO network with a non-ISO network.

Network connections using Gateway are typically characterized by significant effort and lower speed.

# 1.2 Communication Networks

This section of the manual contains information on different options in industrial communication. It will discuss different applicable communication types, explain their features, and showcase the components applicable in each case.

In this chapter you will find information on the following subjects:

- Overview of Industrial Communication
- Subnetworks in Industrial Communication
- Industrial Communication Using MPI
- Industrial Communication Using PROFIBUS
- Industrial Communication Using Ethernet

# 1.2.1 Overview of Industrial Communication

#### Introduction

This section contains information on industrial communication and categorizes different communication types into their respective industrial environment.

#### **General Information**

Corresponding to different requirements, different communication networks are available for industrial communication. The following representation offers a rough assignment between different automation levels and their appropriate communication networks.



#### Management Level

At the management level, superordinate tasks are processed which concern the entire operation. Among tasks of the management level are:

- Archiving of process values and messages
- Processing and analysis of process values and messages
- Logging of process values and messages

Operational data may also be collected and processed for more than one site. From the management level, access to other sites is possible as well. The number of participants in such a network can exceed 1,000.

The dominating network type at the management level is the Ethernet. In order to bridge large distances, the TCP/IP protocol is used primarily.

#### **Cell Level**

At the cell level, automation tasks are processed. Here, PLCs, operating and monitoring devices, as well as computers are connected to each other.

Depending on performance requirements, the cell level uses primarily Industrial Ethernet and PROFIBUS network types.

#### **Field Level**

The field level represents the link between PLCs and the system. Devices deployed at the field level supply process values and messages, for example, and pass on commands to the system.

Data amounts to be transmitted at the field level are low in the majority of cases.

The dominating network type at the field level is the PROFIBUS. Communication with field devices often uses the DP protocol.

#### **Actuator-Sensor Level**

At the actuator-sensor level, a master communicates with actors and sensors connected to its subnet. A characteristic of this level is the transmittal of extremely low data amounts, but with an extremely fast response time.

# 1.2.2 Sub-Networks in Industrial Communication

#### Introduction

This section contains information on various sub-networks used in industrial communication. However, only sub-networks are considered which are of relevance to communication with WinCC. Therefore, the Actor/Sensor interface (AS-i) is not described.

#### **General Information**

Corresponding to different requirements in industrial communication, different subnets are offered. The following list is sorted by increasing sub-net performance:

- MPI
- PROFIBUS
- Industrial Ethernet

#### MPI

The MPI (Multi Point Interface) is suitable for networking at the field and cell level with small aerial extent. However, it may only be used jointly with SIMATIC S7. The MPI interface of the central module group is used for communication with the PLC. The MPI interface has been designed as a programming interface and quickly approaches its performance limits upon increasing communication demands.

A computer may use its own MPI card to access an MPI sub-net. Furthermore, all communication processors may be used which permit access to the PROFIBUS.

#### PROFIBUS

The PROFIBUS (Process Field Bus) is a sub-net designed for field and cell level. It represents an open, manufacturer-independent communication system.

The PROFIBUS is used to exchange smaller to medium-sized amounts of data between a few communication partners.

Using the DP (decentralized peripheral) protocol, the PROFIBUS facilitates communication with intelligent field devices. This type of communication is characterized by rapid cyclical data exchange.

#### **Industrial Ethernet**

The Industrial Ethernet is a sub-net suitable for control and cell levels. It facilitates the exchange of extensive amounts of data over large distances between many participants.

The Industrial Ethernet represents the most powerful sub-net available in industrial communication. It may be configured with a small amount of effort and may be expanded without problems.

# 1.2.3 Industrial Communication Using MPI

#### Introduction

This section contains information of MPI sub-nets. In addition to features and application options of this sub-net, components are described which are necessary or applicable within the network.

#### **General Information**

The MPI sub-net may be used at the field or cell level. Communication partners to be networked must be members of the SIMATIC S7 family.

Using MPI, up to 32 participants may be networked at reasonable costs. However, a cutback in the network performance must be acceptable for the decision regarding a communication solution using MPI.

MPI facilitates communication using the MPI interface which is integrated into PLCs of the SIMATIC S7 family. This interface has been designed as a programming interface.

The following display shows an example of an MPI network. Bus access by the individual communication partners is implemented using the programming interface of the respective central module groups.



#### **Access Methods**

MPI uses the "Token Passing" access method. Access permission to the bus is passed from station to station. This access permission is referred to as a token. If a site has received the token, it may telegram. Upon expiration of a set waiting period, at the latest, the token must be passed on. If a site has no telegram to send, the token is passed on directly to the next site within the logical ring.

#### **Transfer Media**

The same transfer technology may be used for the MPI network as for the PROFIBUS network. Optical and electrical networks may also be installed. The transfer rate is typically at 187.5 kBit/s. However, the most recent version of S7-400 achieves transfer rates of up to 12 MBit/s.

# 1.2.4 Industrial Communication Using PROFIBUS

#### Introduction

This section contains information on PROFIBUS sub-nets. In addition to features and application options of this sub-net, components are described which are necessary or applicable within the network.

#### **General Information**

The PROFIBUS sub-net is designed for the field and cell level with a maximum number of 127 participants.

PROFIBUS represents an open, manufacturer-independent communication system. It is based on the European standard EN 50170, Volume 2, PROFIBUS. Through compliance with these requirements, PROFIBUS guarantees openness for linking standard components by other manufacturers.

The following display shows an example of a PROFIBUS network. It offers a gross overview of which components are used mainly for implementation of bus access by individual communication partners. Because of the open PROFIBUS concept, devices by other manufacturers may also be connected to the communication network.



# 1.2.4.1 Access Method in PROFIBUS

#### **Access Method**

The PROFIBUS network differentiates between active and passive network participants. Active participants utilize the "Token Passing" access method, passive participants utilize the "Master/Slave" access method. The access method in PROFIBUS is therefore also referred to as "Token Passing" with subordinate Master/Slave.



All active sites form a logical ring in a specified sequence. Each active site knows of the other active stations and their sequence within PROFIBUS. The sequence is independent of the physical order of active sites on the bus.

Access permission to the bus is passed from active station to active station. This access permission is referred to as a token. If a site has received the token, it may telegram. Upon expiration of a set waiting period, at the latest, the token must be passed on. If a site has no telegram to send, the token is passed on directly to the next site within the logical ring.

If an active station with subordinate passive stations receives the token, the station will request data from the subordinate station, or will send data to the other stations. Passive stations cannot receive the token.

# 1.2.4.2 Protocol Architecture of PROFIBUS

#### **Protocol Architecture**

For different applications of PROFIBUS, optimized protocols are available for the respective requirements. From the user point of view, the following protocol variants exist:

- PROFIBUS-FMS (Fieldbus Message Specification) is suitable for communication of PLCs in smaller networks at the cell level, as well as communication with field devices with FMS interface. The high-performing FMS services offer an additional application and greater flexibility for handling extensive communication tasks.
- PROFIBUS-DP (Decentralized Peripheral) represents a profile for connecting decentralized peripherals with very fast response times, such as ET 200.
- PROFIBUS-PA (Process Automation) represents an expansion of PROFIBUS-DP compatible with PROFIBUS-DP. PROFIBUS-PA was especially designed for the area of process technology and permits connection of field devices even in areas subject to explosion risks.

All protocols use the same transfer technology and a unified bus access protocol. They may therefore be operated with one single line.

In addition to the protocols listed above, the following communication options are supported as well:

- FDL services (SEND/RECEIVE) permit a simple and quickly realizable communication to any communication partner which supports FDL (Field Data Link).
- S7 functions permit optimized communication within the SIMATIC S7 system.
## 1.2.4.3 Transfer Media

#### Introduction

The PROFIBUS network may be installed as an optical or an electrical network. Mixed structures of electrical and optical PROFIBUS networks may also be implemented.

#### **Electrical Network**

The electrical PROFIBUS network uses as transfer medium shielded, twisted twoconductor wires. The RS 485 interface works on voltage differences. It is therefore less sensitive to interference than a voltage or current interface.

Different PROFIBUS partners are connected to the bus using a bus terminal or a bus connector plug. Up to a maximum of 32 participants may be connected to one segment. Individual segments are connected to each other using a repeater. The transfer rate may be set in increments from 9.6 kBit/s to 12 MBit/s. The maximum segment length depends on the transfer rate.

The following table contains maximum distances which may be bridged with and without use of repeaters:

Transfer rate	Distance without Repeater	Distance with Repeater	
9.6 - 93.75 kBit/s	1000 m	10 km	
187.5 kBit/s	800 m	8 km	
500 kBit/s	400 m	4 km	
1.5 Mbit/s	200 m	2 km	
3 - 12 MBit/s	100 m	1 km	

#### **Optical Network**

The optical PROFIBUS network uses fiber optic cables as transmittal medium. The fiber optic variant is insensitive to electromagnetic interference, is suitable for large ranges, and optionally uses plastic or glass optical conductors. The transfer rate may be set in increments from 9.6 kBit/s to 12 MBit/s. The maximum segment length is independent of transfer rate, except for redundant optical rings.

For the design of an optical PROFIBUS network, two different connector technologies are available.

- Using Optical Link Modules (OLM) with plastic or glass fiber optic cables: Using OLM permits the design of an optical network in linear, ring, or star structure. Connection of end devices takes place directly at the OLM. Optical rings may be designed as single strand rings (cost-optimized) or as dual strand rings (increased network availability).
- Using Optical Link Plugs (OLP), passive bus participants may be connected to an optical single strand ring in a very simple manner. The OLP is plugged directly onto the PROFIBUS interface of the bus participant.

Maximum bridgeable distances for the optical PROFIBUS network range beyond 100 km for all transfer rates.

# 1.2.5 Industrial Communication Using Ethernet

#### Introduction

This section contains information on Industrial Ethernet sub-nets. In addition to features and application options of this sub-net, components are described which are necessary or applicable within the network.

#### **General Information**

The Industrial Ethernet is the most powerful sub-net used in the industrial field. It is suitable for the cell level as well as the management level. The Industrial Ethernet permits the exchange of extensive amounts of data over large distances between many participants.

The Industrial Ethernet has been standardized as an open communication network in accordance with IEEE 802.3. It was specifically designed to provide economical solutions to demanding communication tasks in the industrial environment. Among the decisive advantages of this sub-net are its speed, simple expandability and openness, as well as high degree of availability and worldwide distribution. Configuration of an Industrial Ethernet sub-network requires very little effort.



#### **Access Method**

The Industrial Ethernet uses the access method of CSMA/CD (Carrier Sense Multiple Access/Collision Detection). Each communication participant must check prior to telegramming whether or not the bus trunk is available at the time. If the bus trunk is available, the communication partner may telegram immediately.

If two communication partner begin to telegram at the same time, a collision occurs. This collision is recognized by both partners. The communication partners terminate their telegrams and reinitiate another telegram attempt after a certain amount of time has passed.

# 1.2.5.1 Protocol Profiles of Industrial Ethernet

#### **Protocol Profiles**

Using the Industrial Ethernet, communication may be facilitated by using the following protocol profiles:

- MAP (Manufacturing Automation Protocol) uses MMS services as user interface.
- The TF protocol contains the open automation protocol SINEC AP proven in many applications. Building on these, the technological functions of TF are available.
- SEND/RECEIVE offers functions which permit simple and quick implementation of communication between S5 and S7 with each other on the one hand, and with the PC on the other hand.
- S7 functions permit optimized communication within the SIMATIC S7 system.

A change of communication profile without changing the user programs is possible.

# 1.2.5.2 Transport Protocols

#### **Possible Transport Protocols**

Several transport protocols are available for communication using Industrial Ethernet:

- ISO transport offers services for transfer of data using process-to-process connections. User data may be split into several data telegrams.
- ISO-on-TCP transport corresponds to the TCP/IP standard with RFC 1006 expansion. This expansion is necessary since TCP/IP uses data stream communication without splitting user data.
- UDP offers only unsecured data transfer.

# 1.2.5.3 Transfer Media

#### Introduction

The Industrial Ethernet may be installed as an optical or an electrical network. Mixed structures consisting of electrical and optical networks may also be realized. This allows to use advantages and configuration options of both network types.

#### **Electrical Network**

The electrical Industrial Ethernet offers two wiring options:

- Triax cables (AUI)
- Industrial Twisted Pair cables (ITP)

In order to connect communication module groups to an ITP network using only one AUI interface, a twisted pair transceiver (TPTR) must be used.

#### **Optical Network**

The optical network may be designed in linear, ring, or star structure. Glass fiber optic cables are used exclusively for this.

# 1.2.5.4 PROFINET

#### Introduction

As part of Totally Integrated Automation (TIA), PROFINET represents the logical continuation of the following systems:

- PROFIBUS DP (established field bus)
- Industrial Ethernet (communication bus for cell level)

Functions and services from both systems are integrated into PROFINET.

PROFINET, as an Ethernet-based automation standard by PROFIBUS International, therefore defines an all-manufacturer encompassing model for:

- Communication
- Automation
- Engineering

PROFIBUS International originated from PROFIBUS Nutzerorganisation e.V. (User Organization).

#### WinCC & PROFINET

Yo may access PROFINET modules using the S7 PROFINET Master.

Additionally, WinCC can communicate with PROFINET using OPC. In order to do so, you must operate the SIMATIC PC Station as the PROFINET IO Controller.

#### **SIMATIC PC Station**

A "PC Station" is a PC with communication modules and software components within the automation solution using SIMATIC.

### PC Station as PROFINET IO Controller

Using the appropriate communication modules and software components, you may operate any PC station as the PROFINET IO Controller.

PC applications of the PC station have the following access options to the PROFINET IO Controller:

- As OPC Client using the OPC Server PROFINET IO
- Directly using the PROFINET IO user interface (RTE Base programming interface)

PC applications may use only one of these access options (Open/Close sequence) at any given time.

#### Communication

Functions	OPC Server PROFINET IO	RTE Base Programming Interface
Reading and writing of IO data	Yes	Yes
Reading and writing of data sets	Yes	Yes
Receiving and acknowledging of alarms	No	Yes

#### Note

Additional information may be found in the Siemens documentation on the subject of "Profinet".

# 1.3 Interface Standard OPC

#### Introduction

This section contains information on interface standard OPC and its application options.

#### **General Information**

OPC (OLE for Process Control) represents an open communication standard for components in the automation area. Using this concept achieves the integration of office applications, operating, and monitoring systems such as WinCC, controlling, and field devices.

OPC is defined by the OPC Foundation as an open interface standard. The OPC Foundation represents an association of more than 320 companies in the automation industry. The current specification of OPC is accessible to anyone free of charge using the internet. Information on individual members of the OPC Foundation and their product offerings are also available.

The internet address of the OPC Foundation is:

http://www.opcfoundation.org

#### **Communication Concept**

Minimum components of an OPC Configuration are always an OPC server and an OPC client. The OPC server represents an application which provides data to an OPC client. The OPC client downloads the data for further processing.

#### WinCC and OPC

WinCC supports the following OPC specifications:

- OPC Data Access (DA)
- OPC Alarms & Events (OPC A&E)
- OPC Historical Data Access (OPC HDA)
- OPC eXtensible Markup Language DA (OPC XML-DA)

# 1.3.1 OPC Data Access (OPC DA)

#### Introduction

The OPC DA specification defines an interface for reading and writing of realtime data.

#### WinCC OPC-DA Server

The WinCC OPC-DA Server complies with OPC DA specifications 1.0a, 2.0, and 3.0.

The WinCC OPC-DA Server makes available online tag values of the WinCC project to other applications. Applications may be running on the same computer or on computers as part of the connected network.

The WinCC OPC-DA Server is activated once the OPC Client accesses the WinCC OPC-DA Server through a connection. In order to successfully establish an OPC communication, you must observe the following:

- The WinCC project of the WinCC OPC-DA server must be activated.
- The computer of the WinCC OPC-DA must be accessible through its IP address.

#### WinCC OPC-DA Client

The WinCC OPC-DA client may access the process values of a PLC using the OPC-DA server of a manufacturer XYZ. There are a multitude of OPC-DA servers by different manufacturers. Each of these OPC-DA servers has a unique name (ProgID) for identification purposes. This name must be used by the OPC-DA client in order to address the OPC server.

The WinCC OPC-XML client consists of two parts:

- OPC Item Manager for displaying and browsing of OPC servers, establishing WinCC connections, and creating WinCC tags
- Communication drivers (WinCC channel) for data exchange in activated project

Using the OPC Item Manager, you may inquire the name of the OPC-DA server.

The WinCC OPC-DA client may access OPC DA servers compliant with specifications 1.0a, 2.0, or 3.0.

# 1.3.2 OPC Historical Data Access (OPC HDA)

#### Introduction

The OPC HDA specification defines an interface for access to archived data.

#### WinCC OPC-HDA Server

The WinCC OPC-HDA Server complies with OPC-HDA specification 1.1. The WinCC OPC-HDA server provides required data from the WinCC archive system to the OPC-HDA client. Data access may be read or write.

All OPC-HDA clients of specification OPC Historical Data Access 1.1 may access the WinCC OPC-HDA server.

Additional information on configuration of WinCC OPC-HDA servers may be found in the WinCC documentation in Chapter "Interfaces" > "OPC - OLE for Process Control".

# 1.3.3 OPC Alarms & Events (OPC A&E)

#### Introduction

The OPC Alarms & Events specification defines an interface for monitoring events.

#### WinCC OPC-A&E Server

The WinCC OPC-A&E server is compliant with OPC-A&E specification 1.0. The WinCC OPC-A&E server may only be used on a WinCC server. The WinCC OPC-A&E server represents a Condition Related Event Server.

In a Condition Related Event Server, the event is linked to a certain condition. For example, the condition may be a limit value violation of a tag.

In addition, there is a Simple Event Server and a Tracking Event Server:

- In a Simple Event Server, the event represents simple information, such as start, stop, or user logon.
- A Tracking Event Server differs from a Simple Event Server by the fact that additionally a UserID is issued. Events for a Tracking Event Server are, for example, operations by a user.

All OPC-A&E clients of specification OPC Alarms & Events 1.0 may access the WinCC-OPC A&E Server.

Additional information on configuration of WinCC OPC-A&E servers may be found in the WinCC documentation in Chapter "Interfaces" > "OPC - OLE for Process Control".

# 1.3.4 OPC eXtensible Markup Language DA (OPC XML-DA)

#### Introduction

OPC XML represents a standard which enables communication using a platformindependent protocol over the internet. A client is no longer restricted to the Windows environment. Data access using OPC XML has a functional extent similar to OPC Data Access.

#### WinCC OPC-XML Server

The WinCC OPC-XML is implemented as the web service of Microsoft Internet Information Server (IIS). The WinCC OPC-XML server supplies the OPC-XML client with OPC process data as a website. The website is accessed using the internet via HTTP.

The WinCC OPC-XML server is not visible in WinCC. If an OPC-XML client requests data, the web service is automatically started by the web server. In order to successfully establish an OPC communication, you must observe the following:

- The WinCC project of the WinCC OPC-XML server must be activated.
- The computer of the WinCC OPC-XML server must be accessible through HTTP.

#### WinCC OPC-XML Client

The WinCC OPC-XML client may access the process values of a PLC using the OPC-XML server of manufacturer XYZ.

The WinCC OPC-XML client consists of two parts:

- OPC Item Manager for displaying and browsing of OPC servers, establishing WinCC connections, and creating WinCC tags
- Communication drivers (WinCC channel) for data exchange in activated project

# 1.4 Communication Configuration

#### Introduction

This section contains information on configuration of a communication connection in a WinCC project. The general concept of WinCC process communication is explained, as well as configuration procedure for process communication and its diagnostics.

This present section will provide information on the following topics.

- WinCC Process Communication
- WinCC Communication Configuration

# 1.4.1 WinCC Process Communication

#### **Data Manager**

Administration of a data set is handled by the data manager in WinCC. However, this manager is not visible for the user. The data manager works with data created within the WinCC project and saved in the project data bank. It assumes the entire administration of WinCC tags during the runtime of WinCC Runtime. All WinCC applications must request the data from the data manager as WinCC tags. These applications include Runtime, Alarm Logging Runtime, and Tag Logging Runtime, among others.

#### **Communication Drivers**

In order for WinCC to communicate with different available PLCs, different communication drivers are used. The WinCC communication drivers connect the data manager to the PLC.

A communication driver represents a DLL which communicates with the data manager using a Channel API interface. The Channel API interface is specified by the data manager. The communication driver supplies the WinCC tags with process values.

#### **Communication Structure**

The administration of WinCC tags in Runtime is handled by the WinCC data manager. Different WinCC applications direct their tag requests to the data manager.

The data manager obtains the requested tag values from the process. This is facilitated using the communication driver tied into the respective WinCC project. The communication driver forms an interface between WinCC and the process through one of its channel units.

The hardware connection to the process is usually facilitated using a communication processor. The WinCC communication driver sends requests to the PLC using the communication processor. The PLC sends the requested process values back to WinCC in respective response telegrams.



# 1.4.2 WinCC Communication Configuration

#### Introduction

This section contains information on configuration steps for establishing a communication link to a PLC in WinCC.

#### **Communication Drivers**

In WinCC, communication is facilitated through various communication drivers. There is a multitude of communication drivers available for linking different automation systems through different bus systems.

Linking a communication driver in the WinCC project takes place in WinCC Explorer. The communication driver is linked to tag management. In general, this

takes place by clicking  $\sqrt[6]{B}R$  on the "Tag Management" entry and the "Add New Driver" entry. Afterwards, all communication drivers installed on the computer are offered in a selection dialog. Each communication driver can only be linked to the WinCC project once, not several times.



Communication drivers are files with the file extension "\*.chn". Communication drivers installed on the computer are located in the WinCC installation directory in subdirectory "\bin".

Following linkage of the communication driver to the WinCC project, it will be displayed WinCC Explorer as an additional sub-item next to the "Internal Tags" entry in Tag Management.

#### **Channel Unit**

The communication driver entry in Tag Management contains at least one, in many cases several sub-items. These are the so-called Channel Units. Each Channel Unit forms an interface to exactly one subordinate hardware driver and therefore to exactly one communication module in the computer. For the Channel Unit, you define which communication module should be addressed.

You configure this assigned module in the "System Parameter" dialog. You open

the dialog by clicking  ${}^{\checkmark} UR$  on the entry of the respective Channel Unit in WinCC Explorer and the "System Parameter" entry.



This dialog has a different appearance in different communication drivers. Here you configure the module to be used by the Channel Unit. However, input of additional information on communication using this module may be necessary.

#### Connection

You establish a connection to a PLC so that the Channel Unit may read process values from the PLC and may write process values. A new connection is

established by clicking  ${}^{\checkmark} BR$  on the entry of the respective Channel Unit in WinCC Explorer and on the "New Driver Connection" entry.

The type of parameters to be set for the connection may differ from one communication driver to the next. The connection must definitely be assigned a unique name within the project. In general, using the additional parameters to be set will specify the communication partner to be addressed.

#### WinCC Tags

In order to obtain access to specific data of the PLC, you need to configure WinCC tags. In contrast to internal tags which do not have any process connection, these tags are referred to as external tags.

WinCC tags are created for each configured connection. Creation of a new WinCC

tag is facilitated by clicking  ${}^{\frown} BR$  on the entry of the respective connection in WinCC Explorer and selecting the "New Tag" entry.



The property dialog of the tag opens. In this dialog you will specify various properties of the tag.

Assign a unique name to the tag.

Furthermore, the data type of the tag must be specified. In relation to external tags, WinCC supports the following tag types:

- Binary tag
- Unsigned 8-bit value
- Signed 8-bit value
- Unsigned 16-bit value
- Signed 16-bit value
- Unsigned 32-bit value
- Signed 32-bit value
- Floating-point number 32-bit IEEE 754
- Floating-point number 64-bit IEEE 754
- Text tag 8-bit character set
- Text tag 16-bit character set
- Raw Data Type

For numeric data types, with the exception of data type "Binary tag", you may execute a type conversion. This means that a WinCC tag may reference a data area in the PLC which does not correspond to the data type of the WinCC tag.

No type conversion is executed by default. The WinCC tag is assigned a data area in the PLC which corresponds to the data type of the WinCC tag.

For numeric data types, with the exception of data type "Binary tag", you may also perform linear scaling. The value range of a quantity available within the process may then be linearly projected onto a certain value range of a WinCC tag.

For example, the process may demand presentation of actual values in units "bar". However, in WinCC you are supposed to enter this value in "mbar". The simplest solution to this problem is the use of linear type conversion shown in the following figure.

Tag properties		×			
General Limits/Reporting	1				
Properties of Tags					
<u>N</u> ame:	WinCC_Variable_01				
Data <u>T</u> ype :	Floating-point number 64-bit IEEE 754				
Length:	8				
<u>A</u> ddress:	Select				
Adapt <u>f</u> ormat :	DoubleToDouble				
C <u>P</u> roject-wide upda	ite C Computer-local update				
🔽 Linear scaling					
Process Value Range	Tag Value Range				
Value1 0	Value1 0				
Value2 1	Value2 1000				
OK Cancel Help					

Tags of data type "Text tag 8-bit character set" as well as "Text tag 16-bit character set" require a length statement. This length statement is in characters. This means that for a tag of type "Text tag 16-bit character set", intended to take on 10 characters, a length of 10 characters must be configured.

WinCC must be assigned to a data area in the communication partner. They must be addressed in a certain way in the communication partner. The type of addressing depends on the type of communication partner. The dialog for setting the address of a tag may be opened by clicking the "Select" button.

# 2 Decision Support

#### Introduction

This chapter offers support in the decision for one of the communication solutions offered. General procedures are presented, based on the existing circumstances and requirements posed for a project, which will allow you to select the best-suited communication solution.

#### Factors for Selecting a Communication Solution

Factors which enter the decision for a communication solution are extremely complex. The timing for the decision to be made is important. The best time for this is the planning state for a system. If it is supposed to build on an existing system, the available latitude to play with existing circumstances is typically quite limited.

Experience from a multitude of existing projects shows: It makes sense to plan for a sufficiently large reserve during configuration of a communication solution. The rule of thumb is approximately 20%. The comparatively low additional costs for this pay off as savings many times over during later configuration and expansion.

The main factors in a decision for one of the communication solutions offered are:

- Data amount to be handled
- Number of participants
- Network extent
- Expected expandability

#### Procedure in selecting the communication solution

This chapter is divided into the following sections:

- Project Analysis Requirements posed to communication by the own project must be specified exactly.
- Performance Data Specified requirements posed to communication must be compared to services offered by various communication options.

# 2.1 Project Analysis

#### Introduction

This section offers you a guide with support for exact specifications of requirements for the communication system.

In order to come to the proper decision on a communication solution, it is important to know which requirements are asked of the communication system in the first place. You must gather and analyze all necessary data. The following information refers exclusively to determining such communication requirements.

An important foundation for determining such requirements is the quantity structure. Furthermore, you must take into consideration the existing specifications for hardware and software used.

This chapter is divided into the following sections:

- Quantity Structure Determining the projected data amounts and origin of data.
- Notes on Configuration Reduction of communication load and increase in performance.

## 2.1.1 Quantity Structure

#### Introduction

The assessment of quantity structure will help you in determining the data amount to be handled by the communication system. This will require, among others, what data amounts are needed by the WinCC project and where the WinCC project must obtain the data from.

You obtain the needed data amount by adding the data amounts required by individual applications. Therefore, you determine the requirements of the following applications:

- Graphics Runtime
- Alarm Logging Runtime
- Tag Logging Runtime
- Global Script Runtime (including C actions in individual WinCC pictures)
- Customer-specific applications

#### **Requirements of Graphics Runtime**

Graphics Runtime will require from data manager only those data needed for updating the values in the currently displayed WinCC picture. This means that requirements imposed upon the communication system depend on individual pictures and may be rather different from one WinCC picture to the next.

The communication load caused by Graphics Runtime which will enter your decision is determined by the picture with the highest communication volume.

#### **Requirements of Alarm Logging Runtime**

Alarm Logging Runtime will require from data manager all tags to be monitored in a cycle set by the system. This may be event tags or tags for boundary value monitoring.

If no configurations have been implemented in Alarm Logging, the data to determine the number of messages may typically be deduced from measurement points and I/O lists.

#### **Requirements of Tag Logging Runtime**

Tag Logging Runtime will require from data manager all tags to be archived. Tag Logging Runtime will follow the update cycle specified for the respective tag. Whether these archived tag values are displayed as a trend or table will have no influence on the entire requirements for the communication system.

If no configurations have been implemented in Tag Logging, the data to determine the number of tags whose values are to be archived may typically be deduced from customer requirements for archiving and production run logs.

#### **Requirements of Global Script Runtime**

Requirements imposed by Global Script Runtime upon the communication system depend on the type of tag request in WinCC scripts and their runtime cycles.

Take note that WinCC scripts may be executed globally as well as locally only in individual WinCC pictures.

Determination of Global Script Runtime requirements may therefore, in a worst case scenario, permit only a rough estimate of data amounts to be handled.

#### **Communication Telegrams**

Communication between individual communication partners is facilitated by sending telegrams. This is concerned with communication between:

- PLCs and operating and monitoring stations
- Between PLCs
- PLCs and their peripherals

Instead of the term telegram, one often uses the term PDU (Protocol Data Unit).

For example, a WinCC station requests certain data from a PLC by sending request telegrams. In return, the PLC sends the requested data in the form of a response telegram to the WinCC station.

The following display shows an example of a telegram structure.

1101001 11101101 1101101 1101101 1101001 1110110	<b>Telegram Header</b> Contains general telegram information. This can include, among other things, information about the telegram type
11011 11101101 11101001 11101101 11101101 11101101 11101101 11101101 11101101 11101101 11101101 11101101 11101101 11101101 11101101 11101101	<b>Telegram Body</b> Contains the user data of the telegram. This can be tag values
1101001 11101101 11011 1101101 11101101 11011 110110	Address Information, e.g. 4 Byte Net Data, e.g. 2 Byte

#### Net space requirement of WinCC tags

In order to determine the data volume required by WinCC, information is needed on the space requirements of individual WinCC tags. This space requirement will vary greatly between individual data types. The following table lists the space requirement of WinCC tag types.

Pos.	Tag type:	Space requirement
1	Binary tag	1 byte
2	Unsigned 8-bit value	1 byte
3	Signed 8-bit value	1 byte
4	Unsigned 16-bit value	2 bytes
5	Signed 16-bit value	2 bytes
6	Unsigned 32-bit value	4 bytes
7	Signed 32-bit value	4 bytes
8	Floating-point number 32-bit IEEE 754	4 bytes
9	Floating-point number 64-bit IEEE 754	8 bytes
10	Text tag 8-bit character set	1 byte per character
11	Text tag 16-bit character set	2 bytes per character
12	Raw data type	Set length

Please note in determining the net space requirement that for certain data types a configuration of type conversion is possible. In this case, the net space requirement of a WinCC tag in the communication telegram corresponds to the space requirement of the format to which the tag is adjusted.

#### Example:

For the type conversion, a tag of the "Unsigned 32-bit value" data type is projected onto the memory space of 16 bits in the PLC. This is achieved through type conversion DwordToUnsignedWord. The space requirement of the WinCC tag in the communication telegram no longer corresponds to the 4-bit value listed in the table but only to 2 bits instead.

DwordToUnsignedWord	•
	DwordToUnsignedWord

#### Total space requirement of WinCC tags

For the transfer of a tag using a telegram between communication partners, not only net data are of relevance. Address information is also necessary to enable an assignment of individual tags by the communication partner.

For communication using SIMATIC S7, for example, each tags requires an additional 4 bytes for additional information. This represents a significant increase in space requirement for individual tags. The space requirement of a tag with a net space requirement of 1 byte increases by a factor of 4 by the additionally transmitted information.

This example specifically applies to communication using SIMATIC S7. Communication using other systems will be based on comparable situations.

#### Update cycle

For various WinCC tags, whether or not these are requested by Graphics Runtime, Alarm Logging Runtime, or some other application, an update cycle must be specified. This update cycle will have great influence upon the demands the WinCC project will impose upon the communication system. Specification of the update cycle will therefore have to be planned very carefully.

In connection with WinCC, update cycles listed in the following table are generally used. In addition, using the user cycles, a maximum of 5 individual cycle times may be defined. In order to determine data traffic caused by WinCC, a table in accordance with the following template may be useful. The individual columns will record the data amounts (in bytes) needed by various applications.

Update cycle	Graphics RT	Alarm Lg. RT	Tag Lg. RT	Global Sc. RT
Upon change				
250 [ms]				
500 [ms]				
1 [s]				
2 [s]				
5 [s]				
10 [s]				
1 [min]				
5 [min]				
10 [min]				
1 [h]				
User cycle 1				
User cycle 2				
User cycle 3				
User cycle 4				
User cycle 5				

The update cycle "Upon change" is of importance for the communication system as the tag is requested in a cycle of 250 ms.

#### Determining the total data volume

For individual applications, add the projected data amounts corresponding to their respective update cycles. You thus determine the entire load on the communication system caused by WinCC.

Determination of data amounts is not exact to the very byte. It is an estimate of the data throughflow to be facilitated by the communication system during system operation later on.

#### Determination of number of telegrams

Using the total data volume per application per time unit, the approximate number of telegrams needed may be calculated. This also requires knowledge of the maximum telegram length possible. This, however, cannot be specified prior to the decision on a particular communication solution. The maximum telegram length varies greatly depending on communication network used and communication modules used.

You may, however, estimate the approximate data volume for various communication solutions and include these numbers in your decision for one communication solution.

In determining the approximate number of telegrams per time unit, several different factors must be considered. These include the number of communication partners requesting data, and the method these communication partners use in their response to the requests.

SIMATIC S5 uses its own telegram for each module. SIMATIC S7 may additionally group the data from several data modules into one telegram.



#### **Restrictions on number of telegrams**

A PLC is usually connected to the communication system through a communication processor. Such a communication processor may only process a certain number of telegrams during a time unit. These numbers are typically between 15 and 20 telegrams per second.

The determining property of a communication system is the thus implemented transmittal rate. Based on this value and a certain telegram length, the approximate number of telegrams per time unit may be determined. With an increasing transmittal rate, the maximum number of telegrams per time unit will also increase.

#### Consideration of additional communication participants

Aside from the demands imposed upon the communication system by WinCC, additional factors will influence the decision for a specific communication solution.

- Communication between individual PLCs
- Communication between PLCs and connected field devices
- Communication by other WinCC stations
- Communication by additional connected stations (Operator panels, tele service stations, and similar)

# 2.1.2 Notes on Configuration

#### Introduction

The type of configuration may significantly affect the demands on the communication system. While observing some basic guidelines, you are able to configure a well performing and easily expandable communication system.

This section will explain how you may reduce the load on the communication system already during the planning phase. Certain configurations will have an effect on the communication system.

A configuration tuned to the communication system will offer the following advantages:

- A well performing system
- More latitude for expansions later on
- Reduced costs for the current project as well as expansions later on

Therefore you will achieve greater customer satisfaction.

# 2.1.2.1 Cycle of Data Updates

#### Introduction

A well thought-out configuration of update cycles will make or break the performance of a communication system.

Specification of updates should always be determined by the overall picture of the entire system:

- What type of values are we concerned with from a technical point of view?
- How often should new values be requested from the PLC?

For example, the following considerations should be included in the decision on update cycles:

- Is it of great disadvantage if the user of a system will learn of a temperature change by 1°C only 10 sec after its occurrence, or does he need to know within 250 ms?
- Is it necessary to archive the temperature time series of a boiler of 5000 liters every 500 ms?

If you adjust the updates of these measurements to the process involved, the data volume may be reduced significantly.

Request telegrams will summarize those tags updated within the same cycle. If many different update cycles are used, the total number of telegrams will increase and therefore negatively influence performance.

# 2.1.2.2 Type of Data Updates

#### Introduction

The WinCC data manager supplies various applications of the WinCC project with process data. It must update its data inventory at the required cycles in order to do so. The type of updates will affect the load on the communication system.

#### **Active WinCC Station**

There are several options for updating the required data. If the WinCC Station is supposed to act as an active partner, the updates may be performed through so-called acyclic or cyclic reads.



During an acyclic read, each update requires two communication telegrams. The WinCC station sends a request to the PLC where it is processed in one or several response telegrams.

During a cyclic read, the WinCC station registers a read request at the PLC where it is processed in its respective cycle. If the data are no longer needed or their composition changes, the WinCC station will unregister the corresponding request.

#### Active PLC

In another variant of data updates, the PLC actively sends data to WinCC if it recognizes a change in data. This reduces the data traffic to its necessary amount. The configuration effort for the PLC, however, will increase.

## PLC WinCC Station 00:00:00 Send Possibly an upon Change Acknowledgmen DB75.. 00:00:10 Status 00:00:20 Send Possibly an upon Change Acknowledgmen DB75.. Status t [s] ,

# PLC Transmission active

#### **Configuration guidelines**

A meaningful combination of different types of data updates will generally be the most advantageous configuration variant.

# 2.1.2.3 Organization of Data

#### Introduction

The organization of data available in the PLC may significantly affect the communication volume. This will greatly depend on the type of PLC.

#### Summarize data areas

SIMATIC S5 systems summarize requested data in data modules. The greater the degree of distribution of required data in the PLC, the higher the number of required telegrams.

Communication-relevant data should be accessible in a maximum of 3 to 5 data modules in the PLC. If a greater distribution of data is unavoidable, rearrangement of distributed data into a common data area may have some advantages. You must weight the disadvantages created within the PLC versus the advantages achieved within the communication system.

#### **Telegram optimization**

SIMATIC S7 may also summarize distributed data in a communication system. This does not mean, however, that a summary of communication-relevant data in a few data modules would not bring any advantages here.

The PLC may optimize the telegram structure. This will enable sending more requested user data using one telegram. In general, for each requested tag its process value (net data) as well as its address information must be transmitted. If the tags are located in neighboring or closely co-located data areas in the PLC, the necessary address information may be reduced.



#### Telegram without Optimization

#### WinCC Communication Manual V6 Edition 12/2004, 6AV6392-1CA06-0AB0

# 2.2 Performance Data

#### Introduction

This section contains detailed information on performance of various communication systems, as well as their strengths and weaknesses.

The first section will compare different communication systems. Subsequent sections will contain detailed performance data on individual communication systems, as well as various options for communication in WinCC.

Based on the assessed communication requirements, you may select the best solution for your application. The decision for a communication solution will contain the decision for an available communication system, as well as hardware to be used.

# 2.2.1 Process Communication

#### Introduction

The following table provides information on possible configurations and maximum number of connections.

#### Note

Limit values listed in the table will depend on performance of your system and quantity structure of your WinCC project (such as number of process values / time unit).

# Configuration

Communication channels in WinCC <sup>1)</sup>	PC based <sup>2)</sup>	MPI/Profibus Soft Net <sup>3)</sup>	MPI/Profibus Hard Net <sup>3)</sup>	Industrial Ethernet Soft Net <sup>3)</sup>	Industrial Ethernet Hard Net <sup>3)</sup>
SIMATIC S7 Protocol Suite1)					
- MPI		8	44		
- Soft PLC		1			
- Slot PLC		1			
- Profibus (1)		8	44		
- Profibus (2)		8	44		
- Named Connections				64	60
- Industrial Ethernet ISO L4 (1)				64	60
- Industrial Ethernet ISO L4 (2)				64	60
- Industrial Ethernet TCP/IP				64	60
SIMATIC S5 Programmers Port					
- AS 511	2 <sup>4)</sup>				
SIMATIC S5 Serial 3964R					
- RK 512	2 <sup>4)</sup>				
SIMATIC S5 Profibus FDL					
- FDL			50		
SIMATIC S5 Ethernet Layer 4 + TCP/IP					
- Industrial Ethernet ISO L4 (2)					60
- Industrial Ethernet ISO L4 (2)					60
- Industrial Ethernet TCP/IP				60	60
SIMATIC S5 Ethernet TF					
- Industrial Ethernet TF					60
SIMATIC 505 Serial					
- NITP / TBP	2 <sup>4)</sup>				
SIMATIC 505 Ethernet Layer 4					
- Industrial Ethernet ISO L4 (1)					60
- Industrial Ethernet ISO L4 (2)					60
SIMATIC 505 Ethernet TCP/IP					
- Industrial Ethernet TCP/IP				60	60
Profibus FMS					
- FMS			40		
Profibus DP (V0 Master)					
- DP 1			122		
- DP 2			122		
- DP 3			122		
- DP 4			122		
OPC					
- OPC	100 <sup>5)</sup>				

#### Remarks

<sup>1)</sup> In general, all types of communication channels may be combined with each other. Subordinate communication drivers may lead to limitations, however.

Using the SIMATIC S7 Protocol Suite, a maximum number of 64 S7 connections may be operated. For example, in a typical configuration, there are 60 S7 connections configured.

Example:

 8 S7 connections using "MPI" and 52 S7 connections using "Industrial Ethernet TCP/IP"

or

• 60 S7 connections using "Industrial Ethernet TCP/IP"

<sup>2)</sup> COM1/COM2 and internal software interface for SIMATIC S7 Protocol Suite communication "Soft PLC" and "Slot PLC" as well as DCOM for OPC.

<sup>3)</sup> Using Soft Net, communication runs on the PC processor. Using Hard Net, the communication card has its own micro processor and therefore reduces the PC processor load during communication.

For process communication, only one Soft Net module may be operated on the PC. Combinations with Hard Net communication cards are possible. You may obtain the driver software for Hard Net communication cards from the enclosed SIMATIC NET CDs.

Hard Net communication cards allow for parallel operation of a maximum of 2 protocols, e.g., Ethernet communication using SIMATIC S7 Protocol Suite and SIMATIC S5 Ethernet. In this case, a reduction of approx. 20% of the table values must be taken into consideration.

#### Example:

• 40 connections using the combination of "SIMATIC S7 Protocol Suite" and 8 connections using "SIMATIC S5 Ethernet".

<sup>4)</sup> Expandable by using communication cards with several serial interfaces, such as Digi-Board with 8/16 serial interfaces.

<sup>5)</sup> Guidance.

The maximum number of connections depends on system resources.

# 2.2.2 Comparison of Communication Systems

## Introduction

The decision for a certain communication system will require information on performance of the various options. This section will compare individual communication systems.

Performance of individual communication systems will be assessed using the following criteria:

- Transfer rate
- Number of participants
- Length of telegrams
- Extent of network
- Possible communication partners
- Costs
#### **Communication data**

The following table provides a summary of various performance features of individual communication systems.

	Serial	MPI	PROFIBUS	Ind. Ethernet
Area of application	Field Level	Field level, cell level	Field level, cell level	Cell level, management level
Transfer rates	9.6 kBit/s to 256 kBit/s	187.5 kBit/s to 12 Mbit/s	9.6 kBit/s to 12 MBit/s	10 MBit/s (100 MBit/s)
Typical telegram length	60 bytes	60 bytes	120 bytes	240 bytes
Maximum telegram length	128 bytes	240 bytes	240 bytes	512 bytes to 4096 bytes
Extent of network	50 m	50 m to 100 m	10 km to 90 km	1 km to global

#### **Communication partners**

The following table provides a summary of which PLCs may be accessed by a WinCC station using which communication systems.

System	Serial	MPI	PROFIBUS	Ind. Ethernet
S5-90U, S5-95U, S5-100U	1		1	
S5-115U, S5-135U, S5-155U	1		1	1
S7200			1	
S7-300		1	1	1
S7-400		1	1	1

#### **Cost factor**

With increasing demands on a communication system, the costs for implementing same will naturally increase as well. The following diagram will compare individual communication systems in relation to expected implementation costs.



# 2.2.3 Serial Communication

#### Introduction

The most cost-effective option to communicate with a PLC from a WinCC station is to establish a serial communication link. The COM port of the WinCC station is used as the communication module.

#### **Communication partners**

In WinCC, there are two communication drivers available in order to establish a serial communication link to the SIMATIC S5 family.

- SIMATIC S5 PROGRAMMERS PORT AS511 Communication using programming interface of the respective CPU.
- SIMATIC S5 Serial 3964R Communication using serial interface

The following display shows which PLCs are accessible using the communication drivers.



#### **Communication links**

For each COM port of the WinCC station, a maximum of one PLC is accessible.

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

# 2.2.4 Communication Using MPI

#### 2.2.4.1 Communication Processors

#### Introduction

In order to establish a communication link between the WinCC station and the MPI network, the WinCC station must be equipped with a suitable communication processor.

#### Communication processors for communication using MPI

You may use the same communication processors utilized to connect to the PROFIBUS network. Additional information may be found in Chapter "Communication using PROFIBUS/Communication Processors".

The following table lists communication processors which may be used to connect a WinCC station to the MPI network.

Communication Processor	Build/Type
CP 5613	PCI card/ Hard Net
CP 5614	PCI card/ Hard Net
CP 5511	PCMCIA card/ Soft Net
CP 5611	PCI card/ Soft Net

# 2.2.4.2 SIMATIC S7 PROTOCOL SUITE

#### Introduction

The "SIMATIC S7 PROTOCOL SUITE" communication driver, through several channel units, offers all options relevant to communication with PLCs of the SIMATIC S7-300 and S7-400 family. An MPI channel unit is also offered for communication using MPI.

#### **Communication partners**

Using the communication driver SIMATIC S7 PROTOCOL SUITE, communication may be facilitated with PLCs of the SIMATIC S7-300 and S7-400 family. The following display shows details of possible communication partners upon utilization of the MPI channel unit.



#### **Communication links**

The MPI channel unit supports communication using hard net modules and soft net modules. For each computer, only one module may be used for MPI communication.

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

# 2.2.5 Communication Using PROFIBUS

#### 2.2.5.1 Communication Processors

#### Introduction

In order to establish a communication link between the WinCC station and the PROFIBUS network, the WinCC station must be equipped with a suitable communication processor. Furthermore, suitable driver software must be installed for the desired communication protocol.

#### **Communication processors for communication using PROFIBUS**

There are two different types of communication processors available for a WinCC station. These are communication processors for the so-called Hard Net and Soft Net. The main difference is that Hard Net modules have their own micro processors to reduce the load on the computer CPU, and Soft Net modules do not.

#### Hard Net

- The entire protocol software runs on the module.
- Two protocols may be operated at the same time. (Multi-protocol operation)
- The module has better performance when compared to Soft Net modules.

#### Soft Net

- The entire protocol software runs on the computer CPU.
- Only one protocol may be operated at any time. (Mono-protocol operation).
- Module is more cost-effective when compared to Hard Net modules.

The following table lists communication processors available for connecting a WinCC station to the system.

Communication Processor	Build/Type
CP 5613	PCI card/ Hard Net
CP 5614	PCI card/ Hard Net
CP 5511	PCMCIA card/ Soft Net
CP 5611	PCI card/ Soft Net

# 2.2.5.2 Communication Driver

#### Introduction

In WinCC, several communication drivers are available for communication using PROFIBUS.

#### **Communication Protocols**

Communication drivers available for PROFIBUS will each implement communication using a specific communication protocol.

In the following table, communication drivers are assigned to the respective communication protocols.

Communication driver	Protocol
SIMATIC S7 PROTOCOL SUITE (PROFIBUS)	S7 functions
SIMATIC S5 PROFIBUS FDL	FDL
PROFIBUS FMS	FMS
PROFIBUS DP	DP

#### **Communication links**

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

# PLCs

PLCs may be connected to the PROFIBUS network using either interfaces integrated into the central module, or using special communication modules.

In WinCC, several communication drivers are available for communication using PROFIBUS. The following table lists which communication driver may be combined with which module. Please note the legend following the table.

System	Module	PB DP	PB FMS	S5 FDL	S7 PB
S5-90U, S5-95U, S5-100U	CPU 95U	1		1	
	CP 541	1			
S5-115U,S5-135U, S5-155U	CP 5431		1	1	
	IM 308-C	1			
S7200	CPU 215	1			
	CP 242-8	1			
S7-300	CPU 315-2 DP	1			<b>v</b>
	CP 342-5	1			<b>v</b>
	CP 343-5		1		<b>v</b>
S7-400	CPU 41x-2 DP				<b>v</b>
	CP 443-5 Ext.				<b>v</b>
	CP 443-5 Basic		1		<b>v</b>
	IM 467				<b>v</b>
DP Slaves	e.g. ET 200	1			

Legend:

- PB DP PROFIBUS DP
- PB FMS PROFIBUS FMS
- S5 FDL SIMATIC S5 PROFIBUS FDL Note: SIMATIC S5 PMC PROFIBUS only using CP 5431
- S7 PB SIMATIC S7 PROTOCOL SUITE (PROFIBUS channel unit)

# 2.2.5.3 PROFIBUS DP

#### Introduction

Using the "PROFIBUS DP" communication driver, a WinCC station may communicate with all PLCs and field devices operated as DP Slaves.

Application of the PROFIBUS DP communication driver in WinCC makes sense for communication with many subordinate devices requiring only low data volumes. Despite the distributed data, very rapid tag updates may be achieved. Communication uses the cyclic data exchange of PROFIBUS DP. The WinCC station acts as the DP Master.

#### **Communication partners**

Using the "PROFIBUS DP" communication driver, a WinCC station may communicate with all PLCs and field devices operated as DP Slaves. The following display shows details of possible communication partners.



#### **Communication links**

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

#### **Required software**

The following table lists software components necessary for implementation of a communication link of a WinCC station using PROFIBUS DP.

Name	Description
WinCC	Communication driver PROFIBUS DP
SIMATIC NET	All existing communication drivers

# 2.2.5.4 PROFIBUS FMS

#### Introduction

Using the "PROFIBUS FMS" communication driver, a WinCC station may communicate with PLCs which support the FMS protocol.

The "PROFIBUS FMS" communication driver may be used for communication with devices from different manufacturers. In terms of communication technology, large data volumes can be handled.

#### **Communication partners**

Using the "PROFIBUS FMS" communication driver, communication is possible with all PLCs which support the FMS protocol. The following display shows details of possible communication partners.



#### **Communication links**

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

#### **Communication software**

The following table lists software components necessary for implementation of a communication link of a WinCC station using PROFIBUS FMS.

Name	Description
WinCC	Communication driver PROFIBUS FMS
SIMATIC NET	All existing communication drivers

# 2.2.5.5 SIMATIC S7 PROTOCOL SUITE

#### Introduction

The "SIMATIC S7 PROTOCOL SUITE" communication driver, through several channel units, offers all options relevant to communication with PLCs of the SIMATIC S7-300 and S7-400 family. Among others, the PROFIBUS two channel units are intended for communication using PROFIBUS.

#### **Communication partners**

Using the "SIMATIC S7 PROTOCOL SUITE" communication driver, communication is possible with PLCs of the SIMATIC S7-300 and S7-400 family. The following display shows details of possible communication partners upon utilization of the PROFIBUS channel unit.



#### **Communication Links**

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

# 2.2.5.6 SIMATIC S5 PROFIBUS FDL

#### Introduction

The "SIMATIC S5 PROFIBUS FDL" communication driver supports communication using the SEND/RECEIVE interface (FDL) to systems of the SIMATIC S5 family.

#### **Communication partners**

The following display shows details of possible communication partners.



#### **Communication links**

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

#### **Communication software**

The following table lists software components necessary for implementation of a communication link of a WinCC station using FDL to SIMATIC S5.

Name	Description
WinCC	Communication driver SIMATIC S5 PROFIBUS FDL
SIMATIC NET	All existing communication drivers
STEP5	Standard communication modules

# 2.2.6 Communication Using Industrial Ethernet

#### 2.2.6.1 Communication Processors

#### Introduction

In order to establish a communication link between the WinCC station and the Industrial Ethernet network, the WinCC station must be equipped with a suitable communication processor. Furthermore, suitable driver software must be installed for the desired communication protocol.

#### Communication processors for communication using Industrial Ethernet

There are two different types of communication processors available for a WinCC station. These are communication processors for the so-called Hard Net and Soft Net. The main difference is that Hard Net modules have their own micro processors to reduce the load on the computer CPU, and Soft Net modules do not.

#### Hard Net

- The entire protocol software runs on the module.
- Two protocols may be operated at the same time. (Multi-protocol operation)
- The module has better performance when compared to Soft Net modules.

#### Soft Net

- The entire protocol software runs on the computer CPU.
- Only one protocol may be operated at any time. (Mono-protocol operation)
- Module is more cost-effective when compared to Hard Net modules.

The following table lists communication processors available for connecting a WinCC station to the system.

Communication Processor	Structure	Туре
CP 1613	PCI card	Hard Net
CP 1612	PCI card	Soft Net
CP 1512	PCMCIA card	Soft Net

# 2.2.6.2 Communication Driver

#### Introduction

In WinCC, several communication drivers are available for communication using Industrial Ethernet.

#### Protocols

Communication drivers available for Industrial Ethernet implement communication to a certain automation system using one specific communication protocol each.

In the following table, communication drivers are assigned to the respective transport and communication protocols.

Communication Driver	Transport/Communication
SIMATIC S5 ETHERNET LAYER 4	ISO with SEND/RECEIVE
SIMATIC S5 Ethernet TF	ISO with TF
SIMATIC S7 PROTOCOL S. (Industrial Ethernet)	ISO with S7 functions
SIMATIC S7 PROTOCOL S. (TCP/IP)	ISO-on-TCP with S7 functions

#### **Communication links**

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The displayed table shows the number of communication links which may be established using a certain communication driver.

# PLCs

Connection of a PLC to the Industrial Ethernet uses specific communication modules.

In WinCC, several communication drivers are available for communication using Industrial Ethernet. The following table lists which communication driver may be combined with which module. Please note the legend following the table.

System	Module	S5 SR	S5 TF	S7 ISO	S7 TCP
S5-115U,S5-135U, S5-155U	CP 1430	1	>		
S7-300	CP 343-1			1	
	CP 343-1 TCP				<
S7-400	CP 443-1			>	
	CP 443-1 TCP				<b>&gt;</b>
	CP 443-1 IT				<b>v</b>

Legend:

- S5 SR SIMATIC S5 ETHERNET LAYER 4, SIMATIC S5 PMC ETHERNET
- S5 TF SIMATIC S5 ETHERNET TF
- S7 ISO SIMATIC S7 PROTOCOL SUITE (Industrial Ethernet channel unit)
- S7 TCP SIMATIC S7 PROTOCOL SUITE (TCP/IP channel unit)

# 2.2.6.3 Communication Using SIMATIC S5

#### Introduction

For communication with automation systems SIMATIC S5 115U, S5 135U, and S5 155U using Industrial Ethernet, the following communication drivers are available:

- SIMATIC S5 ETHERNET LAYER 4 Communication using interfaces "SEND/RECEIVE" and "WRITE/FETCH"
- SIMATIC S5 PMC Ethernet Communication using interface "SEND/RECEIVE" with PMC handling modules
- SIMATIC S5 Ethernet TF Communication using TF

The "SIMATIC S5 Ethernet Layer 4" communication driver offers better performance when compared to the "SIMATIC S5 Ethernet TF" communication driver.

#### **Communication partners**

Different communication drivers enable communication with PLCs SIMATIC S5 115U, S5 135U, and S5 155U. These PLCs must be equipped with the communication processor CP 1430 TF.



#### SIMATIC S5 ETHERNET LAYER 4

The "SIMATIC S5 ETHERNET LAYER 4" communication driver enables communication using the interfaces "SEND/RECEIVE" and "WRITE/FETCH". Using the "WRITE/FETCH" interface enables the active sending of data from the PLC.

The following table lists software components necessary for implementation of a communication link of a WinCC station using the "SEND/RECEIVE" interface to SIMATIC S5.

Name	Description
WinCC	Communication driver "SIMATIC S5 ETERNET LAYER 4"
SIMATIC NET	Driver software

#### SIMATIC S5 Ethernet TF

The "SIMATIC S5 ETERNET TF" communication driver enables communication using the "TF" (Technological Function) interface.

The following table lists software components necessary for implementation of a communication link of a WinCC station using the "TF" interface to SIMATIC S5.

Name	Description
WinCC	Communication driver "SIMATIC S5 ETERNET TF"
SIMATIC NET	Driver software

#### 2.2.6.4 Communication Using SIMATIC S7

#### Introduction

Communication with SIMATIC S7 uses the "SIMATIC S7 PROTOCOL SUITE" communication driver. Through several channel units, this driver offers all options relevant for communication with PLCs of the SIMATIC S7-300 and S7-400 family.

- ISO Transport Protocol The Industrial Ethernet 2-channel units are intended for communication using ISO Transport Protocol.
- ISO-on-TCP Transport Protocol The TCP/IP channel units is intended for communication using ISO-on-TCP Transport Protocol.

It is intended to use the ISO Transport Protocol for networks of less spatial extent because of its higher performance. Communication for more expansive networks connected by routers, the ISO-on-TCP Transport Protocol must be used.

#### **Communication partners**

Using the "SIMATIC S7 PROTOCOL SUITE" communication driver, communication is possible with PLCs of the SIMATIC S7-300 and S7-400 family. These must be equipped with communication processors which support transport protocols "ISO" or "ISO-on-TCP". The following display shows details of possible communication partners.



#### **Communication data**

The Industrial Ethernet channel units as well as TCP/IP support communication using Hard Net and Soft Net modules. The following table lists driver software required by various communication processors.

<b>Communication Processor</b>	Driver software
CP 1613	SIMATIC NET
CP 1612	SIMATIC NET
CP 1512	SIMATIC NET

#### **Communication links**

Information on communication links may be found in Chapter "Performance Data">"Process Communication". The table shown lists the number of communication links which may be established using a certain communication driver.

**Decision Support** 

# **3** Project Examples

This chapter will show project examples for configuring communication between a WinCC station and a PLC. Each of the project examples is based on the use of a certain communication option as well as a certain hardware combination.

#### **Contents of Examples**

You will find the example projects described below at the Online Support under the following URL for downloading:

<u>http://support.automation.siemens.com/WW/view/en/21320307</u>

If you click onto "Info", a second page with the example projects will be displayed.

You can either copy the data onto the hard disk drive or open and unpack it immediately. The projects are filed in the directory C:\Communication\_Manual by default.

The functionality of the example projects is essentially restricted to the use and display of a few tag values. The focus will be on the procedure for configuring communication.

#### **Design of Examples**

There are detailed descriptions of steps for successful implementation of the respective communication link. Individual descriptions are generally structured into sections listed as follows.

- Summary of the respective project example
- Installation of necessary components on computer
- Project creation for the respective PLC
- WinCC project creation
- Diagnostics of communication links

#### **Generation systems**

The current examples were generated using the following software issues:

- WinCC Version 6.0 SP 2
- STEP7 Version 5.2
- SIMATIC NET 11/03

# 3.1 Installation of SIMATIC NET Software

#### **User Documentation for Software Installation**

Prior to installing the software from the SIMATIC NET CD, you should read the following documents and follow their notes:

- Installation Manual for Software
- Additional information

Additional notes supplemented with product.

#### Notes on documentation

Please note that any paper documents attached to your product shall take precedence over documents available in file format.

There may be additional service packs available for product expansion. You may obtain additional information from SIMATIC Customer Support.

	Installation of SIMATIC NET Software	
1	Installation of software from the CD SIMATIC NET.	
	After inserting the SIMATIC NET CD, the installation automatically.	n program starts
	System requirements for SIMATIC NET Software an Service Pack 1 or Windows 2000 with Service Pack	e Windows XP with 3
	Software installation is started in the following dialog SIMATIC NET Software" button. Follow the instructi program.	g using the "Install ons of the installation
	SIMATIC NET Software	
	SIEMENS SIMATIC NET Software	Display <u>R</u> eadme
	Incredibly powerf	Install SIMATIC NET <u>S</u> oftware
		Display SIMATIC NET <u>D</u> ocuments
		Install Acrobat Reader 5.0
		Cancel

	Installation of SIMATIC NET Software
2	Install the following components
	SIMATIC NET PC products
	Contains the necessary tools for installing and operating a PC station. These components are essentially required:
	- Drivers for PC modules
	- Configuration console "Install PC stations"
	- Station configuration editor
	- Configuration notification service
	- OPC Server
	- OPC Scout
	SIMATIC NCM PC
	However, you will need SIMATIC NCM PC only if you are not already using STEP7 on your single-user station. With SIMATIC NCM PC, the Configuration Wizard is installed as well.
	SIMATIC NET - Setup
	Components
	Programs to be installed
	AuthorsW V2.5 + SP2 7 MB SIMATIC AuthorsW V2.5 + SP2
	IMATIC NET PC Product V6.2     142 MB Manage Authorizations.     Imanage Authorizations.     Imanage Authorizations.
	<u>R</u> eadme
	Required on c: 339 Mbytes
	Available on c: 5617 Mbytes
	Target directory:
	C:\SIEMENS Browse
	< <u>B</u> ack <u>Next&gt;</u> Cancel

# 3.2 Communication with SIMATIC S7 Using Industrial Ethernet (Hard Net)

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on <a href="http://support.automation.siemens.com/WW/view/en/21320307">http://support.automation.siemens.com/WW/view/en/21320307</a>).

There is the option of copying the following components to hard disk:



The STEP7 project to be generated.



The WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between SIMATIC S7 and WinCC. The communication link is implemented by using the Industrial Ethernet. The CP 1613 communication processor used on the computer has its own CPU. This removes communication loads from the computer's CPU load. Such a constellation is typically referred to as a Hard Net.

#### Summary on Example Design



On the computer side, the network connection is established using a CP 1613 communication processor. Its installation requires the installation of SIMATIC NET on the computer. Using SIMATIC NET, all necessary drivers are installed.

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

The PLC is equipped with a central module CPU 416-1. Connection to the network is established using the CP443-1 communication processor. In order to configure this communication processor with STEP7 software, the NCM S7 Industrial Ethernet options package is required.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Commissioning of CP 1613 communication processor
- Generation of STEP7 project S7\_IEH
- Generation of WinCC project WinCC\_S7\_IEH
- Diagnostics of Communication Link

#### **Required software**

Name	Description
SIMATIC NET	Using installation from the SIMATIC NET CD, all drivers are installed.
STEP7	STEP7 software with option package NCM for Industrial Ethernet to generate the STEP7 project.
WinCC	WinCC with SIMATIC S7 Protocol Suite communication driver to generate the WinCC project.

#### Required hardware on computer

Name	Description
Communication Processor	Communication processor CP 1613 to establish connection to communication processor in PLC.

#### **Required hardware in PLC**

Name	Description
Rack	Module rack UR1.
Power supply unit	Power supply unit PS 407 10A in slots 1 and 2.
Central module	Central module CPU 416-1 in slot 3.
Communication Processor	Communication processor CP 443-1 in slot 4.

# 3.2.1 Commissioning of CP 1613 Communication Processor

The following description shows detailed configuration steps necessary for successful installation of the CP 1613 communication processor. It is assumed that SIMATIC NET is already installed on your configuration computer. Furthermore, it is assumed that the communication processor was previously installed.

## **Summary of Configuration Steps**

The following is a summary list of all necessary configuration steps for commissioning of the CP 1613 communication processor.

- A: Configuration of communication processor
- B: Assigning of access point
- C: Testing of communication processor

#### A: Configuration of communication processor

	A: Configuration of com	nmunication proc	essor
1	In Program Start → SII "Set PC station", the com "General" menu, the mod	MATIC → SIMA munication proces ule operation mod	ATIC NET → Settings → sor may be configured. In the le must be set to PG Operation.
	Eile Action View Help		
	← → 🗈 🖬 😫		
		General Module properties	
		Type of module:	Ethernet
	🖻 🛃 Modules	Mode of the module:	Configured mode
	General		PG operation Configured mode
	😭 Version 😭 Address ເชิ Network parameters	Interface profile for:	CP1613
	Time Firmware-trace Protocols SR-test CP5611 SR-test Intel 21143-Based PCI	CP1613(RFC1006) CP1613(ISO)	
		Module reaction:	
	CP simulation	Restart	
		Apply Cance	el Help



	A: Configuration of com	munication proce	ssor
4	In the General menu, the operation mode of the module is set to Configured Mode. This change leads to a display of the Index and Module Name fields. In the example, the index is set to 1 and the module name to CP 1613. These changes are saved using the Apply button. The displayed note may be confirmed by clicking OK.		
	Configuration Console		
	File Action View Help		
	PC Station	General Module properties	
	Applications	Type of module:	Ethernet
	🖻 🐖 Modules	Mode of the module:	Configured mode
	General		Index: 1
	· [알 Version · 전문 Address		
Hodress Metwork parameters Time Firmware-trace Protocols SR-test T-■ C55611	Interface profile for:	CP1613	
	- 땳 Time - 딸 Firmware-trace - 땹 Protocols - 땹 SR-test	CP1613(ISO)	<u>^</u>
		Module reaction:	
	E 🖓 Intel 21143-Based PCI		
	CP simulation	Hestart	
		Apply Cancel	Help

# B: Assigning of access point

	B: Assigning of access point		
1	In Program Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ "Set PC Station", the just installed communication processor must be assigned the access point CP_H1_1: The access point CP_H1_1:: is the default access point used for TCP/IP communication in WinCC. It was created automatically during installation of SIMATIC NET.		
	Configuration Console		
	Eile Action View Help		
	PC Station     Access points     Access point     Access point     Interface parameter assignment     Module		
	Applications     Gradient Constructions     Gradient Construction     Access points     Gradient Construction     Const		
	S7ONLINE PC internal (local) KBUS CP_H1_1: FWL_LOAD MPI		
	D. In the upper field, select the CP1613(RFC1006) entry by using the pull- down menu. This concludes the assignment between access point and communication processor.		
	New access point		
	Ccess point		
	Access point:		
	CP-TCPIP:		
	Associated interface parameter assignment:		
	If you change an access point of a PRUFIBUS module to another interface parameter assignment of the same module, all other access points that point to the old interface parameter assignment will be remapped to the new interface parameter assignment.		
	OK Cancel Help		

# C: Testing of communication processor

C: Testing of communication processor		
Testing the proper installation of the CP 1613 communication processor using the "Setting PC Station" program.		
This is started by clicking Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ Setting PC Station. In order to test the protocols, select the "Protocol" folder of the respective module. In our case it is module CP 1613.		
On the right side of the window, the CP 1613 Industrial Ethernet dialog is displayed.		
Ele Action View Help         Image: Configuration Sector		
Testing of proper installation uses the "Test" button. Upon successfully tested protocols, a dialog is displayed as follows. Konfigurations-Konsole "PC-Station einstellen" Deter Aktion Ansicht ? PC Station PC Station Protocols CP 1613 Industrial Ethernet Protocols CP 1613 Industrial Ethernet PFC1006 Test was completed successfully. PFC1006 Test was completed successfully. PC Station PC Station PFC1006 Test was completed successfully. PC simulation PC simulation Access points Apply Cancel Help		



# 3.2.2 Creating the STEP7 Project S7\_IEH

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the STEP7 project S7\_IEH.

- A: Installation of hardware
- B: Creating STEP7 project
- C: Configuring hardware
- D: Loading of hardware configuration
- E: Testing of hardware configuration
- F: Creating STEP7 program
- G: Testing of STEP7 program

#### A: Installation of hardware

	A: Installation of hardware				
1	Assemble the used modules on the module racks.				
	In the current example, these are a power supply unit PS 407 10A, a central module CPU 416-1, as well as a communication processor CP 443-1.				
	Establish the connection between programming device and programming interface of the central module.				
	Establish the connection between the computer's communication processor CP 1613 to communication processor CP 443-1 in the PLC.				

# **B: Creating STEP7 project**

	B: Creating STEP7 project							
1	Creating a new STEP7 project in SIMATIC Manager.							
	This is started using Start $ ightarrow$ SIMATIC $ ightarrow$ SIMATIC Manager.							
	SIMATIC Manager							
2	The SIMATIC Manager opens.							
	Using menu item File $\rightarrow$ New, the dialog to specify parameters of a new STEP7 project opens.							
	The New dialog opens.							
	The User Projects tab register must be selected. Enter the name of the newly created project in the Name field. Names of STEP7 projects created as part of this manual must start with the character sequence S7. Furthermore, they contain a description of the communication type used. The current example has the name S7_IEH.							
	By default, projects are saved in directory C:\PROGRAM FILES\SIEMENS\STEP7\S7proj. However, this may be changed at any time by clicking the Browse button.							
	New							
	User projects Libraries							
	Name Storage path							
	S7_Pro1 C:\Program Files\Siemens\SIMATIC.NCM\S7proj\S7_Pro1							
	Name: <u>I</u> ype:							
	S7_IEH Project							
	Storage location (path):							
	C:\Program Files\Siemens\SIMATIC.NCM\S7proj Browse							
	Cancel Help							

# C: Configuring hardware

	C: Conf	nfiguring hardware								
1	<ul> <li>The new project is displayed in SIMATIC Manager.</li> <li>Hardware must be configured for this project. Two components are needed. These are a SIMATIC 400 station, as well as an Industrial Ethernet for its connections.</li> <li>These components are added in SIMATIC Manager using <sup>→</sup>BR on the name of project S7_IEH and Insert New Object <sup>→</sup> SIMATIC 400 Station as well as Insert New Object <sup>→</sup> Industrial Ethernet.</li> </ul>									
	<b></b> S	Cut Copy Paste	Ctrl+X Ctrl+C Ctrl+V							
		Delete	Del	-						
		Insert new object	•	SIMATIC 400 Station						
		Manage Multilingual Texts		SIMATIC 300 Station SIMATIC H Station						
		Rename Object Properties	F2 Alt+Return	SIMATIC PC Station Other station SIMATIC S5 PG/PC						
				MPI PROFIBUS Industrial Ethernet PTP						
				S7 Program M7 Program						

	C: Configuring hardware								
2	The two components just added are displayed in the right window of SIMATIC Manager.								
	圖 SIMATIC 400(1) \$₽MPI(1) \$₽Et		<b>T</b> Ethe	met(1)					
	Using <sup>1</sup> D on component SIMATIC 400(1) in the right window will display the Hardware item. Using <sup>1</sup> D on the Hardware item or <sup>1</sup> R and Open Object on it will start the HWConfig program.								
		Open Ob	oject	Ctrl+Alt+O	-				
		Cut		Ctrl+X					
		Copy		Ctrl+C Ctrl+V					
					-				
		Delete		Del					
		Manage Multilingual Texts							
		Rename		F2					
3	3 The HWConfig program opens.								
	It is used to specify exactly the hardware used in the PLC, and to								
	its proper	ties.							
	- <b>I</b> W Konfic								
4									
4	program, the hardware catalog opens. This is used to select the required								
	hardware components.								


	C: Configuring hardware							
6	The HWConfig program displays the presently still empty module rack. It has been assigned to rack number 0. In configuring the connection in the WinCC project, the rack number is one of the parameters to be set.							
	(0) UR1 2 3 4 5 6 7 7 •							
7	Arrangement of additional hardware components in module racks. This uses Drag&Drop for the desired components from the hardware catalog in their respective slots in the module rack.							
	The example uses a power supply unit PS 407 10A. This is inserted in slot 1. A power supply unit of this type uses two slots.							
	The example uses a CPU 416-1 as central module. This is inserted in slot 3. In configuring the connection in the WinCC project, the slot number of the central module is an additional parameter to be set.							
	Furthermore, a CP 443-1 communication processor is needed. However, this is available from the hardware catalog only if the NCM S7 Industrial Ethernet option package has been installed. Once the CP 443-1 communication processor is inserted into the module rack, its properties dialog opens.							

	C: Configuring hardware
8	The property dialog of the Ethernet interface of CP 443-1 is displayed. Use the Parameter tab register in the MAC address field to set the desired Ethernet address of the communication processor. The current example specifies this as 08.00.06.01.00.00. In configuring the connection in the WinCC project, this Ethernet address is an additional parameter to be set. Use the lower selection field Subnet to assign the entry Ethernet(1) to the communication processor. Close the dialog with OK.
	Properties - Ethernet interface CP 443-1 (R0/S4)
	General Parameters
	MAC address: 08-00-06-01-00-00 If a subnet is selected, the next available addresses are
	IP grotocol is being used         IP address:       140.80.0.1         Subnet mask:       255.255.0.0         C       Use router
	Address: 140.80.0.1
	Ethernet(1)
	Dejece
	OK Cancel Help
9	In the following, the fully configured hardware design of the example is shown.
	1       PS 407 10A         3       CPU416-1         4       FCP 443-1         5       6         7       Image: CPU416-1
10	Settings made must be saved in the HWConfig program and must be compiled in order to load the data onto the module. This is done using the toolbar button displayed in the following.
	Save and Compile

## D: Loading of hardware configuration

	D: Loading of hardware configuration							
1	The hardware configuration created in program HWConfig must be transferred to the PLC.							
	This is done using the toolbar button displayed in the following.							
	с , , , , , , , , , , , , , , , , , , ,							
	Download to Module							
2	A dialog opens which allows selection of components to be loaded.							
	make sure that any loading of the central module is possible only in operational switch positions STOP or RUN-P. Close the dialog with OK.							
	Select Target Module							
	Target Modules:							
	Module Racks Slot							
	CP 443-1 0 3							
	Select <u>All</u>							
3	The Select Node Address dialog opens.							
	Here you state which node address is used for communication between STEP7 software and central module. The current example uses communication via the MPI interface. The address of the central module is 2.							
	Close the dialog with OK.							
4	have to be put into the STOP status.							
	The HWConfig program may be terminated.							
	Components newly added are displayed in SIMATIC Manager for SIMATIC 400(1).							
	E- <sup>(</sup> S7_IEH) È III SIMATIC 400(1) È <sup>1</sup> II CP 443-1 È III CPU416-1							

## E: Testing of hardware configuration

	E: Testing of hardware configuration								
1	Testing of hardware configuration decision								
	If the key switch of the central module is put into RUN or RUN-P position, and the operational switch of the communication processor is put into RUN position, only status LEDs indicating the RUN state should be lit.								
	If this is not the case, an error has occurred. This error may be determined using the steps described in the following. However, these steps should also be implemented even if no error is indicated by the status LEDs. This will allow recognition of non-critical errors and faulty configurations.								

E: Testing of h	ardware configura	tion								
Testing of confi	guration in central m	odule.								
This uses the M	lodule Information d	ialog in SIMATIC	Manager. This dialog							
is opened using	ened using $\mathcal{H}$ R on the entry of the central module in the left window									
and Target Sys	tem — Module Ir	$m \rightarrow Module Information.$								
The Module Info	ormation dialog of th	e central module	is opened							
The General tal module. The St as existing erro	The General tab register displays various general data of the central module. The Status field will display the current Module Information as well as existing errors, if any.									
The Diagnostic	The Diagnostic Buffer tab register display detailed information on existing									
The dialog is clo	osed by clicking the	Close button								
	bood by biloiding the									
<b>Module Inform</b>	ation - CPU416-1									
Path:  S7_IEH\SIM/ Status: OK	ATIC 400(1)\CPU416-1	Uperating mode of the LPU: < NUN Not a force job								
Time System	Performance Data	Communication Stacks								
General	Diagnostic Buffer	Memory	Scan Cycle Time							
Description: CPU416-1		System Identification: SIMATIC 400								
<u>V</u> ersion:	Order No. / Description	Component	Version							
	6ES7 416-1XJ01-0AB0	Hardware Firmware	1 V310							
Back:	0	Address: ····								
Slot:	3									
<u>S</u> tatus:	Module available and o.k.									
			<u> </u>							
Close	Update Print		Help							

E: Testing of	hardware configura	tion					
Testing of communication processor configuration.							
This uses the	Module Information d	lialog in SIMATIC Ma	nager. This dialog				
is opened using $\mathcal{C}R$ on the entry of the communication processor in the left window and Target System $\rightarrow$ Module Information							
The General t	ab rogister displays y						
	ab legisler uispiays v						
A dialog for m	ore detailed diagnost	ICS OF THE COMMUNICA	ation processor ma				
	ng the openia blagh						
<b>Module Infor</b>	mation - CP 443-1						
Path: S7_IEH\SI	MATIC 400(1)\CP-Station(1)\CP	Operating mode of the CPU	J:   RUN				
Status: OK Operating mode of the module: () RUN							
General   Diagnos	tic Butter		1				
Description:	CP 443-1	System Identification:	SIMATIC 400				
<u>∨</u> ersion:	Order No. / Description	Component	Version				
	6GK7 443-1EX02-0XE0	Hardware Eirroware	1				
		FIMware	V 5.2.0				
<b>.</b> .							
Hack:	0	Address: 1818/					
Slot:	4						
Status:	Module available and o.k.						
Close	Update Print	Special Diagnostics	Help				
			Thosp				

	E: Testing of har	dware configuration									
4	The NCM S7 Industrial Ethernet Diagnostics dialog opens. The CP Information tab register displays general information on the module. Among others, the set network address may be checked. The dialog is closed by clicking the Close button. The Module Information										
	dialog may also bu	e closed by clicking the Cl CP 443-1 0/6 08-00-06-92-18-C8 0 Diagnostic Buffer View Options Help Conline Path Interface: Industrial Ethernet S7 subnet ID of destination network: " Rack: 0 General Module Information Module type: CP 443-1 Module type: V5.2.0 Hardware version: 1 Order number: 6GK7 443	Address of gateway: Address of gateway: Address of dest. station network attachment: Slot:	 08-00-06-92-18-C8 5							
	Press F1 for help			h.							

## F: Creating STEP7 program

	F: Creating STEP7 program								
1	Creating STEP7 program								
	For the current example project, only one operations block, OB1, and one data block are needed. OB1 is available by default. The needed data block								
	must first be created. This is done in SIMATIC Manager using ${}^{\checkmark}\mathbb{B}R$ on the Blocks subitem of entry S7 program(1) of the configured central module and Add New Object $\rightarrow$ Data Block.								
	The property dialog of the data block opens. Enter DB75 as the name for the block and close the dialog by clicking OK.								
	⊡								
	- CO 🛛	Cut	Ctrl+X						
		Delete	Del						
		Insert New Object		Þ	Organization Block				
		PLC		۲.	Function Block				
		Dewiring			Function				
		Compare Blocks			Data Block				
		Reference Data		•	Data Type				
		Check Block Consistency		L,	Variable Table				
		Print		•					
		Rename	F2						
		Object Properties	Alt+Return						
		Special Object Properties		٢					

	F: Creating STEP7 program							
2	The newly created data block DB75 is displayed in the right window of the project. Using D on it or using R and Open Object, the contents of the block may be programmed. The program KOP/AWL/FUP is started.							
		Cut Copy Paste	Ctrl+X Ctrl+C Ctrl+V					
		Delete	Del					
		Insert New Object PLC						
		Compare Blocks Reference Data		•				
		Print		•				
		Rename Object Properties Special Object Propertie	F2 Alt+Return es	•				
3	The program KOP/AWL/FUP opens. The New Data Block dialog appears and must be acknowledged by clicking OK.							
	KOP AV	KOP AWL FUP						

	F: Creatin	ng STEP7 p	rogram						
4	Programming of DB75.								
	Here, two tags of length 16 bits are created. Their sum is supposed to be determined in OB1 and written to another tag of length 16 bits.								
	Furthermore, two tags of length 16 bits are created, whose values are to cyclically incremented in OB1.								
	Tags created in data block DB75 are supposed to be visualized in the WinCC project. To do so, WinCC tags with corresponding addresses are								
	created. The follow	ving shows t	he complete	ly programr	ned data block	DB75.			
	■ DB75	s7_ieh\sim	ATIC 400(1)	\CPU 416-1					
	lddress	Name	Туре		Initial value	Comment			
	0.0	· · · · · · · · · · · · · · · · ·	STRUCT						
	+0.0	Var_01	WORD		W#16#O	Value 1			
	+2.0	Var_02	WORD		W#16#O	Value 2			
	+4.0	Var_03	WORD		W#16#O	Summ			
	+6.0	Var_04	WORD		W#16#O	Inc 1			
	+8.0	Var_05	WORD		W#16#O	Inc 2			
	=10.0		END_ST.	RUCT					
	<					>			
	Please make sure that any loading of the central module is possible only in operational switch positions STOP or RUN-P.								
6	Programn	ning of OB1.							
	This must	be opened	beforehand	in program	KOP/AWL/FUP	<u>ح</u>			
	Initially, tv	vo values cre	eated in DB7	75 are adde	d and the resu	It is again			
	Netzwei	r <b>k 1:</b> Add	ition						
	Adding two 16-Bit Values The result is stored in another 16-Bit Value								
	(	DPN DB	75						
	I	L DBW	0						
	1	L DBW	2						
	+	-I							
	Г	r dew	4						

F: Crea	ting ST	EP7 progra	am					
Next, th	e count	of a value	created in DB75 is implemented every second.					
Netwo	Network 2: Second Cycle							
Gener	Generation of a second cycle at M 0.0							
	AN	М	0.0					
	L	S5T#1S						
	SD	T	1					
	A =	M	0.0					
Netwo:	rk 3:	Countin	g in a second cycle					
Count	ing a	value i	n a second cycle					
At 10	000, :	reset to	0					
	AN	М	0.0					
	JC T	MOO1	~					
	ь т.	DBW 1	6					
	+I	-						
	т	DBW	6					
	L	10000						
	<i TC</i 	MOO1						
	L	MUUI O						
	Т	DBW	6					
M001:	NOP	0						
Next, th	e count	of a value	created in DB75 is implemented for each run of					
OB1. Netwo	rk 4:	Countin	a in the cycle time					
Count	ing a	value e	ach time the OB is executed					
At 10	1000,	reset to						
	L	DBW	8					
		1						
	+1 T	DBM	8					
	L	10000						
	< I							
	JC T	M002						
	ь т	U DBM	8					
моо2:	NOP	0						
The OB	1 block	must be sa	ved and loaded onto the PLC. This is done					
using th	e respe							
inus, th program	e STEF 1 mav be	r project is e terminate	complete and ready to run. The KOP/AWL/FUP	1				

## G: Testing of STEP7 program

G: Testing o	f STEP7	progra	am					
Testing of program using STEP7 software.								
A tag table is created for this. This is done in SIMATIC Manager us R on the entry of the configured central module and Target System Monitor / Modify Tag.								
⊡ <mark>   CPU 416-1</mark>  =- <u>G</u> T S7 Prd  ⊡ Sc  ⊡ Bl	Cut Copy Paste Delete Insert Ner	w Object	Ctrl+X Ctrl+C Ctrl+V <b>Del</b>					
	PLC			Copy F	AM to ROM			
	Run-Time	Propertie	es	CPU M	essages			
	Rename		F2	Monitor/Modify Variables				
	Object Pro Special Ob	operties. bject Proj	Alt+Retur perties	n Hardw. Module Operat Clear/F Set Tin	are Diagnostics 9 Information ing Mode Reset ne of Day	Ctrl+D Ctrl+I		
An editor is displayed to create and use such a tag table. In the following, the complete tag table is shown. All tags created in DB75 are entered.								
<b>VAT_20</b>								
Addres Addres Control Addres Addres Addres Control Addres Addres Addres Addres Control Addres	is 5 198 0 198 2 198 4 198 6 198 8	ymbol   	Display format DEC DEC DEC DEC DEC DEC	Status value 12 12 24 1083 1703	Modify value 12 12			
	A tag table is R on the entr Monitor / Moo C I I I I I I I I I I I I I I I I I I I	Testing of program us         A tag table is created if         R on the entry of the c         Monitor / Modify Tag.         S7 Pro         S7 Pro         S3 St         Paste         Delete         Insert Ne         PLC         Run-Time         Rename         Object Pr         Special Object         An editor is displayed         In the following, the coare entered.         S1         DB75.DBW       0         2       DB75.DBW       0         3       DB75.DBW       4         4       DB75.DBW       8         6       S       5	Testing of program using ST         A tag table is created for this         R on the entry of the configu         Monitor / Modify Tag.         S7 Pro         S0         S1         CPU 4165         Cut         Copy         Paste         Delete         Insert New Object         PLC         Run-Time Properties.         Special Object Properties	Testing of program using STEP7 softward         A tag table is created for this. This is done         R on the entry of the configured central monitor / Modify Tag.         Image:	Testing of program using STEP7 software. A tag table is created for this. This is done in SIMAT R on the entry of the configured central module and Monitor / Modify Tag. Cut Ctrl+X Copy Ctrl+C Paste Ctrl+V Delete Del Insert New Object PLC Copy Run-Time Properties Rename F2 Object Properties Alt+Return Special Object Properties An editor is displayed to create and use such a tag t In the following, the complete tag table is shown. All are entered. Monito An editor is displayed to create and use such a tag t In the following, the complete tag table is shown. All are entered. Monito Certify Symbol Display format Status value 1 DB75.DBW 0 DEC 12 2 DB75.DBW 4 DEC 12 3 DB75.DBW 4 DEC 12 3 DB75.DBW 8 DEC 1703 5 DB75.DBW 8 DEC 1703	Testing of program using STEP7 software.         A tag table is created for this. This is done in SIMATIC Manager IR on the entry of the configured central module and Target System Monitor / Modify Tag.         Image: Status value of the configured central module and Target System Monitor / Modify Tag.         Image: Status value of the configured central module and Target System Monitor / Modify Tag.         Image: Status value of the configured central module and Target System Monitor / Modify Tag.         Image: Status value of the configured central module and Target System Monitor / Modify Tag.         Image: Status value of the configured central module and Target System Monitor / Modify Tag.         Image: Status value of the configured central module and Target System Monitor / Modify Variables         Image: Status value of the configured central module and Target System Monitor / Modify Variables         Rename       F2         Object Properties       Copy RAM to ROM         Rename       F2         Object Properties       Alt+Return         Special Object Properties       Monitor/Modify Variables         Hardware Diagnostics       Module Information         Operating Mode       Clear/Reset         Set Time of Day       Set Time of Day         An editor is displayed to create and use such a tag table.       In the following, the complete tag table is shown. All tags created are entered.         Image: Modify		

	G: Testing of STEP7 program
3	Monitoring current tag values.
	By clicking the toolbar button shown in the following, the current values of respective tags in the PLC are displayed in the Status Value column.
	Monitor variable.
	Controlling of tag values.
	In the Control Value column, values may be entered. By clicking the toolbar button displayed in the following, these values are written to the corresponding tags in the PLC.
	Please make sure that any controlling of tags is possible only in operational switch position RUN-P.
	Modify variable
4	The so-created tag table may now be saved.
	In the current example, it is save under the name VAT1. If the program function in the PLC has now been checked, the tag table may be closed. Thus, configuration of the STEP7 project is complete and SIMATIC Manager may be terminated.
	I VAT1

## 3.2.3 Creating WinCC Project WinCC\_S7\_IEH

The following description shows in detail the necessary configuration steps for creating and commissioning of WinCC project S7\_IEH.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project S7\_IEH.

- A: Creating WinCC project
- B: Establishing connection
- C: Creating WinCC tags
- D: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project
1	Creating a new WinCC project in WinCC Explorer. It is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.
	WinCCExplorer
2	<ul> <li>WinCC Explorer is displayed.</li> <li>Using menu item File → New, the dialog to specify the properties of a new WinCC project opens.</li> <li>The following example project creates a single-user project.</li> <li>Finish the dialog with OK.</li> </ul>
	WinCC Explorer       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project       Image: Create a New Project         Image: Create a New Project a New Project       Image: Create a New Project

	A: Creating WinCC project		
3	The Create a New Project dia	alog opens.	
	Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_S7_IEH.		
	Furthermore, in the Project P project must be set.	Path field, the storage location	of the new
	The Create a New Project dia	alog is closed by clicking the (	create button.
	Create a new project		? 🔀
	Project Name: WinCC_S7_IEH New <u>S</u> ubfolder: WinCC_S7_IEH You can use this dialog box to create a new WinCC project.	Project Path c:\\wince\winceprojects Eolder: [] Drive:	Cr <u>e</u> ate <u>C</u> ancel <u>H</u> elp

## **B: Establishing connection**

	B: Establishing co	nnection		
1	The new project is displayed in WinCC Explorer.			
	Installing of required on the Tag manage	d communication drive ment item and Add N	er. This is done t ew Driver.	oy clicking <sup>√</sup> ੳR
	⊡ ∰ Tag Managemen ⊕ 🚰 Internal tags	Add New Driver Find Properties	-	
2	The Add New Drive It offers a selection	r Dialog opens. of all communication with SIMATIC S7_the	drivers available	for installation.
	driver is required. It must be selected in the dialog. Close the dialog with Open.			
	Add new driver			? 🛛
	Look in: 🔁 bin		- + 🖻	* 📰 👻
	PDLCache		SIMATIC SS Eth	iernet TF.CHN ifibus FDL.chn
	Profibus FMS.chn	IP.chn	SIMATIC SS Ser	ial 3964R.CHN tocol Suite.chn
	SIMATIC S5 Ether	net Layer 4.CHN	SIMATIC TI Eth	ernet Layer 4.Cł
	<			<u> </u>
	File <u>n</u> ame: SIMA	TIC S7 Protocol Suite.chn		<u>O</u> pen
	Files of <u>type</u> : WinCl	C Communication Driver (*.	chn) 💌	Cancel

	B: Establishing connection
3	The newly added driver SIMATIC S7 Protocol Suite opens as a subitem of Tag Management.
The driver contains nine different channel units. In order to opera CP 1613 communication processors on a computer, two channel are available for Industrial Ethernet.	
	The current example uses the Industrial Ethernet channel unit.
	A new connection must be created for it. This is done using ${}^{\checkmark}\!\!\!\!  extsf{D}R$ on the Industrial Ethernet and New Connection entry.
	Industrial Ether     New Driver Connection       Industrial Ether     System Parameter
	Named Connec Find      PROFIBUS Paste      PROFIBUS (II)
	Slot PLC Properties
	Soft PLC     TCP/IP
	It is S7_IEH_01 in the current example. Specify connection parameters using the Properties button.
	Connection properties
	General
	Name: S7 JEH 01 Properties
	Server List
	DIETRICH-XP-02
	OK Cancel Help

	B: Establishing connection	on	
5	The Connection Parameter	dialog opens.	
	Enter the address set for the CP 443-1 communication processor in the Ethernet Address field. In the current example, this is Ethernet address 08.00.06.01.00.00.		
	Furthermore, Rack Number to be addressed must be er central module and not thos here.	as well as Slot Number of the central module ntered. Please make sure that values for the se of the communication processor are entered	
	Close the dialog with OK. T by clicking OK.	he Connection Properties dialog is also closed	
	Connection Parameter - I	ndustrial Ethernet 🛛 🛛 🔀	
	Connection		
	S7 Network Address		
	Ethernet Address:	08 00 06 01 00 00	
	<u>R</u> ack Number:	0	
	Slo <u>t</u> Number:	0	
	🔲 Send/receive ra <u>w</u> data	a block	
	<u>C</u> onnection Resource:	02	
	OK	Cancel Help	

	B: Establishing connection	
6	Setting of system parameters for Industrial Ethernet channel unit. This setting uses the System Parameters dialog which opens using on the Industrial Ethernet and System Parameters entry. On the Channel tab register, different settings for communication and communication monitoring may be specified. However, these do not app to all channel units of the communication driver.	R Iy
	System Parameter - Industrial Ethernet	
	SIMATIC S7       Unit         Cycle management       Image: Cycle management         Image: Dy PLC       Image: Change driven transfer         Lifebeat monitoring       Image: Cycle management         Image: Dy PLC       Image: Change driven transfer         Lifebeat monitoring       Image: Cycle management         Image: Dy PLC       Image: Change driven transfer         Lifebeat monitoring       Image: Cycle management         Image: Dy Activate       Image: Cycle management         Image: Dy Act	
	OK Cancel Help	

	B: Establishing connection		
7	On the Unit tab register, it must be specified which access point the connection to the PLC should use.		
	Default setting is access point CP_H1_1:. Earlier, access point CP_H1_1:: was assigned to the CP 1613 communication processor in the Setting PG/PC Interface program. If this access point is supposed to be set automatically, it must be checked whether or not the correct one is used, especially when using multiple communication processors. Close the dialog with OK.		
	System Parameter - Industrial Ethernet		
	SIMATIC S7 Unit		
	Select logical device name		
	CP-Type/Bus Profile: Industrial Ethernet		
	Logical <u>d</u> evice name: CP_H1_1:		
	☐ Set <u>a</u> utomatically		
	Job processing		
	$\Box$ <u>W</u> rite with priority		
	OK Cancel Help		

## C: Creating WinCC tags

	C: Creating WinCC	Tags	
1	C: Creating WinCC tags Creating WinCC tags This is done by click S7_IEH_01 and New SIMATIC S7 PRO Industrial Eth S7_IEH Industrial Eth S7_IEH Industrial Eth PROFIBUS PROFIBUS Slot PLC TCP/IP	Tags s required for exa ing CR on the e v Tag. TOCOL SUITE ernet New Group New Tag Find Cut Cut Copy Paste Delete	mple. ntry for the newly created connection
	L		

	C: Creating WinCC Tags
2	The property dialog of the tag opens. The example uses S16x_S7IEH01_01 as the name for the first tag. The tag is of data type Signed 16-Bit Value. Using the Select button, the address of the new tag is set.
	Tag properties
	General       Limits/Reporting         Properties of Tags         Name:       \$16x_\$7!EH01_01         Data_ype :       \$igned 16-bit value         Length:       2         Address:       Select         Adapt format :       \$hortToSignedWord
	C Eroject-wide update C Computer-local update
	Linear scaling  Process Value Range Value1 Value2 Value
	OK Cancel Help

	C: Creating WinCC Tags
3	The Address Properties dialog opens
5	Enter DB as data range and the value 75 as DB No. In the Address field, set Word and set the value to 0 in the DBW field. Finish the dialog with OK. The Property dialog of the tag is also closed by clicking OK. The just created WinCC tag has been addressed to the area of DB75 where the first of the two values to be added is located.
	Address properties
	Address
	Description
	<u>C</u> PU
	Data DB  DB No. 75
	Address Word  DBW 0 Length 1
	Quality Code
4	Creating the remaining required WinCC tags. The procedure is analogous to s 1 to 3 as described. Names, data types
	and addresses of tags used in this example may be obtained from the following display.
	Name Type Parameters
	S16x_S7EH01_01 Signed 16-bit value DB75,DW0
	S16x_S7IEH01_03 Signed 16-bit value DB75,DW4
	S16x_S7IEH01_04 Signed 16-bit value DB75,DW6

#### D: Creating WinCC picture



	D: Creating WinCC picture	
3	After placement of the I/O field on the picture, its configuration dialog opens.	
	In the Tag field, the tag S16x_S7IEH01_01 is set using the button shown in the following.	
	Tag updates are left at 2 seconds. The additional set options should retain their default values. Finish the dialog with OK.	
	I/O-Field Configuration	
	Tag: S16x_S7IEH01_01	
	Update 2 s	
	C Dutput C Input C Both	
	Format	
	Font Size 12	
	Font Name Arial	
	OK Cancel	

	D: Creating WinCC picture		
4	Changes of output format for I/O field.		
	Open its property dialog. This is done by clicking <sup>√</sup> ੳR on the I/O field and Properties.		
	I <u>C</u> opy Ctrl+C Duplicate		
	Paste Ctrl+V		
	D <u>e</u> lete Del		
	Customized object		
	Properties		
F	The Object Dreperties dialog energy		
ວ	The Object Properties dialog opens.		
	window. Using UD on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is capable to display signed values with a maximum of 5 digits		
	Object Properties		
	Properties Events		
	I/O Field       Attribute       Static       Dynamic       Current       I         Geometry       Field Type       I/O Field       I/O       I/O       I/O       I/O         Colors       Output Value       0.000000e       \$16x_57IEH01_01 2 s       I/O         Styles       Data Format       Decimal       I/O       I/O         Font       Output Format       \$99999       I/O       I/O         Flashing       Apply on Full       No       I/O       I/O		
	Miscellaneous Apply on Exit No Limits Clear on New Input Yes Output/Input Clear on Invalid Inpu No Hidden Input No		
6	Creating an additional four I/O fields to display the remaining tags. The procedure is analogous to Steps 2 to 5 as described.		



## 3.2.4 Diagnostics of Communication Link Using Industrial Ethernet (Hard Net)

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_S7\_IEH and the SIMATIC S7 station.

Diagnostics of an example in accordance with the following description is only meaningful if the following checks listed have successfully been concluded.

- Commissioning of CP 1613 communication processor
- Testing of communication processor
- Generation of STEP7 project S7\_IEH
- Testing of hardware configuration
- Testing of STEP7 program

## A: WinCC Explorer

	A: WinCC Explorer			
1	Diagnostics of communication link in WinCC Explorer.			
	Switch the WinCC_S7_IEH project into Runtime. This is done in WinCC Explorer using the toolbar button displayed in the following.			
	Activate			
	The created WinCC picture com_3_S7IEH_01.pdl may also be switched directly from Graphics Designer into Runtime.			
2	In WinCC Explorer, using the menu Tools $\rightarrow$ Status of Driver Connections, a dialog may be opened to monitor all configured connections. However, this menu item is only active if the project is in Runtime.			
	Tools			
	Language			
	Status of Driver Connections			
	Status of Server Connections			
	Status of <u>Client</u> Connections			

	A: WinCC Explorer			
<ul> <li>The Status - Logical Connections dialog is displayed.</li> <li>This dialog lists all configured connections. In the current example, connection S7_IEH_01 exists.</li> </ul>				
	The displayed values correspond to the status at the moment the dialog was opened. By selecting the corresponding checkbox, a cyclic display update may also be achieved.			
Status - Logical Connections				
	Tag ID     Name     Status     Tag read     Read requ     Tag written     Write requ       2     S7_IEH_01     OK     885     0     2     0			
	Vpdate □ Cyclic update ( 4 ÷ × 250 ms ) Update Help Close			
4	Another option to obtain information on the connection status in general but also on the connection status of individual tags is provided by Tag Management.			
	The status of a configured connection may be obtained as a tooltip by simply moving the mouse over it.			
	Name Parameters			
	S7_IEH_01 H1,08 00 06 01 00 00,,0,3,02			
	The current process value of a certain tag, as well as its status, may be obtained as a tooltip by simply moving the mouse over it. This procedure allows determination of errors of a single tag only, not of errors concerning the entire connection.			
	Name Type Parameters S16x_S7IEH01_01 Signed 16-bit value DB75,DW0			
	Process value: 34 Quality: c0 Last Change:1/31/2005 10:23:35 AM			

## **B: Channel Diagnosis**

1					
	B: Channel Diagnosis				
1	Diagnostics of communication link using the WinCC Channel Diagnosis program.				
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Tools $\rightarrow$ Channel Diagnosis.				
	Channel Diagnosis				
2	The WinCC Channel Diagnosis	program is displayed.			
The Channels/Connections tab register displays exact information of status of each configured connection. The default value for display is one second. The update cycle may be changed in the lower input					
	🎄 WinCC Channel Diagnosis	23			
	Channels/Connections Configuration	☐ Always on top			
	SIMATIC S7 PROTOCOL SUITE	Counters     Value       State     ready       Error Code     none       Error Count     0       Unit     Industrial Etherne       Device     CP_H1_1:       PDU Size     480       Request Counter     9       Response Counter     306       Own Cycles     0       AS Cycles     1       Max. AS Cycles     32       ConnectionState     ready       ForceConnectionAddress     projected			
3	In case a connection problem exists, the right window will display in the Error Code line a value indicating a more specific cause of the problem.				
	or codes may be obtained by clicking づ切R				
	This will display the description of the online help of WinCC. Further displayed.	of the respective error code contained in ermore, possible error causes are			
	Error 7001 - CEC_STPCHK Communication aborted due to stop check. • The connection was aborted by the channel because a VMD state of the CPU - STOP, HOLD or DEFECTIVE - was detected.				

# 3.3 Communication with SIMATIC S7 Using Industrial Ethernet (Soft Net)

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on <a href="http://support.automation.siemens.com/WW/view/en/21320307">http://support.automation.siemens.com/WW/view/en/21320307</a>).

There is the option of copying the following components to hard disk:



The STEP7 project to be generated.



The WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between SIMATIC S7 and WinCC. The communication link is implemented by using the Industrial Ethernet. The CP 1612 communication processor used in the computer does not have its own CPU, processing of communication tasks is performed by the computer's CPU. Such a constellation is typically referred to as a Soft Net.

#### Summary on Example Design



On the computer side, the network connection (Industrial Ethernet) is established using a CP 1612 communication processor. Its installation in SIMATIC NET is required. Using the installation from SIMATIC NET, all drivers are installed.

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

The PLC is equipped with a central module CPU 416-1. Connection to the network is established using the CP443-1 communication processor. In order to configure this communication processor with STEP7 software the NCM S7 Industrial Ethernet options package is required.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Commissioning of CP 1612 communication processor
- Generation of STEP7 project S7\_IES
- Generation of WinCC project WinCC\_S7\_IES
- Diagnostics of Communication Link

#### **Required software**

Name	Description
SIMATIC NET	Using installation from the SIMATIC NET CD, all required drivers are installed.
Windows	Windows installation software for installation of communication processor CP 1612.
STEP7	STEP7 Software with option package NCM for Industrial Ethernet to generate the STEP7 project.
WinCC	WinCC with SIMATIC S7 Protocol Suite communication driver to generate the WinCC project.

#### Required hardware on computer

Name	Description
Communication Processor	Communication processor CP 1612 to establish connection to communication processor in PLC.

#### Required hardware in the PLC

Name	Description
Rack	Module rack UR1.
Power supply unit	Power supply unit PS 407 10A in slots 1 and 2.
Central module	Central module CPU 416-1 in slot 3.
Communication Processor	Communication processor CP 443-1 in slot 4.

## 3.3.1 Commissioning of Communication Processor CP 1612

The following description shows detailed configuration steps necessary for successful commissioning of the CP 1612 communication processor. Communication is facilitated using the SIEMENS Industrial Ethernet protocol. It is assumed that the communication processor was previously installed.

#### **Summary of Configuration Steps**

The following is a summary list of all necessary configuration steps for commissioning the communication processor CP 1612.

- A: Configuration of communication processor
- B: Assigning of access point
- C: Testing of communication processor

## A: Configuration of communication processor

	A: Configuration of communication processor			
1	In Program Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ "Setting PC station", the communication processor may be configured. In the General menu, the operation mode of the module is set to Configured Mode. This change leads to a display of the Index and Module Name fields. In the example, the index is set to 1 and the module name to CP 1612. The changes are saved using the Apply button. The displayed note may be confirmed by clicking OK.			
	Type of module:	ernet		
	Mode of the module:	ifigured	mode 📃	
			Index: 1	
	Nam	e of the	module:	
	Interface profile for:	1612		
	<ul><li>the TCP/IP protocol was added unless it previously existed. If you now open the Properties and Internet Protocol Properties dialog, the following windows appear.</li><li>In the current example, the following settings were made for the TCP/IP protocol.</li></ul>			
	Local Area Connection Properties	? 🗙	Internet Protocol (TCP/IP) Properties	
	General Authentication Advanced		General	
	Connect using: Siemens CP1612 Configu	ure	You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.	
	This connection uses the following items:		Obtain an IP address automatically	
	□ 📮 QoS Packet Scheduler 🗹 🐨 SIMATIC Industrial Ethernet (ISO)	^	Use the following IP address:      IP address:      190 99 99 48	
	Internet Protocol (TCP/IP)	~	Subnet mask: 255 . 255 . 0 . 0	
			Default gateway:	
	Description	lies	O Dbtain DNS server address automatically	
	Transmission Control Protocol/Internet Protocol. The def- wide area network protocol that provides communication across diverse interconnected networks.	ault	Use the following DNS server addresses:     Preferred DNS server:	
	Show icon in notification area when connected	stivitu	Alternate DNS server:	
			Advanced	
	ОК	Cancel	OK Cancel	
## B: Assigning of access point

	B: Assigning of access point					
1	In Program Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ "Setting PC Station", the just installed interface must be assigned the access point CP_H1_1: .					
	The access point CP_H1_1:: is the default access point used for Industrial Ethernet communication in WinCC. It was created automatically during installation of SIMATIC NET.					
	Configuration Console					
	<u>Eile Action View H</u> elp					
	C Station     Access points     Access point     Access point     Access point     Access point     Access point     Access point					
	Applications       Image: CP_PN_1:         Modules       Image: CP_L2_2:         CP_L2_1:       Image: CP_SM_1:					
	원 CP-TCPIP: 원 S7ONLINE PC internal (local) KBUS 원 CP_H1_1: 문 FWL_LOAD 문 MPT					
	D. In the upper field, select the entry ISO industrial Ethernet -> Siemens CP1612 using the pull-down menu. This concludes the assignment between access point and communication processor.					
	STONLINE Properties					
	Access point: S70NLINE					
	Associated interface parameter assignment:					
	ISO Ind. Ethernet -> Siemens CP1612					
	Module:					
	Siemens CP1612					
	If you change an access point of a PROFIBUS module to another interface parameter assignment of the same module, all other access points that point to the old interface parameter assignment will be remapped to the new interface parameter assignment.					
	OK <u>Apply</u> Cancel Help					



## C: Testing of communication processor

	C: Testing of communication processor				
1	Testing the proper installation of the CP 1612 communication processor using the "Setting PC Station" program.				
	This is started by clicking Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ Setting PC Station.				
	In order to test the protocols, select the "Protocol" folder of the respective module. In our case it is module CP 1613.				
2	Testing of proper installation uses the "Test" buttons.				
3	In order to check the Send/Receive function, open the directory SR Test. Use the buttons for testing purposes.				
4	If diagnostics yields a negative result, the cause of the error must be found and the error must be corrected. Some tools and tips on this subject are described in chapter "Is the computer's communication module operable?".				
	This test may also be performed using the "Setting PG/PC Interface" program, however, the "PG Operation" operation mode is required to do so.				

#### 3.3.2 Creating STEP7 Project S7\_IES

The following description shows in detail the necessary configuration steps for creating and commissioning of STEP7 project S7\_IES.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the STEP7 project S7\_IES.

- A: Installation of hardware
- B: Creating STEP7 project
- C: Configuring hardware
- D: Loading of hardware configuration
- E: Testing of hardware configuration
- F: Creating STEP7 program
- G: Testing of STEP7 program

#### A: Installation of hardware

	A: Installation of hardware
1	Assemble the used modules on the module racks.
	In the current example, these are a power supply unit PS 407 10A, a central module CPU 416-1, as well as a communication processor CP 443-1.
	Establish the connection between computer and programming interface of the central module.
	Establish the connection between the computer's communication processor CP 1612 to communication processor CP443-1 in the PLC.

## **B: Creating STEP7 project**

	B: Creating STEP7 project					
1	Creating a new STEP7 project in SIMATIC Manager.					
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC Manager.					
	<i></i>					
	<b>7 /</b>					
	SIMATIC Manager					
2	Using menu item File $\rightarrow$ New, the dialog to specific STEP7 project opens.	y parameters of a new				
	Names of STEP7 projects created as part of this man the character sequence S7. Furthermore, they conta	nual must start with in a description of the				
	communication type used. The current example has	the name S7_IES.				
	By default, projects are saved in directory C:\PROGE	KAM be changed at any				
	time by clicking the Browse button.	so onangoa at any				
	The New dialog is closed by clicking the OK button					
	New Project					
	User projects   Libraries   Multiprojects					
	Name Storage path					
	<u></u>					
	☐ Add to current multiproject					
	Na <u>m</u> e: <u>I</u> ype:					
	S7_IES Proj	ect 💌				
	Storage location (path):					
	C:\Program Files\Siemens\SIMATIC.NCM\s7proj	Browse				
		Hala I				
		нер				

## C: Configuring hardware

	C: Configuring hardware						
1	The new project is displayed in SIMATIC Manager. Hardware must be configured for it. Two components are needed. These are a SIMATIC 400 station, as well as an Industrial Ethernet for its connections.						
	These components are added in SIMATIC Manager using $\mathcal{T}R$ on the name of project S7_IES and Add New Object $\rightarrow$ SIMATIC 400 Station as well as Insert New Object $\rightarrow$ Industrial Ethernet.						
		Cut Copy Paste		Ctrl+X Ctrl+C Ctrl+V			
		Delete		Del	-		
		Insert New PLC	Object		SIMATIC 400 Station     SIMATIC 300 Station		
		Rename Object Properties		F2 Alt+Return	SIMATIC H Station SIMATIC PC Station Other station SIMATIC S5 PG/PC		
			MPI PROFIBUS Industrial Ethernet PTP				
					S7 Program M7 Program		
2	The two con SIMATIC N	mponents jus lanager.	st added	are display	ved in the right window of		
	📓 SIMATIO	C 400(1) 🏼 🏪 I	MPI(1)	<b>₽</b> ₽ €	Ethernet(1)		
	Using D on component SIMATIC 400(1) in the right window will display						
	the Hardware item. Using づÜD on the Hardware item or づÜR and Open Object on it will start the HWConfig program.						
	Du Hardware	Open Object	t Ctrl+Alt	:+0			
		Cut	Ctrl+X Ctrl+C				
		Paste	Ctrl+V				
		Delete	Del				
		Rename	F2				

	C: Configuring hardware
3	The HWConfig program opens.
	It is used to exactly specify the hardware used in the PLC, and to configure its properties.
	HW Konfig
4	Using the subsequently displayed button in the toolbar of HWConfig program, the hardware catalog opens. This is used to select the required hardware components.



	C: Configuring hardware				
6	The HWConfig program displays the presently still empty module rack. It has been assigned to rack number 0. In configuring the connection in the WinCC project, the rack number is one of the parameters to be set.				
	(0) UR1 2 3 4 5 6 7 7 •				
7	Arrangement of additional hardware components in module rack. This uses Drag&Drop for the desired components from the hardware catalog in their respective slots in the module rack.				
	The example uses a power supply unit PS 407 10A. This is inserted in slot 1. A power supply unit of this type uses two slots.				
The example uses a CPU 416-1 as central module. This is insert 3. In configuring the connection in the WinCC project, the slot nu the central module is an additional parameter to be set.					
	Furthermore, a CP 443-1 communication processor is needed. However, this is available from the hardware catalog only if the NCM S7 Industrial Ethernet option package has been installed. Once the CP 443-1 communication processor is inserted into the module rack, its properties dialog opens.				

	C: Configuring hardware
8	The property dialog of the Ethernet interface of CP 443-1 is displayed. Use the Parameter tab register in the MAC address field to set the desired Ethernet address of the communication processor. The current example specifies this as 08.00.06.01.00.00. In configuring the connection in the WinCC project, this Ethernet address is an additional parameter to be set. Use the lower selection field Subnet to assign the entry Ethernet(1) to the communication processor. Close the dialog with OK.
	Properties - Ethernet interface       CP 1612 (R0/S1)         General       Parameters         Image: Set MAC address / use ISO protocol
	MAC address:       08-00-06-6F-C6-3E       If a subnet is selected, the next available addresses are         IP grotocol is being used       IP address:       190.99.99.48         Subnet mask:       255.255.0.0       Image: Backway         Subnet:
	OK Cancel Help
9	In the following, the fully configured hardware design of the example is shown.
10	Settings made now must be saved in program HWConfig and must be compiled. This is done using the toolbar button displayed in the following.

## D: Loading of hardware configuration

	D: Loading of hardware configuration					
1	The hardware configuration created in program HWConfig must be transferred to the PLC.					
	This is done using the toolbar button displayed in the following.					
	sin,					
	Download to Module					
2	A dialog opens which allows selection of components to be loaded.					
	In the current example, all selectable components must be marked. Please make sure that any loading of the central module is possible only in operational switch positions STOP or RUN-P. Close the dialog with OK.					
	Select Target Module					
	Target Modules:					
	Module Racks Slot					
	CPU416-1 0 3 CP 443-1 0 4					
	Select <u>A</u> ll OK Cancel Help					
3	The Select Node Address dialog is displayed.					
	Here you state which node address is used for communication between STEP7 software and central module. The current example uses communication via the MPI interface. The address of the central module is 2.					
	Close the dialog with OK.					
4	Configuration data are now transferred to the PLC. Individual modules may have to be put into the STOP status.					
	The HWConfig program may be terminated.					
	Components newly added are displayed in SIMATIC Manager for SIMATIC 400(1).					
	E <sup>(</sup> S7_IES) È III SIMATIC 400(1) È <sup>1</sup> II CP 443-1 È III CPU416-1					

## E: Testing of hardware configuration

	E: Testing of hardware configuration				
1	Testing of hardware configuration decision				
	If the key switch of the central module is put into RUN or RUN-P position, and the operational switch of the communication processor is put into RUN position, only status LEDs indicating the RUN state should be lit.				
	If this is not the case, an error has occurred. This error may be determined using the steps described in the following. However, these step should also be implemented even if no error is indicated by the status LEDs. This will allow recognition of non-critical errors and faulty configurations.				

E:	Testing of ha	rdware configurat	ion		
Te	Testing of configuration in central module.				
Th	This uses the Module Information dialog in SIMATIC Manager. This dialog				
lio					
IS C	J Tarrat Custo	OR on the entry of	i the central module	in the left windo	
and	d Target Syste	m Wodule Info	ormation.		
Th mc as	e General tab odule. The Stat existing errors	egister displays va us field will display , if any.	rious general data c the current Module	of the central Information as w	
Th err	e Diagnostic B ors and their c	uffer tab register dis orrection.	splay detailed inform	nation on existin	
Th	e dialog is clos	ed by clicking the C	Close button.		
Ð	O Module Information - CPU416-1				
<u>P</u> a St	Path: S7_IES/SIMATIC 400(1)/CPU416-1 Status: OK		Operating mode of the CPL Not a force job	J: 🕕 RUN	
ļ,	Time System	Performance Data	Communication	Stacks	
	General	Diagnostic Buffer	Memory	Scan Cycle Time	
	Description:	CPU416-1	System Identification:	SIMATIC 400	
	⊻ersion:	Order No. / Description	Component	Version	
		6ES7 416-1XJ01-0AB0	Hardware	1	
			Firmware	V 3.1.0	
	Rack:	0 ,	Address: ···		
	Slot:	3			
	<u>S</u> tatus:	Module available and o.k.		<u>.</u>	
				×	

	E. Teathan at Landaran and farmation					
	E: Lesting of hardware configuration					
3	Testing of communication processor configuration.					
	This uses the Module Information dialog in SIMATIC Manager. This dialog					
	is opened using	CR on the entry	of the communication	processor in the		
	left window and	Target System	Module Information	l.		
	The General tab	register displays v	arious general data o	f the module.		
	A dialog for more	e detailed diagnost	ics of the communica	tion processor may		
	be opened using	the Special Diagn	ostics button.	aon proceeder may		
	Module Informa	tion - CP 443-1				
	Path: S7 IES\SIMAT	IC 400(1)\CP-Station(1)\CP	Operating mode of the CPU:	: ① RUN		
	Status: OK		Operating mode of the modu	le: 🐧 RUN		
	General Diagnostic B	Buffer				
	Description:	CP 443-1 System Identification: SIMA*		SIMATIC 400		
	Marrian					
	version.	Order No./ Description	Component Hardware	Version		
			Firmware	V 5.2.0		
	Back:	0	Address: 1.8187			
	Slot:	4				
	<u>S</u> tatus:					
		1				
	Close	Jpdate Print	Spe <u>c</u> ial Diagnostics	Help		

4	The NCM S7 Industrial Ethernet Diagnostics dialog opens. The CP Information tab register displays general information on the module. Among others, the set network address may be checked. The dialog is closed by clicking the Close button. The Module Information dialog may also be closed by clicking the Close button.										
	NCM S7 Diagnostics -	CP 443-1 0/6 08-00-06-92-18-C8 01 Diagnostic Buffer View Options Help  Online Path Interface: Industrial Ethernet S7 subnet ID of destination network: Rack: 0  General Module Information Module type: CP 443-1 Module version: V5.2.0 Hardware version: 1 Order number: 6GK7 443-	Address of gateway: Address of dest. station network attachment: Slot: 1EX02-0XE0	 08-00-06-92-18-C8 5							

## F: Creating STEP7 program

	F: Creating STEP7 program							
1	Creating STEP7 program							
	For the current example project, only one operations block, OB1, and one data block are needed. OB1 is available by default. The needed data block							
	must first be created. This is done in SIMATIC Manager using $\sqrt[6]{CR}$ on the Blocks subitem of entry S7 program(1) of the configured central module and Insert New Object $\rightarrow$ Data Block.							
	The property dia the block and cl	alog of the data block op ose the dialog by clickin	ens. Enter g OK.	DB7	5 as the name for			
	⊡ 📓 CPU 416-1 ⊟ 🛐 S7 Prog	jram(1) irces						
		Cut	Ctrl+X					
		Сору	Ctrl+C					
		Paste	Ctrl+V					
		Delete	Del					
		Insert New Object		•	Organization Block			
		PLC		•	Function Block			
	-	Rewiring			Function			
		Compare Blocks			Data Block			
		Reference Data		•	Data Type			
		Check Block Consistency		4	variable l'able			
		Print		F				
		Rename	F2					
		Object Properties	Alt+Return					
		Special Object Properties		•				

	F: Cre	eating STEP7 program	n							
2	The n projec	ewly created data bloc ct.	k DB75 is d	lisplayed in the right window of the						
	Using may b	D on it or using OR and Open Object, the contents of the block programmed. The program KOP/AWL/FUP is started.								
		Open Object	Ctrl+Alt+O							
		Cut Copy Paste	Ctrl+X Ctrl+C Ctrl+V							
		Delete	Del							
		Insert New Object PLC		<b>b</b>						
		Compare Blocks Reference Data		•						
		Print		•						
		Rename Object Properties Special Object Propertie	F2 Alt+Return s	•						
3	The p The N OK.	rogram KOP/AWL/FUF lew Data Block dialog	<sup>D</sup> is displaye appears and	ed. d must be acknowledged by clicking						
	KOP A	WL FUP								

	F: Creating STEP7 program								
4	Programm	ning of DB75.							
	Here, two tags of length 16 bits are created. Their sum is supposed to be determined in OB1 and written to another tag of length 16 bits.								
	Furthermore, two tags of length 16 bits are created, whose values are to be cyclically incremented in OB1.								
	Tags created in data block DB75 are supposed to be visualized in the WinCC project. To do so, WinCC tags with corresponding addresses are created.								
	The following shows the completely programmed data block DB75.								
	DB75 S7_IEH\SIMATIC 400(1)\CPU 416-1								
	lddress	Name	Туре	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						
	<				>				
	PLC. This is done using the toolbar button displayed in the following. Please make sure that any loading of the central module is possible only in operational switch positions STOP or RUN-P.								
6	Programm	ning of OB1.							
	This must	be opened be	forehand in prog	ram KOP/AWL/FUP					
	Initially, tw	vo values creat	ed in DB75 are a	dded and the result	t is again				
	saved in E	DB75.			-				
	Netzwer	<b>k 1:</b> Addit	ion						
	Adding two 16-Bit Values The result is stored in another 16-Bit Value								
	c	PN DB	75						
		, DBW	0						
		·I DBW	2						
	т	DBW	4						
	·								

	F: Creating STEP7 program
	Next, the count of a value created in DB75 is implemented every second.
	Network 2: Second Cycle
	Generation of a second cycle at M 0.0
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
	Network 3: Counting in a second cycle
	Counting a value in a second cycle At 10000, reset to 0
	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 Next, the count of a value created in DB75 is implemented for each run of OB1. Network 4: Counting in the cycle time Counting a value each time the OB is executed At 10000, reset to 0</i 
	L DBW 8 L 1 +I T DBW 8 L 10000 <i JC M002 L 0 T DBW 8 M002: NOP 0</i 
7	The OB1 block must be saved and loaded into the PLC. This is done using the respective toolbar button. Thus, the STEP7 project is complete and ready to run. The KOP/AWL/FUP program may be terminated.

## G: Testing of STEP7 program

		_	_		_	_						
	G: Testing of STEP7 program											
1	Testing of program using STEP7 software.											
	A tag table is created for this This is done in SIMATIC Manager using $\frac{1}{2}$ R											
	on the entry of the configured central module and Target System $\rightarrow$											
	Monitor / Modify Tag.											
	<b>S</b>	CF	U 416-1							7		
	Ē	- 57	S7 Pro	Cut				Ctrl+X				
			🛅 Sd	Cop	iy Fa			Ctrl+C				
			. <b>EN</b> DI									
				Dele	ete			Del				
				Inse	ert	New Objec	t		-			
				PLC					•	Copy R	AM to ROM	
				Run	i-Ti	me Propert	ies		CPU Messages			
				Ren	am	e		F2	Monitor/Modity Variables		:5	
				ОЫ	ect	Properties	Alt+Return		Hardwa	are Diagnostics		
			L	Spe	cial	Object Pro	operties		•	Module	ing Mode	Ctrl+D Ctrl+I
										Clear/F	leset	Carri
										Set Tim	e of Day	
2	Δn	adite	or is d	ienla		d to cro	ato ar	nd liep o	such	t na tan t	ahla	
2				ispia	ye o			tabla ia			togo orosto	
	in u are	ente	ollowii ered	ig, in	e	comple	le lag	lable is	She	Jwn. All	lags create	
		CIII	sicu.									
		VA	T_20									
		<u>^</u>	Addres	s		Symbol	Displa	y format	Stat	tus value	Modify value	1
	1		DB75.D	BW	0		DEC		12		12	
	2	I	DB75.D	)BW	2		DEC		12		12	
	3	I	DB75.D	)BW	4		DEC		24			
	4	l	DB75.D	)BW	6		DEC		108	33		
	5		DB75.D	)BW	8		DEC		170	03		
	6								l			
	-											

	G: Testing of STEP7 program
3	Monitoring current tag values.
	By clicking the toolbar button shown in the following, the current values of respective tags in the PLC are displayed in the Status Value column.
	Monitor variable.
	Controlling of tag values.
	In the Control Value column, values may be entered. By clicking the toolbar button displayed in the following, these values are written to the corresponding tags in the PLC.
	Please make sure that any controlling of tags is possible only in operational switch position RUN-P.
	Modify variable
4	The so-created tag table may now be saved.
	In the current example, it is saved under the name VAT1. If the program function in the PLC has now been checked, the tag table may be closed. Thus, configuration of the STEP7 project is complete and SIMATIC Manager may be terminated.
	I VAT1

# 3.3.3 Creating WinCC Project WinCC\_S7\_IES

The following description shows in detail the necessary configuration steps for creating and commissioning of WinCC project S7\_IES.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project S7\_IES.

- A: Creating WinCC project
- B: Establishing connection
- C: Creating WinCC tags
- D: Creating WinCC picture

## A: Creating WinCC Project

	A: Creating WinCC Project
1	Creating a new WinCC project in WinCC Explorer.
	It is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.
2	WinCC Explorer is opened.
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.
	The following example project creates a single-user project.
	Finish the dialog with OK.
	WinCC Explorer
	Create a New Project
	Single-User Project
	🕵 🔿 Client Project
	C Open an Existing Project
	OK Cancel

	A: Creating WinCC Project								
3	The Create a New Project dialog opens.								
	Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_S7_IES. Furthermore, in the Project Path field, the storage location of the new project								
	The Create a New Project dia	log is closed by clicking the C	reate button.						
	Create a new project		? 🛛						
	Project Name: WinCC_S7_IES	Project Path c:\\wincc\winccprojects Eolder: []	<u>Cre</u> ate <u>C</u> ancel						
	New <u>S</u> ubfolder: WinCC_S7_IES You can use this dialog box to create a new WinCC	Drive	<u>H</u> elp						
	project.								

## **B: Establishing connection**

	B: Establishing connection							
1	The new project is displayed in WinCC Explorer.							
	Installing of required communication driver. This is done by clicking $\mathcal{C}R$ on the Tag Management item and Add New Driver.							
	⊡ 🛄 Tag Management ⊕ 🚰 Internal tag: Add New Driver							
	Find							
	Properties							
2	The Add New Driver Dialog opens.							
	It offers a selection of all communication drivers available for installation.							
	For communication with SIMATIC S7, the SIMATIC S7 Protocol Suite driver	r						
	is required. It must be selected in the dialog. Close the dialog with Open.							
	Add new driver							
	Look in: 🔁 bin 💽 🖛 🗈 📸 🎫							
	PDLCache							
	OPC.chn     SIMATIC S5 Profibus FDL.chn     Simatic S5 Profibus FDL.chn							
	Profibus DP.chn     Im SIMATIC S5 Programmers Port 4     Im SIMATIC S5 Serial 39648, CHN							
	SIMATIC 505 TCPIP.chn							
	SIMATIC SS Ethernet Layer 4.CHN							
	File name: SIMATIC S7 Protocol Suite cha							
	Files of type: WinCC Communication Driver (*.chn)							

	B: Establishing connection						
3	The newly added driver SIMATIC S7 Protocol Suite displays as a subitem of Tag Management.						
The driver contains eight different channel units. In order to opera 443 -1 communication processors on a computer, two channel un available for Industrial Ethernet.							
	The current example u	ses the Industrial Ethernet	channel unit. A new				
	connection must be created for it. This is done using ${}^{\circ}\!\!\!\! \ensuremath{\mathbb{C}}\!\!\!\! \mbox{R}$ on the Industrial Ethernet and New Connection entry.						
	SIMATIC S7 PROTOCOL SUITE						
	Industrial Ether	New Driver Connection					
		System Parameter					
		Find					
	PROFIBUS	Paste					
	E Slot PLC	Properties					
	● Soft PLC ● TCP/IP	a fel colonia a conservativa de la	<i>s</i>				

	B: Establishing connection						
4	The property dialog of the connection opens.						
	Enter the name of the new connection on the General tab register. It is S7_IES_01 in the current example.						
	Specify connection parameters using the Properties button.						
	Enter the address set for the CP 443-1 communication processor in the Ethernet Address field. In the current example, this is Ethernet address 08.00.06.01.00.00.						
	Furthermore, Rack Number as well as Slot Number of the central module be addressed must be entered. Please make sure that values for the comodule and not those of the communication processor are entered her Close the dialog with OK. The Connection Properties dialog is also close	ule to entral e. sed					
	by clicking OK.						
	Connection properties						
	General						
	Name: S7 IES_01 Properties						
	Unit: Industrial Ethernet						
	Server List						
	Connection Parameter - Industrial Ethernet						
	Connection						
	S7 Network Address						
	Ethernet Address: 08 00 06 01 00 00						
	Back Number:						
	Slot Number:						
	Send/receive raw data block						
	Connection Resource: 02						
	OK Cancel Help						

	B: Establishing connection	
5	Setting of system parameters for Industrial Ethernet channel unit.	
	This setting uses the System Parameters dialog which opens using the Industrial Ethernet and System Parameters entry.	<sup>4</sup> R on
	On the Channel tab register, different settings for communication an communication monitoring may be specified. However, these do not all channel units of the communication driver.	d apply to
	System Parameter - Industrial Ethernet	
	SIMATIC S7 Unit	
	Cycle management	
	✓ by PLC ✓ Change driven transfer	
	Lifebeat monitoring	
	✓ Activate 60 Interval 30 Timeout interval	
	Monitoring of CPU-stop	
	✓ Activate	
	The channel uses cyclic read rservices in the AS.	
	OK Cancel Help	

	B: Establishing connection	
6	On the Unit tab register, it must be specified which access point the connection to the PLC should use.	
	Default setting is access point CP_H1_1:. Earlier, access point CP_ was assigned the CP 1612 communication processor in the Setting Interface program. If this access point is supposed to be set automa must be checked whether or not the correct one is used, especially using multiple communication processors. Close the dialog with OK.	H1_1:: PG/PC tically, it when
	System Parameter - Industrial Ethernet	
	SIMATIC S7 Unit	
	Select logical device name	
	CP-Type/Bus Profile: Industrial Ethernet	
	Logical <u>d</u> evice name: CP_H1_1;	
	✓ Set <u>a</u> utomatically	
	Job processing	
	☐ <u>W</u> rite with priority	
	Enter a new device name or select the requested device from the list.	
	OK Cancel Help	

## C: Creating WinCC tags

	C: Creating WinCC ta	ags	
1	Creating WinCC tags r	required for exam	ble.
	This is done by clicking S7_IES_01 and New 1	g <sup>7</sup> ੳR on the ent Fag.	ry for the newly created connection
	SIMATIC S7 PROTO     SIMATIC S7 PROTO     Industrial Ethern     ST IES 01	COL SUITE net	
	🕀 🛄 Industrial Ether	New Group	
		New Tag	
		Find	
	■ PROFIBUS (II)	Cut	
	E Slot PLC	Сору	
	TCP/IP	Paste	
		Delete	
		Properties	

2	The example uses S16x_S7IES01_01 as the name for the first tag. The ta is of data type Signed 16-Bit Value. Using the Select button, the address of the new tag is set.
	Tag properties       General       Limits/Reporting       Properties of Tags
	Name:     S16x_S7IES01_01       DataType :     Signed 16-bit value       Length:     2
	Address: ShortToSignedWord
	Linear scaling     Process Value Range     Tag Value Range
	Value1 Value1 Value2 Value2
	Data type of the tags from the viewpoint of the OS
	OK Cancel Help

<ul> <li>C: Creating WinCC tags</li> <li>The Address Properties dialog opens. Enter DB as data range and the value 75 as DB No. In the Address field, set Word and set the value to 0 in the DBW field. Finish the dialog with OK. The Property dialog of the tag is also closed by clicking OK. The just created WinCC tag has been addressed to the area of DB75 where the first of the two values to be added is located.</li> <li>Address properties</li> <li>Address properties</li> <li>Address word use the part of the two values to be added is located.</li> <li>Address word use the part of the two values to be added is located.</li> <li>Address word use the part of the two values to be added is located.</li> <li>Address word use the part of the two values to the area of DB75 where the first of the two values to be added is located.</li> <li>Address word use the part of the two values to the area of DB to the two values to the area of DB to the area of DB to the two values to be added is located.</li> <li>Address word use the part of the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to be added is located.</li> <li>Address word use the part of the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to the area of DB to the two values to the two values to the area of DB to the two values to the area of DB to the two values to the two values</li></ul>	<ul> <li>C: Creating</li> <li>The Address</li> <li>Enter DB as set Word an The Propert</li> <li>The just crewhere the fi</li> <li>Address</li> <li>Descripting</li> <li>Address</li> <li>Descripting</li> <li>QPU</li> <li>Data</li> <li>Address</li> </ul> 4 Creating the The procedure and address following distributions of the procedure	
<ul> <li>The Address Properties dialog opens.</li> <li>Enter DB as data range and the value 75 as DB No. In the Address field, set Word and set the value to 0 in the DBW field. Finish the dialog with OK. The Property dialog of the tag is also closed by clicking OK.</li> <li>The just created WinCC tag has been addressed to the area of DB75 where the first of the two values to be added is located.</li> <li>Address properties</li> <li>Address</li> <li>Description</li> <li>DB D D D No. 75</li> <li>Address</li> <li>Word D B No. 75</li> <li>Address</li> <li>Word D BNO. 75</li> <li>DBW 0</li> <li>ength 1</li> <li>Quality Code</li> <li>Cancel Help</li> <li>4</li> <li>Creating the remaining required WinCC tags.</li> <li>The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.</li> </ul>	<ul> <li>The Address Enter DB as set Word an The Propert The just cre where the fi</li> <li>Address</li> <li>Descripting</li> <li>QPU</li> <li>Data</li> <li>Address</li> </ul> 4 Creating the The procedure and address following distributions	g WinCC tags
<ul> <li>Enter DB as data range and the value 75 as DB No. In the Address field, set Word and set the value to 0 in the DBW field. Finish the dialog with OK. The Property dialog of the tag is also closed by clicking OK.</li> <li>The just created WinCC tag has been addressed to the area of DB75 where the first of the two values to be added is located.</li> <li>Address properties <ul> <li>Address</li> <li>Description</li> <li>DB</li> <li>DB</li> <li>DB</li> <li>DB</li> <li>DB</li> <li>Cancel</li> </ul> </li> <li>4 Creating the remaining required WinCC tags. <ul> <li>The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.</li> </ul> </li> </ul>	<ul> <li>Enter DB as set Word an The Propert The just crewhere the fi</li> <li>Address p</li> <li>Address</li> <li>Descripting</li> <li>Descripting<th>ss Properties dialog opens.</th></li></ul>	ss Properties dialog opens.
Address properties         Address         Description         PU         Data         DB         Address         Word         DBW0         Length         Quality Code         DBW0         Cancel         Help         4         Creating the remaining required WinCC tags.         The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.         Name       Type         Parameters	Address prescript         Address         Descript         QPU         Data         Address	s data range and the value 75 as DB No. In the Address field, nd set the value to 0 in the DBW field. Finish the dialog with OK. ty dialog of the tag is also closed by clicking OK. eated WinCC tag has been addressed to the area of DB75 first of the two values to be added is located.
Address         PU         Pu         DB         Address         Word         DBW         Image: Type         Parameters         StEx         Image: Type         Parameters	Address         Descript         PU         Data         Address         ddress         4         Creating the proceduand address following distributions	roperties 🛛 🕅
4       Creating the remaining required WinCC tags.         The procedure is analogous to \$ 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.	4 Creating the The procedu and address following dis	
4       Creating the remaining required WinCC tags.         The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.	4 Creating the The procedu and address following dis	tion
Pata       DB       DB       DB No. 75         Address       Word       Image: Code         DBW       Image: Code       Quality Code         Image: Quality Code       Image: Quality Code         Image: Code       Help	4 Creating the The procedu and address following dis	
Address       Word       Length         DBW       Length       Quality Code         Quality Code       Quality Code         Image: Concelence       Help         4       Creating the remaining required WinCC tags.         The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.         Name       Type         Parameters         S16x       S7ES01.01	4 Creating the The procedure and address following dis	DB DB No. 75
4       Creating the remaining required WinCC tags.         The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.         Name       Type         Parameters         S16x S7[ES01.01_Signed 16-bit valueB75 DW0]	4 Creating the The procedure and address following dis	DBW 0 Length 1
4       Creating the remaining required WinCC tags.         The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.         Name       Type         Parameters         S15x S7IES01.01       Sinced 16-bit value	4 Creating the The procedure and address following dis	Quality Code
<ul> <li>Creating the remaining required WinCC tags.</li> <li>The procedure is analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.</li> </ul> Name Type Parameters S16x S7/ES01.01. Signed 16-bit value. DB75 DW0	4 Creating the The procedu and address following dis	OK Cancel Help
Analogous to s 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.     Name Type Parameters     S16x S7[ES01_01_Signed 16-bit value	and address following dis	e remaining required WinCC tags.
Name         Type         Parameters           S16x         S7JES01_01         Signed 16-bit value         DB75_DW/0		splay.
L AS16x S7ESU1 U1 Signed 16-bit value DB75 DW0	Name	Type Parameters
$\square$ S16x S7IES01 02 Signed 16-bit value DB75 DW2	S16x_S70	IES01_01 Signed 16-bit value DB75,DW0 IES01 02 Signed 16-bit value DB75,DW2
S16x_S7IES01_03 Signed 16-bit value DB75,DW4	S16x_S7I	IES01_03 Signed 16-bit value DB75,DW4
	S16x_S7II ■ S16x_S7II	IES01_04 Signed 16-bit value DB75,DW6 IES01_05 Signed 16-bit value DB75,DW8

#### **D: Creating WinCC picture**



	D: Creating WinCC picture
3	After placement of the I/O field on the picture, its configuration dialog opens.
	In the Tag field, the tag S16x_S7IES01_01 is set using the button shown in the following.
	Tag updates are set to Upon Change. The additional set options should retain their default values. Finish the dialog with OK.
	I/O-Field Configuration
	Tag: S16x_S7IES01_01
	Update 2 s
	Туре
	C Output C Input C Both
	Format
	Font Size 12
	Font Name Arial
	Color
	Cancel

	D: Creating WinCC picture
4	Changes of output format for I/O field.
	Open its property dialog. This is done by clicking <sup>O</sup> R on the I/O field and Properties.
	<ul> <li>Cut Ctrl+X</li> <li>Copy Ctrl+C</li> <li>Duplicate</li> <li>Paste Ctrl+V</li> <li>Delete Del</li> <li>Customized object</li> <li>Group object</li> <li>Linking</li> <li>Configuration Dialog</li> </ul>
5	The Object Properties dialog opens. On the Properties tab register, select the Output/Input entry in the left window. Using $$ on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is
	Capable to display signed values with a maximum of 5 digits.         Object Properties         I/O Field       IOField         I/O Field       IOField         I/O Field       Attribute       Static       Dynamic       Current       I         I/O Field       Attribute       Static       Dynamic       Current       I         Geometry       Geometry       Output Value       0.000000e-       \$16x_\$7IE\$01_01 2 s       D         Output Value       0.000000e-       \$16x_\$7IE\$01_01 2 s       D       D       D         Field       Properties       Events       Data Format       Decimal       Dutput Format \$99999       Apply on Full       No       D       D         Miscellaneous       Limits       Output / Input       No       D
6	Creating an additional four I/O fields to display the remaining tags.


# 3.3.4 Diagnostics of Communication Link Using Industrial Ethernet (Soft Net)

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_S7\_IES and the SIMATIC S7 station.

Diagnostics of an example in accordance with the following description is only meaningful if the following checks listed have successfully been concluded.

- Commissioning of CP 1612 communication processor
- Testing of communication processor
- Generation of STEP7 project S7\_IES
- Testing of hardware configuration
- Testing of STEP7 program

## A: WinCC Explorer

	A: WinCC Explorer		
1	Diagnostics of communication link in WinCC Explorer. Switch the WinCC_S7_IES project into Runtime. This is done in WinCC Explorer using the toolbar button displayed in the following.		
	The created WinCC picture com_3_S7IES_01.pdl may also be switched directly from Graphics Designer into Runtime.		
2	In WinCC Explorer, using the menu Tools $\rightarrow$ Status of Driver Connections, a dialog may be opened to monitor all configured connections. However, this menu item is only active if the project is in Runtime.		
	Status of Driver Connections		
	Status of Server Connections		
	Status of <u>Client</u> Connections		
3	<ul> <li>The Status - Logical Connections dialog is opened.</li> <li>This dialog lists all configured connections. In the current example, only the connection S7_IES_01 exists.</li> <li>The displayed values correspond to the status at the moment the dialog was opened. By selecting the corresponding checkbox, a cyclic display</li> </ul>		
	Status - Logical Connections		
	Tag ID Name Status Tag read Bead regu Tag written Write regu		
	2 S7_IES_01 OK 885 0 2 0		
	□ Cyclic update ( 4 ÷ x 250 ms ) Update Help Close		

A: WinCC Explorer		
Another option to obtain information on the connection status in general but also on the connection status of individual tags is provided by Tag Management.		
The status of a config simply moving the mo	gured connection may be obtai buse over it.	ned as a tooltip by
Name	Parameters	
\$∲∲S7_IES_01 Status: OK	H1,08 00 06 01 00 00,,0,3,02	
The current process obtained as a tooltip allows determination the entire connection	value of a certain tag, as well a by simply moving the mouse o of errors of a single tag only, r	as its status, may be ver it. This procedure not of errors concerning
Name	Туре	Parameters
S16x_S7IES01_01	Signed 16-bit value value: 34 c0 apge:1/31/2005 10:23:35 AM	DB75,DW0
	A: WinCC Explorer Another option to obt also on the connection Management. The status of a config simply moving the model Name S7_IES_01 Status: OK The current process of obtained as a tooltip allows determination the entire connection Name S16x_S7IES01_01 Process Quality: Last ch	A: WinCC Explorer Another option to obtain information on the connect also on the connection status of individual tags is pro- Management. The status of a configured connection may be obtain simply moving the mouse over it. Name Parameters S7_IES_01 H1,08 00 06 01 00 00,,0,3,02 Status: OK The current process value of a certain tag, as well a obtained as a tooltip by simply moving the mouse of allows determination of errors of a single tag only, r the entire connection. Name Type S16x_S7IES01_01 Signed 16-bit value Process value: 34 Quality: c0 Last Change:1/31/2005 10:23:35 AM

## **B: Channel Diagnosis**

	B: Channel Diagnosis		
1	Diagnostics of communication lin program.	ik using the WinCC C	hannel Diagnosis
	This is started using Start → S Channel Diagnosis.	SIMATIC -> WinCO	C → Tools →
	Channel Diagnosis		
2	The WinCC Channel Diagnosis p	program is opened.	
	The Channels/Connections tab re status of each configured connect is one second. The update cycle	egister displays exact ction. The default valu may be changed in t	t information on the ue for display update he lower input field.
	🔹 WinCC Channel Diagnosis		? 🛛
	Channels/Connections Configuration		Always on top
	□       ✓ SIMATIC S7 PROTOCOL SUITE         □       ✓ S7_IES_01	Counters State Error Code Error Count Unit Device PDU Size Request Counter Response Counter Own Cycles Max. AS Cycles ConnectionState ConnectionState ForceConnectionAddress	Value ready none 0 Industrial Ethernet ISO Ind. Ethernet -> CP1 480 7 73 0 1 32 ready automatic up projected
3	In case a connection problem existence of the second secon	ists, the right window g a more specific caus error code may be o p entry.	will display in the se of the problem. btained by clicking
	This will display information on the possible error causes are display	ne respective error co ved.	de. Furthermore,
	Error 7001 - CEC_STPCHK Communication aborted due to a • The connection was aborte because a VMD state of th or DEFECTIVE - was detec	stop check. Id by the channel Ie CPU - STOP, HOLI cted.	

## 3.4 Communication with SIMATIC S7 Using TCP/IP

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on <a href="http://support.automation.siemens.com/WW/view/en/21320307">http://support.automation.siemens.com/WW/view/en/21320307</a>).

There is the option of copying the following components to hard disk:



The STEP7 project to be generated.



The WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between SIMATIC S7 and WinCC. The communication link is implemented by using the Industrial Ethernet. The TCP/IP protocol is used as the transport protocol.

#### Summary on Example Design



On the computer side, the network connection (Industrial Ethernet) is established using a CP 1612 communication processor. For its installation on the computer, the IE SOFTNET-S7 BASIC driver from the SIMATIC NET CD is required.

In the WinCC project, the SIMATIC S7 Protocol Suite communication driver must be installed. Using its TCP/IP channel unit, the connection to SIMATIC S7 is configured.

The PLC is equipped with a central module CPU 416-1. Connection to the network is established using the CP443-1 communication processor. In order to configure this communication processor with STEP7 software, the NCM S7 Industrial Ethernet options package is required.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Commissioning of CP 1612 communication processor
- Generation of STEP7 project S7\_IETCP
- Generation of WinCC project WinCC\_S7\_IETCP
- Diagnostics of communication links

#### **Required software**

Name	Description
SIMATIC NET	Driver IE SOFTNET-S7 BASIC for installation of communication processor CP 1612 from the SIMATIC NET CD.
Windows	Windows installation software for installation of communication processor CP 1612 as well as TCP/IP protocol.
STEP7	STEP7 Software with option package NCM for Industrial Ethernet to generate the STEP7 project.
WinCC	WinCC with SIMATIC S7 Protocol Suite communication driver to generate the WinCC project.

#### Required hardware on computer

Name	Description
Communication Processor	Communication processor CP 1612 to establish connection to communication processor in PLC.

#### **Required hardware in the PLC**

Name	Description
Rack	Module rack UR1.
Power supply unit	Power supply unit PS 407 10A in slots 1 and 2.
Central module	Central module CPU 416-1 in slot 3.
Communication Processor	Communication processor CP 443-1 TCP in slot 4.

#### 3.4.1 Commissioning of CP 1612 Communication Processor

The following description shows detailed configuration steps necessary for successful commissioning of the CP 1612 communication processor. Communication is facilitated using the SIEMENS Industrial Ethernet protocol. It is assumed that the communication processor was previously installed.

#### **Summary of Configuration Steps**

The following is a summary list of all necessary configuration steps for commissioning the communication processor CP 1612.

- A: Configuration of communication processor
- B: Assigning of access point
- C: Testing of communication processor

## A: Configuration of communication processor

	A: Configuration of com	municatio	on proces	sor		
1	In Program Start → SIM "Setting PC station", the co the General menu, the ope Mode. This change leads t In the example, the index i changes are saved using t confirmed by clicking OK.	IATIC → ommunica eration mo to a displa is set to 1 the Apply	SIMATI ation proce ode of the in y of the In and the m button. Th	C NET - ssor may module is dex and l odule na e display	→ Settin v be config s set to Co Module Na me to CP ed note m	gs → gured. In onfigured ame fields. 1612. The lay be
	Type of module:	Ethernet				
	Mode of the module:	Configured	mode		-	
				Index:	1 🔻	
		Name of the	module:			
	Interface profile for:	CP1612				
	the Properties and Internet Protocol Properties dialog, the following windows appear. In the current example, the following settings were made for the TCP/IP protocol.			ng TCP/IP		
	Local Area Connection Properties	? 🗙	Internet Protoco	ol (TCP/IP) Prop	perties	? 🔀
	General Authentication Advanced		General			
	Connect using:	Configure	You can get IP s this capability. Ot the appropriate II	ettings assigned au therwise, you need t P settings.	tomatically if your net to ask your network a	work supports idministrator for
	This connection uses the following items:		🔿 Obtain an II	P address automatic	ally	
	Boos Packet Scheduler     SiMATIC Industrial Ethernet (ISO)	<u>^</u>	IP address:	owing IP address: -	190.99.99	. 48
	Internet Protocol (I LP/IP)	×	Subnet mask:		255.255.0	. 0
	Install Uninstall	Properties	Default gatew	ay:		
	Description	The default	Obtain DNS	server address au	tomatically	
	wide area network protocol that provides commun across diverse interconnected networks.	nication	Preferred DNS	) server:		
	Show icon in notification area when connected Votify me when this connection has limited or no	connectivity	Alternate DNS	) server:	· · ·	Advanced
					(	
	OK	Cancel			OK	Cancel

## B: Assigning of access point

	B: Assigning of access point
1	In Program Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ "Setting PC Station", the just installed interface must be assigned to the access point CP_H1_1:
	The access point CP_H1_1: is the default access point used for Industrial Ethernet communication in WinCC. It was created automatically during installation of SIMATIC NET.
	😽 Configuration Console
	<u>E</u> ile <u>A</u> ction <u>V</u> iew <u>H</u> elp
	C Station     Access points     Access points     Access points
	Access point Interface parameter assignment Module
	Access points
	₩CP_L2_1: ₩CP_SM_1:
	CP_H1_1:
	THE FWL_LOAD
2	
	D. In the upper field, select the entry ISO Industrial Ethernet $\rightarrow$ Siemens CP1612 using the pull-down menu. This concludes the assignment between access point and communication processor.
	S7ONLINE Properties
	Access point
	Access point: S7ONLINE
	Associated interface parameter assignment:
	ISO Ind Ethernet -> Siemens CP1612
	Module:
	Siemens CP1612
	If you change an access point of a PROFIBUS module to another interface parameter assignment of the same module, all other access points that point to the old interface parameter assignment will be
	remapped to the new interface parameter assignment.
	OK <u>Apply</u> Cancel Help

	B: Assigning of acce	ess point		
3	Module CP 1612 shou and CP_H1_1: as follo	uld be assig ows.	ned access points CP-TCPI	P:, S7ONLINE,
	Configuration Console	,		
	<u>File A</u> ction <u>V</u> iew <u>H</u> elp			
	← → 🗈 🖬 🛱 🔮			
	PC Station	Access poir	its	
	SIMATIC NET Configurati	ion Access poir	nt Interface parameter assignment	Module
	Applications     Access points	€CP_L2_3 €CP_L2_3 €CP_L2_3 €CP_SM_	2: 1: 1:	
		CP-TCP	P: TCP/IP -> Siemens CP1612	Siemens CP1612 Siemens CP1612
			1: ISO Ind. Ethernet -> Siemen	Siemens CP1612
			AD	
4	The address configura	ation may b	e checked again in the Addr	ess folder.
	Configuration Console			
	<u>File Action View H</u> elp			
	PC Station	ddress MAC and IP	addresses	
	Applications	Ethernet (MAC) addr	855	
	Siemens CP1612	Current:	08-00-06-6F-C6-3E	
	Adresse	-IP addresses	departituated	
	SR-Test	IP address:	190.99.99.48	
		Subnet mask:	255.255.0.0	
	CP simulation	Gateway:	0.0.0.0	
	ſ	Activate ISO proto	col only (for H systems)	
		Apply	Cancel Help	

## C: Testing of communication processor

	C: Testing of communication processor
1	Testing the proper installation of the CP 1612 communication processor using the "Setting PC Station" program.
	This is started by clicking Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ Setting PC Station.
	In order to test the protocols, select the "Protocol" folder of the respective module. In our case it is module CP 1613.
2	Testing of proper installation uses the "Test" buttons.
З	In order to check the Send/Receive function, open the directory SR Test. Use the buttons for testing purposes.
4	If diagnostics yields a negative result, the cause of the error must be found and the error must be corrected. Some tools and tips on this subject are described in chapter "Is the computer's communication module operable?".
	This test may also be performed using the "Setting PG/PC Interface" program, however, the "PG Operation" operation mode is required to do so.

## 3.4.2 Creating STEP7 Project S7\_IETCP

The following description shows in detail the necessary configuration steps for creating and commissioning of STEP7 project S7\_IETCP.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the STEP7 project S7\_IETCP.

- A: Installation of hardware
- B: Creating STEP7 project
- C: Configuring hardware
- D: Loading of hardware configuration
- E: Testing of hardware configuration
- F: Creating STEP7 program
- G: Testing of STEP7 program

#### A: Installation of hardware

	A: Installation of hardware
1	Assemble the used modules on the module racks.
	In the current example, these are a power supply unit PS 407 10A, a central module CPU 416-1, as well as a communication processor CP 443-1 TCP.
	Establish the connection between computer and programming interface of the central module.
	Establish the connection between the computer's communication processor CP 1612 to communication processor CP 443-1 TCP in the PLC.

## **B: Creating STEP7 project**

	B: Creating STEP7 project
1	Creating a new STEP7 project in SIMATIC Manager.
	This is started using Start $ ightarrow$ SIMATIC $ ightarrow$ SIMATIC Manager.
2	The SIMATIC Manager opens.
	Using menu item File $\rightarrow$ New, the dialog to specify parameters of a new STEP7 project opens.
	Enter the name of the newly created project in the Name field. Names of STEP7 projects created as part of this manual must start with the character sequence S7. Furthermore, they contain a description of the communication type used. The current example has the name S7_IETCP. By default, projects are saved in directory C:\PROGRAM FILES\SIEMENS\STEP7\S7proj. However, this may be changed at any time by clicking the Browse button. The New dialog is closed by clicking the OK button
	New Project
	User projects Libraries Multiprojects
	Name Storage path
	< >
	☐ Add to current multiproject
	Na <u>m</u> e: <u>T</u> ype:
	S7_IETCP Project
	Storage location (path):
	C:\Program Files\Siemens\SIMATIC.NCM\s7proj <u>B</u> rowse
	OK Cancel Help

## C: Configuring hardware

	C: Configu	uring hardwa	are			
1	The new p	roject is displ	ayed in SIMA	TIC Ma	nager.	
	Hardware a SIMATIC	must be conf 2 400 station,	igured for it. T as well as an	wo con Industr	nponents are needed. The rial Ethernet for its connection	nese are ections.
	These com	nponents are S7_IETCP an	added in SIM	ATIC M Object	lanager using <sup>∽</sup> ⊕R on t → SIMATIC 400 Stati	he name on as
	well as Ins	ert New Obje	$ct \rightarrow$ Indus	trial Eth	nernet.	
	- 🗗 S7_IE	TCP			1	
		Cut	Ctrl+X			
		Copy Pacto	Ctri+C			
		Delete	Del			
		Tocert New	Object		SIMATIC 400 Station	i i
		PLC	object	•	SIMATIC 300 Station	
					SIMATIC H Station	
		Object Pron	r∠ erties… Alt+Re	turn	SIMATIC PC Station	
		,			Other station	
					PG/PC	
					MPI	
					PROFIBUS	
					Industrial Ethernet	
					PTP	
					S7 Program	
					M7 Program	
2	The two co SIMATIC N	omponents ju Manager.	st added are o	lisplaye	ed in the right window of	
	SIMATI	C 400(1) 📲	MPI(1)	Et	hernet(1)	
	Using 🖓	D on compon	ent SIMATIC	400(1) i	in the right window will c	lisplay
	the Hardwardbig Object on i	are item. Usir it will start the	ng <sup>∽</sup> ÜD on th∉ e HWConfig pr	e Hardv ogram.	ware item or 🏹 🖁 R and C	)pen
	🛄 Hardware			_		
		Open Objec	t Ctrl+Alt+O			
		Cut	Ctrl+X			
		Сору	Ctrl+C			
		Paste	Ctrl+V			
		Delete	Del			
		Rename	F2			

	C: Configuring hardware
3	The HWConfig program opens.
	It is used to exactly specify the hardware used in the PLC, and to configure its properties.
	HW Konfig
4	Using the subsequently displayed button in the toolbar of HWConfig program, the hardware catalog opens. This is used to select the required hardware components.
	Catalog



	C: Configuring hardware		
6	The HWConfig program displays the presently still empty module rack. It has been assigned to rack number 0. In configuring the connection in the WinCC project, the rack number is one of the parameters to be set.		
	(0) UR1		
7	Arrangement of additional hardware components in module rack. This uses Drag&Drop for the desired components from the hardware catalog in their respective slots in the module rack.		
	The example uses a power supply unit PS 407 10A. This is inserted in slot 1. A power supply unit of this type uses two slots.		
	The example uses a CPU 416-1 as central module. This is inserted in slot 3. In configuring the connection in the WinCC project, the slot number of the central module is an additional parameter to be set.		
	Furthermore, a CP 443-1 TCP communication processor is needed. However, this is available from the hardware catalog only if the NCM S7 Industrial Ethernet option package has been installed. Once the CP 443-1 TCP communication processor is inserted into the module rack, its properties dialog opens.		

	C: Configuring hardware			
8	The property dialog of communication processor CP 443-1 TCP is displayed.			
	Use the Parameter tab register in the MAC address field to set the desired Ethernet address of the communication processor. Settings relevant for communication using the TCP/IP protocol are the TCP/IP address and the subnet mask.			
	In configuring the connection in the WinCC project, the IP Address of communication processor CP 443-1 TCP is an additional parameter to be set. Set the same value as the subnet mask which was used as subnet maduring installation of communication processor CP 1612 for same.			
	Use the lower selection field Subnet to assign the entry Ethernet(1) to the communication processor. Close the dialog with OK.			
	Properties - Ethernet interface CP 443-1 TCP (R0/S3)			
	General Parameters			
	MAC address: 08-00-06-01-00-00 If a subnet is selected, the next available addresses are			
	IP address:       140.80.0.1       Gateway         Subnet mask:       255.255.0.0 <ul> <li>Do not use router</li> <li>Use router</li> <li>Address:</li> <li>140.80.0.1</li> </ul>			
	Subnet:			
	not networked       New         Ethernet(1)       Properties         Dejete       Dejete			
	OK Cancel Help			



## D: Loading of hardware configuration

	D: Loading of hardware configuration			
1	The hardware configuration created in program HWConfig must be transferred to the PLC.			
	This is done using the toolbar button displayed in the following.			
	Download to Module			
2	A dialog opens which allows selection of components to be loaded.			
	In the current example, all selectable components must be marked. Please make sure that any loading of the central module is possible only in operational switch positions STOP or RUN-P. Close the dialog with OK.			
	Select Target Module			
	Target Modules:			
	Module Backs Slot			
	CPU416-1 0 3			
	CP 443-1 TCP 0 4			
	Select <u>All</u>			
	OK Cancel Help			
3	The Select Node Address dialog opens.			
	Here you state which node address is used for communication between STEP7 software and central module. The current example uses communication via the MPI interface. The address of the central module is 2. Close the dialog with OK.			
4	Configuration data are now transferred to the PLC. Individual modules may have to be put into the STOP status.			
	The HWConfig program may be terminated. Components newly added are displayed in SIMATIC Manager for SIMATIC 400(1).			
	E			

#### E: Testing of hardware configuration



_			-				
	E: Testing of ha	rdware configurat	ion				
2	Testing of configuration in central module.						
	This uses the Module Information dialog in SIMATIC Manager. This dialog						
	is opened using $\mathcal{T}$ on the entry of the central module in the left window						
	and Target System -> Module Information.						
	The Module Information dialog of the central module is displayed						
	The General tab register displays various general data of the central module. The Status field will display the current Module Information as well as existing errors, if any.						
	The Diagnostic B errors and their c	uffer tab register dis orrection.	splay detailed inform	nation on existing			
	The dialog is clos	ed by clicking the C	Close button.				
	🙆 Module Information	tion - CPU416-1					
	Path: S7_IETCP\SIM/ Status: OK	ATIC 400(1)\CPU416-1	Operating mode of the CPL Not a force job	J: 🚸 RUN			
	Time System	Performance Data	Communication	Stacks			
	General	Diagnostic Buffer	Memory	Scan Cycle Time			
	Description:	CPU416-1	System Identification:	SIMATIC 400			
	⊻ersion:	Order No./ Description	Component	Version			
		6ES7 416-1×J01-0AB0	Hardware Firmware	1 V310			
			1 mmydre	V 3.1.0			
	Rack:	0	Address: ···				
	Slot:	3					
	<u>S</u> tatus:	Module available and o.k.					
	Close <u>U</u>	Įpdate <u>P</u> rint		Help			
				CONTRACTOR AND			

	E: Testing of hardware configuration					
3	Testing of com		r configuration	n		
0	This uses the Medule Information dialog in SIMATIC Manager. This dialog					
	is opened using UR on the entry of the communication processor in the					
	left window and	Target System	Module Info	rmation.		
	The General tat	o register displays va	arious genera	I data of the r	nodule.	
	A dialog for more detailed diagnostics of the communication processor may					
	be opened using	g the Special Diagno	ostics button.			
	🔞 Module Inform	ation - CP 443-1 TCP				
	Path: S7_IETCP\SI	MATIC 400(1)\CP 443-1 TCP	Operating mode	eofthe CPU: 🐠 I	RUN	
	Status: OK	5 % I	Operating mode	e of the module: 🐠 l	RUN	
	General Diagnostic Buffer					
	Description:	CP 443-1 TCP	System Ide	entification: SIMATIO	C 400	
	<u>∨</u> ersion:	Order No. / Description	Component	Versi	on	
		6GK7 443-1EX02-0XE0	Hardware	1		
			Firmware	V 5.2	2.0	
	Rack:	0	Address:	I 8187		
	Slot:	4				
	<u>S</u> tatus:	Module available and o.k.				
	Close	Update Print	Spe <u>c</u> ial Diagn	nostics	Help	
					and a second	

	E: Testing of har	dware configura	tion			
4	The NCM S7 Indu The CP Information module.	ustrial Ethernet Dia on tab register dis	agnostics dialog opens. plays general informatior	n on the		
	The dialog is closed by clicking the Close button. The Module Information dialog may also be closed by clicking the Close button.					
	Diagnostics Operating Mode	Diagnostic Buffer View Opt	ions Help Address of gateway: Address of dest. station network attachment: Slot: CP 443-1 TCP V1.12 4 6GK7 443-1EX00-0XE0	 08-00-06-92-18-C8 4		
	Press F1 for help					

## F: Creating STEP7 program

	F: Creating STEP7 program				
1	Creating STEP7 program				
	For the current example project, only one operations block, OB1, and one data block are needed. OB1 is available by default. The needed data block				
	must first be created. This is done in SIMATIC Manager using $\forall UR$ on the Blocks subitem of entry S7 program(1) of the configured central module and Add New Object $\rightarrow$ Data Block.				
	The property dialog of the data block opens. Enter DB75 as the name for the block and close the dialog by clicking OK.				
E S CPU 416-1 =- g S7 Program(1) B Sources					
	🔁 🖪	Cut	Ctrl+X		
		Сору	Ctrl+C		
		Paste	Ctrl+V		
		Delete	Del		
		Insert New Object		Þ	Organization Block
		PLC		•	Function Block
	-	Dewiring		_ا_	Function
		Compare Blocks			Data Block
		Reference Data		•	Data Type
		Check Block Consistency		4	Variable Table
	-	Print		•	
		Rename	F2		
		Object Properties	Alt+Return		
	L	Special Object Properties		٢	

	F: Creating STEP7 program				
2	The newly created data block DB75 is displayed project.	ed in the right window of the			
	may be programmed. The program KOP/AWL	JFUP is started.			
	Open Object     Crrt+Alt+O       Cut     Ctrl+X       Copy     Ctrl+C       Paste     Ctrl+V       Delete     Del       Insert New Object     >       PLC     >       Compare Blocks     Reference Data       Print     >       Rename     F2       Object Properties     Alt+Return       Special Object Properties     >				
3	The program KOP/AWL/FUP opens. The New Data Block dialog appears and must be acknowledged by clicking OK.				

	F: Creating STEP7 program					
4	Programm	ning of DB75				
	Here, two tags of length 16 bits are created. Their sum is supposed to be determined in OB1 and written to another tag of length 16 bits.					
	Furthermo	ore, two tags incremented	of length 16 bits in OB1.	are created, whose w	alues are to be	
	Tags crea WinCC pr created.	ted in data b oject. To do	lock DB75 are si so, WinCC tags	upposed to be visuali with corresponding ad	zed in the ddresses are	
	The follow	ing shows th	ne completely pro	ogrammed data block	DB75.	
	■ DB75	S7_IEH\SIM	ATIC 400(1)\CPU	416-1		
	lddress	Name	Туре	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			
	<				>	
	PLC. This Please ma operationa	ake sure that ake sure that al switch pos	g the toolbar but any loading of t itions STOP or F	ton displayed in the financial for the financial for the financial module is presented by the financial for the financia	ollowing. bossible only in	
6	Programm	ning of OB1.				
	This must	be opened b	peforehand in pro	ogram KOP/AWL/FUF	Þ.	
	Initially, tw	vo values cre	ated in DB75 are	e added and the resul	lt is again	
	saved in E	DB75.			-	
	Netzwer	<b>k 1:</b> Add:	ition			
	Adding The res 16-Bit	two 16-B sult is s Value	it Values tored in and	other		
		DPN DB	75			
			0			
		-I	2			
	Г	. DBM	4			

F: Creating STEP7 program
Next, the count of a value created in DB75 is implemented every second.
Network 2: Second Cycle
Generation of a second cycle at M 0.0
AN M 0.0
L S5T#1S
$ \begin{array}{cccc} & \mathbf{A} & \mathbf{T} & \mathbf{I} \\ & = & \mathbf{M} & 0 \cdot 0 \end{array} $
Network 3: Counting in a second cycle
Counting a value in a second cycle
At 10000, reset to 0
AN M 0.0
JC MOO1
+I
T DBW 6
L 10000
<i <<="" td=""></i>
JC M001
Next, the count of a value created in DB75 is implemented for each run of OB1. Network 4: Counting in the cycle time Counting a value each time the OB is executed At 10000, reset to 0
L DBW 8
T DBW 8
L 10000
I>
JC M002
MODZ. NOP 0
The OB1 block must be served and leaded into the DLC. This is done using
the respective toolbar button.

## G: Testing of STEP7 program

	G: Testing o	f STEP7	progr	am				
1	Testing of program using STEP7 software. A tag table is created for this. This is done in SIMATIC Manager using OR on the entry of the configured central module and Target System							
								using <sup>A</sup> R →
	P- 1 CPU 416-1							
	🗆 🔛 S7 Pro	Cut	Cut		-X			
	🔤 Sa	Copy		Ctrl+	C			
	i Bi	Paste	Paste		1+V			
				Del				
		Insert Ne PLC	Insert New Object			Сору	RAM to ROM	
		Bup-Time	a Properi	ties		CPU	Messages	
			e Propen	ues		CPU Messages Monitor/Modify Variables		
		Rename Object P	Rename F2 Object Broporties Albu Batarre			Hard	ware Diagnostics	
		Special C	)bject Pr	operties	tecum ►	Modu	le Information	Ctrl+D
	-r				Operating Mode Ctrl+I			
						Clear Soft T	'/Reset ïme of Day	
						Deci	line of Day	
2	2 An editor is displayed to create and use such a tag table.							
	In the followir	ng, the co	omplet	e tag table	is show	ın. All	tags created	l in DB75
	are entered.						and the second	
	<b>111</b> WAT_20							
	Addres	is S	ymbol	Display form	at Status	; value	Modify value	
	1 DB75.D	BW 0-		DEC	12		12	
	2 DB75.D	BW 2-		DEC	12		12	
	3 DB75.D	BW 4		DEC	24			
	4 DB75.D	BW 6		DEC	1083			
	6	- o w o		DEL	1703			
					<u>l</u>			

	G: Testing of STEP7 program				
3	Monitoring current tag values.				
	By clicking the toolbar button shown in the following, the current values of respective tags in the PLC are displayed in the Status Value column.				
	Monitor variable.				
	Controlling of tag values.				
	In the Control Value column, values may be entered. By clicking the toolbar button displayed in the following, these values are written to the corresponding tags in the PLC.				
	Please make sure that any controlling of tags is possible only in operational switch position RUN-P.				
	Modify variable				
4	The so-created tag table may now be saved.				
	In the current example, it is saved under the name VAT1. If the program function in the PLC has now been checked, the tag table may be closed. Thus, configuration of the STEP7 project is complete and SIMATIC Manager may be terminated.				
	I VAT1				

## 3.4.3 Creating WinCC Project WinCC\_S7\_IETCP

The following description shows in detail the necessary configuration steps for creating and commissioning of WinCC project S7\_IETCP.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project S7\_IETCP.

- A: Creating WinCC project
- B: Establishing connection
- C: Creating WinCC tags
- D: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project						
1	Creating a new WinCC project in WinCC Explorer.						
	It is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.						
-	WINULExplorer						
2	WinCC Explorer is opened.						
	Using menu item File → New, the dialog to specify the properties of a new WinCC project opens.						
	The following example project creates a single-user project.						
	Finish the dialog with OK.						
	WinCC Explorer						
	Create a New Project						
	Single-User Project						
	I Ser Project ○ Multi-User Project						
	C Client Project						
	Open an Existing Project						
	Cancel						

	A: Creating WinCC project	t				
3	The Create a New Project dialog opens.					
	Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_S7_IETCP.					
	Furthermore, in the Project Path field, the storage location of the new project must be set.					
	The Create a New Project dialog is closed by clicking the Create button.					
	Create a new project		? 🔀			
	Project Name: WINCC_S7_IETCP New <u>S</u> ubfolder: WINCC_S7_IETCP You can use this dialog box to create a new WinCC project.	Project Path c:\\wincc\winccprojects Eolder: [] Drive: C:	Cr <u>e</u> ate <u>C</u> ancel <u>H</u> elp			

## **B: Establishing connection**

	B: Establishing connection					
1	The new project is displayed in WinCC Explorer.					
	Installing of required communication driver. This is done by clicking ${}^{\circ}\!\!\!\!{}^{\circ}\!\!\!\!{}^{\circ}\!\!\!\!{}^{\circ}\!\!\!R$ on the Tag Management item and Add New Driver.					
	⊡∰ Tag Management È∰ Internal tag	Add New Driver				
		Find				
		Properties				
2	The Add New Driver Dialog opens.					
	It offers a selection of all communication drivers available for installation. For communication with SIMATIC S7, the SIMATIC S7 Protocol Suite driver is required. It must be selected in the dialog. Close the dialog with Open.					
	Add new driver					
	Look in: 🔁 bin		- 🖬 📩 📼			
	PDLCache		SIMATIC S5 Ethernet TF.CHN			
	OPC.chn     Profibus DP.chn		SIMATIC S5 Profibus FDL.chn			
	Profibus FMS.chn		SIMATIC S5 Serial 3964R.CHN			
	SIMATIC 505 TCPIP.c	hn Laver 4 CHN				
	E SIMATIC SS Etherhet	Layer H.Chin		iet Layer 4.Cr		
	< <u> </u>					
	File <u>n</u> ame: SIMATIC	S7 Protocol Suite.chn		<u>O</u> pen		
	Files of type: WinCC C	ommunication Driver (*.	chn) 🔽 📃	Cancel		


	B: Establishing connection
4	The property dialog of the connection opens. Enter the name of the new connection on the General tab register. It is S7_IETCP_01 in the current example. Specify connection parameters using the Properties button.
	Connection properties
	General
	Name:       S7_IETCP_01       Properties         Unit:       TCP/IP       Image: Comparison of the second
	Please make certain that the connection name does not include any national special characters or the characters §, ' or *.
	OK Cancel Help

	B: Establishing connection		
5	The Connection Parameter dialog opens. Enter the address set for the CP 443-1 TCP communication processor in the Ethernet Address field. In the current example, this is the address 140.80.0.2. Furthermore, Rack Number as well as Slot Number of the central module to be addressed must be entered. Please make sure that values for the central module and not those of the communication processor are entered here. Close the dialog with OK. The Connection Properties dialog is also closed by clicking OK.		
	Connection Parameter - TCP/IP   Connection   S7 Network Address   IP Address:   IP Address:   Ital.80.0.2   Back Number:   0   Slot Number:   3   Send/receive raw data block   Connection Resource:   02		
	OK Cancel Help		

	B: Establishing connection
6	Setting of system parameters for TCP/IP channel unit.
	This setting is made in the System Parameter dialog. This is opened using
	$\sim \square$ R on the TCP/IP and System Parameter entry.
	SIMATIC S7 PROTOCOL SUITE         Industrial Ethernet         Industrial Ethernet (II)         Industrial Et
	Properties
	On the SIMATIC S7 tab register, different settings for communication and communication monitoring may be specified. However, these do not apply to all channel units of the communication driver.  System Parameter - TCP/IP  SIMATIC S7 Unit
	Cycle management           Image: Dy PLC         Image: Dy PLC             Image: Dy PLC         Image: Dy PLC
	Lifebeat monitoring
	Monitoring of CPU-stop          Image: Activate         The channel uses cyclic read rservices in the AS.
	OK Cancel Help

	B: Establishing connection					
7	On the Unit tab register, it must be specified which access point the connection to the PLC should use.					
	The default setting is access point CP-TCPIP. Earlier, the access point CP- TCPIP was assigned to communication processor CP 1612 in the Setting PG/PC Interface program. If this access point is supposed to be set automatically, it must be checked whether or not the correct one is used, especially when using multiple communication processors. Close the dialog with OK.					
	System Parameter - TCP/IP					
	SIMATIC S7 Unit					
	Select logical device name					
	CP-Type/Bus Profile: TCP/IP					
	Logical <u>d</u> evice name: CP-TCPIP					
	✓ Set <u>a</u> utomatically					
	Job processing					
	$\Box$ <u>W</u> rite with priority					
	OK Cancel Help					

## C: Creating WinCC tags

	C: Creating WinCC	tags			
1	Creating WinCC tags required for example.				
	This is done by clicking ${}^{\frown}\!$				
	57_IETCP_0	New Group			
		New Tag			
		Find			
		Cut			
		Сору			
		Paste			
		Delete			
		Properties			

Ţā	ag properties		
	General Limits/Report	ing	
	Properties of Tags-		
	<u>N</u> ame:	S16x_S7IETCP01_01	
	Data <u>T</u> ype :	Signed 16	bit value
	Length:	2	
	<u>A</u> ddress:		Select
	Adapt <u>f</u> ormat :	ShortToSig	gnedWord 🗾
	Project-wide u	pdate	C Computer-local update
	🔲 Linear scaling		
	Process Value Range	e	Tag Value Range
	Value1		Value1
	Value2		Value2
	L		

	C: Creating WinCC ta	gs		
3	The Address Propertie	s dialog opens.		
	Enter DB as data range and the value 75 as DB No. In the Address field, set Word and set the value to 0 in the DBW field. Finish the dialog with OK. The Property dialog of the tag is also closed by clicking OK. The just created WinCC tag has been addressed to the area of DB75 where the first of the two values to be added is located.			
	Address properties		X	
	Address Description	<u></u>		
	Data DB Address Wo DBW 0	✓         DB No.         75           rd         ✓         ✓           Length         1		
		Γ <u>Q</u> u	ality Code	
		Cancel	Help	
4	Creating the remaining	required WinCC tags.		
	The procedure is analogous to Steps 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.			
Name Type Parameters				
	S16x_S7IETCP01_01	Signed 16-bit value	DB75,DW0	
	S16x_S7/ETCP01_02	Signed 16-bit value	DB75,DW2 DB75 DW4	
	S16x_S7IETCP01_04	Signed 16-bit value	DB75,DW6	
	S16x_S7IETCP01_05	Signed 16-bit value	DB75,DW8	

#### **D: Creating WinCC picture**



	D: Creating WinCC picture					
3	After placement of the I/O field on the picture, its configuration dialog opens.					
	In the Tag field, the tag S16x_S7IETCP01_01 is set using the button shown in the following.					
	Tag updates are left at 2s. The additional set options should retain their default values. Finish the dialog with OK.					
	I/O-Field Configuration					
	Tag: S16x_S7IETCP01_					
	Update 2 s					
	C Output C Input C Both					
	Format					
	Font Size 12					
	Font Name Arial					
	OK Cancel					

	D: Creating WinCC picture				
4	Changes of output format for I/O field.				
	Open its property dialog. This is done by clicking ${}^{\checkmark} BR$ on the I/O field and Properties.				
	• 0.000 • Cut Ctrl+X Pipe Copy Ctrl+C Duplicate Paste Ctrl+V Delete Del Customized object • Group object • Linking • Configuration Dialog Properties				
_					
5	On the Properties tab register, select the Output/Input entry in the left window. Using $\textcircled{D}$ on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is				
	Object Properties       I/O Field         Properties       Events         I/O Field       I/O Field         Geometry       Geometry         Colors       Output Value         Styles       Output Value         Field Type       I/O Field         Output Value       0.000000e+00 \$16x_57IETCP01_01 2 s         Data Format       Decimal         Output Format       \$99999         Apply on Full       No         Apply on Exit       No         Clear on New Input Yes       Clear on Invalid Inpu No         Hidden Input       No				
6	Creating an additional four I/O fields to display the remaining tags.				
	The procedure is analogous to Steps 2 to 5 as described.				



## 3.4.4 Diagnostics of Communication Links Using TCP/IP

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_S7\_IETCP and the SIMATIC S7 station.

Diagnostics of an example in accordance with the following description is only meaningful if the following checks listed have successfully been concluded.

- Commissioning of CP 1612 communication processor
- Generation of STEP7 project S7\_IETCP
- Testing of hardware configuration
- Testing of STEP7 program

#### A: WinCC Explorer

	A: WinCC Explorer					
1	Diagnostics of communication link in WinCC Explorer.					
	Switch the WinCC_S7_IETCP project into Runtime. This is done in WinCC					
	Activate					
	The created WinCC picture com_3_S7IETCP_01.pdl may also be switched directly from Graphics Designer into Runtime.					
2	In WinCC Explorer, using the menu Tools → Status of Driver Connections, a dialog may be opened to monitor all configured connections. However, this menu item is only active if the project is in Runtime.					
	Tools					
	Language					
	Status of Driver Connections					
	Status of Client Connections					
•						
3	The Status - Logical Connections dialog is opened.					
	connection S7_IETCP_01 exists.					
	The displayed values correspond to the status at the moment the dialog					
	was opened. By selecting the corresponding checkbox, a cyclic display update may also be achieved.					
	Status - Logical Connections					
	Tag ID     Name     Status     Tag read     Read requ     Tag written     write requ       2     S7_IETCP_01     OK     35     O     O     O					
	□ Cyclic update ( 4 ÷ × 250 ms ) Update _ Help _ Close _					

	A: WinCC Explorer					
4	<ul> <li>Another option to obtain information on the connection status in general but also on the connection status of individual tags is provided by Tag Management.</li> <li>The status of a configured connection may be obtained as a tooltip by simply moving the mouse over it.</li> </ul>					
	Name Parameters					
	S7_IETCP_01 IP,140.80.0.2,,0,3,02 Status: 0K The current process value of a certain tag, as well as its status, may be obtained as a tooltip by simply moving the mouse over it. This procedure					
	allows determination of errors of a single tag only, not of errors concerning the entire connection.					
	Name Type Parameters					
	S16x_S7IETCP01	_01 Signed 16-bit value	DB75,DW0			
Process value: 34 Quality: c0 Last Change:1/31/2005 10:23:35 AM						

## **B: Channel Diagnosis**

	B: Channel Diagnosis			
1	Diagnostics of communication lir program.	nk using the WinCC Channel	Diagnosis	
	This is started using Start $\rightarrow$ S Diagnosis.	SIMATIC $\rightarrow$ WinCC $\rightarrow$ (	Channel	
	Channel Diagnosis			
2	The WinCC Channel Diagnosis	program is opened.		
	The Channels/Connections tab register displays exact information on the status of each configured connection. The default value for display update is one second. The update cycle may be changed in the lower input field.			
	🏟 WinCC Channel Diagnosis		? 🛛	
	Channels/Connections Configuration		Always on top	
	Cyclic Update	Counters         Value           State         ready           Error Code         none           Error Count         0           Unit         TCP/IP           Device         CP-TCPIP           PDU Size         480           Request Counter         7           Response Counter         50           Own Cycles         0           AS Cycles         1           Max. AS Cycles         32           ConnectionState         ready           ForceConnectionState         up           ForceConnectionAddress         projected		
3	In case a connection problem ex Error Code line a value indicating	kists, the right window will disp g a more specific cause of the	play in the problem.	
	More detailed information on error on the Error Code entry.	or codes may be obtained by	clicking <sup>7</sup> CR	
	rthermore,			
	<ul> <li>Error 7001 - CEC_STPCHK</li> <li>Communication aborted due to</li> <li>The connection was aborted because a VMD state of the or DEFECTIVE - was deted</li> </ul>	stop check. ed by the channel he CPU - STOP, HOLD ected.		

# 3.5 Communication with SIMATIC S7 Using OPC

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on <a href="http://support.automation.siemens.com/WW/view/en/21320307">http://support.automation.siemens.com/WW/view/en/21320307</a>).

There is the option of copying the following components to hard disk:



The STEP7 project to be generated.



The WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between SIMATIC S7 and WinCC. The example uses Profibus to implement the communication link. Minor adjustments also enable communication using the Industrial Ethernet.

The S7-OPC server running inside the computer enables provision of data from the PLC to other computer applications as well as the entire network environment. The S7-OPC server communicates with the PLC using the CP 5611 communication processor.

#### Summary on Example Design



On the computer side, the network connection (Profibus) is established using a CP 5611 communication processor. Its installation on the computer requires installed SIMATIC NET software with the S7-OPC Server option package. Using the installation from SIMATIC NET, all necessary drivers are installed.

The OPC communication driver must be installed in the WinCC project. The connection to the S7-OPC server is configured using this OPC client.

The PLC is equipped with a central module CPU 414-2.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Commissioning of CP 5611 communication processor
- Generation of STEP7 project S7\_OPC
- Configuring the S7-OPC server
- Generation of WinCC project WinCC\_S7\_OPC
- Diagnostics of communication link

#### **Required software**

Name	Description	
SIMATIC NET	Installed SIMATIC NET software. Using the software, all required drivers are installed.	
	S7-OPC server for communication with OPC client of WinCC.	
STEP7	STEP7 software to create STEP7 project.	
WinCC	WinCC with OPC communication driver to create WinCC project.	

#### Required hardware on computer

Name	Description	
Communication Processor	Communication processor CP 5611 to establish connection to communication processor in PLC	

#### **Required hardware in the PLC**

Name	Description
Rack	Module rack UR1.
Power supply unit	Power supply unit PS 407 10A in slots 1 and 2.
Central module	Central module CPU 414-2 in slot 3.

#### 3.5.1 Configuring WinCC Stations

The following description contains notes to be taken into consideration during configuration of WinCC stations.

During access to an OPC server from a WinCC client station, three constellations are possible in general. These differ on where these two components are located.

- Server and client are on the same computer
- Server and client are on different computers but within the same work group
- Server and client are on different computers in the same domain, or in different domains in trust positions

The first of the above constellations is not goal-oriented for communication between a WinCC OPC server and a WinCC OPC client. This constellation, however, may very well be used in many cases, such as communication with the S7-OPC server.

In the following steps described, the local circumstances must be taken into consideration.

- A: Installing software components
- B: Organization of network
- C: Organization of user structure
- D: Setting DCOM configuration

## A: Installing software components

	A: Installing software components		
1	OPC server and OPC client of WinCC are required. The OPC servers are located on the WinCC Installation CD. The OPC client is automatically installed with WinCC.		
	The OPC server must be installed on the computer which will serve as server. This may have happened during installation of WinCC. However, it may also be installed after the fact without any problems.		
	Following installation of components on the respective computers, these computers must be rebooted.		
	Select Components		
	respectively. Components		
	WinCC 298 MB V Data Access 4 MB		
	Help     49 MB     MB     Marm & Events     2 MB     2 MB     2 MB     2 MB		
	✓ Options     45 MB     XML Data Access     0 MB		
	Description Worldwide standardized and common manufacturer software interface for process connections Available: 7408 MB		
	<u> </u>		

## **B: Organization of network**

	B: Organization of network		
1	Organization of network         Settings required for the respective computers for organizing the network are implemented in the Network program. This is started using Start →         Settings → Control Panel → System.         On the Identification tab register, the computer assignment may be made either to a work group or to a domain by using the Change button.		
	Computer Name Changes		
	You can change the name and the membership of this computer. Changes may affect access to network resources.		
	Computer name:		
	OPC_Client		
	Full computer name: OPC_Client.zip.at		
	More		
	Member of Ommain: zip. at		
	O Workgroup:		
	OK Cancel		

## C: Organization of user structure

	C: Organization of user structure
1	Defining the user on both computers.
	This is facilitated on each computer using the User Manager program. This is started using Start $\rightarrow$ Programs $\rightarrow$ Administrative Tools $\rightarrow$ Computer Management.
	If a work group is used, it must be ascertained that the user of the client station is known at the server station. Furthermore, the user of the server station must be known at the client station in order to use full functionality of OPC.
	If the domain concept is used, no attention needs to be paid to this since all users in the entire domain are known. For cross-domain access to a server station, however, a reciprocal trust position of both domains is required.

## **D: Setting DCOM configuration**

	D: Setting DCOM configuration		
1	Following installation of WinCC, the DCOM settings of the OPC server of WinCC are configured properly.		
These settings must be changed			
	if the registered user of the OPC client or server computer does not have administrator authorization		
	if the OPC server is registered under a different user account that the OPC client.		
2	Setting of DCOM configuration for WinCC-OPC server.		
	The settings for DCOM configuration are implemented using the DCOM Configuration Properties program. This can be started via Start $\rightarrow$ Run and entering the program name dcomcnfg.exe.		
	Run 🕜 🔀		
	Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.		
	Open: dcomcnfg.exe		
	OK Cancel Browse		
3	The Component Services application opens.		
	Select under Component Services $\rightarrow$ Station $\rightarrow$ DCOM Configuration the OPCServer.WinCC entry.		
	For the WinCC-OPC-HDA server, the OPCHDAServers.WinCC entry must be used. For the WinCC-OPC A&E server, the OPCServerAE.WinCC entry must be used.		
	In the pop-up menu of OPCServer.WinCC, select the Properties entry.		
	⊕-     �     OPCServer,WinCC		
	View  New Window from Here		
	Properties		
	Help		

	Di Sotting DCOM configuration		
4	LUCK on the Security tab register. In the Access Permissions area, ma Customize option. Click the Edit button.		
	The Properties of OPCServer.WinCC dialog is displayed.		
	OPCServer. WINCC Properties		
	General Location Security Endpoints Identity		
	- Launch and Activation Permissions		
	C <u>U</u> se Default		
	Customize     Edit.		
	Customize Edit		
	Configuration Permissions		
	C Use Defa <u>u</u> lt		
	Customize		
	OK Cancel Apply		

	D: Setting DCOM configuration		
5	The Access Permission dialog opens.		
	Add users Administrators, Interactive, Everyone, Network and System with Allow authorization. Close the dialog by clicking OK.		
	For the configuration phase, it may be useful to grant everyone access permissions to avoid problems beforehand due to insufficient access rig After successful commissioning of communication, any desired restriction on access authorizations for certain users may be easily configured.		
	Access Permission		
	Security Group or user names: Everyone INTERACTIVE NETWORK NETWORK SERVICE		
	Add <u>R</u> emove		
	Permissions for Everyone Allow Deny		
	Local Access  Remote Access		
	OK Cancel		

	D: Setting DCOM configuration
6	In the Launch Permission area, mark the Customize option. Click the Edit button. The Launch Permission dialog opens.
	Add users Everyone and Network with Allow Authorization. Close the dialog by clicking OK.
	Launch Permission
	Security
	Group or user names:
	METWORK
	SI NETWORK SERVICE
	Add Berrove
	Permissions for Everyone Allow Deny
	Local Launch 🗹 🗌
	Remote Launch
	Local Activation
	OK Cancel
7	Close the dialog by clicking OK.

## 3.5.2 Commissioning of Communication Processor CP 5611

The following description shows detailed configuration steps necessary for successful commissioning of the CP 5611 communication processor. It is assumed that the communication processor was previously installed.

#### **Summary of Configuration Steps**

The following is a summary list of all necessary configuration steps for implementing the communication processor CP 5611.

- A: Configuration of communication processor
- B: Assigning communication processor
- C: Testing of communication processor

#### A: Configuration of communication processor



	A: Configuration of c	communication p	rocessor
3	In the General menu, the Mode. This change lead in the example, the indichanges are saved us confirmed by clicking (	the operation mode ads to a display of dex is set to 1 and ing the Apply butto OK.	e of the module is set to Configured the Index and Module Name fields. the module name to CP 5611. The on. The displayed note may be
Station Console			
	Eile Action View Help ← → € 💀 😢		
	PC Station	General Module properties	
	SIMATIC NET Configuration Applications Modules CP5611 General	Type of module:	PROFIBUS
		Mode of the module:	Configured mode
			Index: 2
	Address	Interface profile for:	Name of the module:
	Pus Network Diagnos	ICP5611(MPI)	
	CP simulation	CP5611(PROFIBUS) < Active CP5611(Auto)	»
		Module reaction:	
		Apply Cance	el Help

#### **B:** Assigning communication processor



## C: Testing of communication processor

	C: resting of commu	nication processor	
1	Testing the proper installation of the CP 5611 communication processor using the "Setting PC Station" program.		
	In order to perform network diagnostics, the Network Diagnostics folder must be selected in the respective module. In our case it is module CP 5611.		
	On the right side, the Network Diagnostics PROFIBUS Parameter window is displayed. Here you may check station address and bus parameters.		
	🖧 Configuration Console		
	<u>File Action View H</u> elp		
	PC Station Applications Applications Modules CP5611 CP5612 CP5611 CP5612 CP562 CP57 CP	Network Diagnostics         Operating state/network diagnostics         Station address:       3         Bus parameters:         Bus parameters:         Bus parameters:         Bud rate:         1.5 Mbps         Highest station address (HSA):         126         Min. station delay responder (Min Tsdr):         11 tBit         Max. station delay responder (Max Tsdr):         150 tBit         Setup time for modulator (Tqui):         01 tBit         Guiet time for modulator (Tqui):         01 Bit         Slot time (ISlot):         300 tBit         Gap update factor:         10         Retruimite:         1         Version:         Siemens AG, SOFTNET PB, HW:ASPC2 STEP D , SW:V 6.2.620.3112 Oct	
	< · · · >		



## 3.5.3 Creating STEP7 Project S7\_OPC

The following description shows in detail the necessary configuration steps for creating and commissioning of STEP7 project S7\_OPC.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the STEP7 project S7\_OPC.

- A: Installation of hardware
- B: Creating STEP7 project
- C: Configuring hardware for SIMATIC PC station
- D: Loading hardware configuration for SIMATIC PC station
- E: Configuring hardware for SIMATIC 400
- F: Loading hardware configuration for SIMATIC 400
- G: Testing of hardware configuration
- H: Creating STEP7 program
- I: Testing of STEP7 program

#### A: Installation of hardware

	A: Installation of hardware				
1	Assemble the used modules on the module racks.				
	In the current example, these are one power supply unit PS 407 10A and one central module CPU 414-2.				
	Establish the connection between programming device and programming interface of the central module.				
	Establish the connection between the computer's communication processor CP 5611 to CP443-2 in the PLC.				

## B: Creating STEP7 project

	B: Creating STEP7 project								
1	Creating a new STEP7 project in SIMATIC Manager.								
	This is started using Start $ ightarrow$ SIMATIC $ ightarrow$ SIMATIC Manager.								
	<b>~</b>								
	SIMATIC Manager								
2	The SIMATIC Manager opens.								
	Using menu item File $\rightarrow$ New, the dialog to specify parameters of a new STEP7 project opens.								
	Enter the name of the newly created project in the Name field. Names of STEP7 projects created as part of this manual must start with the character sequence S7. Furthermore, they contain a description of the communication type used. The current example has the name S7_OPC.								
	FILES\SIEMENS\STEP7\S7proj. However, this may be changed at any								
	time by clicking the Browse button.								
	The New dialog is closed by clicking the OK button								
	New Project 🔀								
	User projects Libraries Multiprojects								
	Name Storage path								
	<								
	Add to current multiproject								
	Na <u>m</u> e: <u>I</u> ype:								
	S7_OPC Project								
	Storage location (path):								
	C:\Program Files\Siemens\SIMATIC.NCM\s7proj <u>B</u> rowse								
	Cancel Help								

## C: Configuring hardware for SIMATIC PC station

	C: Configuring bardware for SIMATIC PC station									
1	The new project is displayed in SIMATIC Manager.									
	Hardware must be configured for it. Three components are needed. These									
	Furthermore, for their network links, one Profibus is required									
	These components are obtained in SIMATIC Manager using UR on the									
	name of project S7_OPC and Insert New Project  SIMATIC 400									
	Object - Industrial Ethernet									
		Cut	Ctrl+X							
		Сору	Ctrl+C							
		Paste	Ctrl+V							
		Delete	Del							
		Incart News	Object		SIMATIC 400 Station	1				
		PLC	Object	, F	SIMATIC 300 Station					
					SIMATIC H Station					
		Object Prop	FZ ortioc ≬lt⊥Dot	1.110	SIMATIC PC Station					
		овјессттор	erdesin Alerike	am	Other station					
					SIMATIC S5					
					MPI					
					PROFIBUS					
					Industrial Ethernet PTP					
					S7 Program M7 Program					
					M7 Program	]				
2	The two components just added are displayed in the right window of									
	SIMATIC N	/lanager.								
	SIMATIC 40	O(1) 🛕 SIMATI	C PC Station(1)		Here MPI(1) Here PR	OFIBUS(1)				
	Using Don component SIMATIC PC Station(1) in the right window will									
	display the	Hardware ite	em. Using 🖓 🗗	D on tl	ne Hardware item or 7	R and				
	Open Object on it will start the HWConfig program.									
	Mu Hardware									
		Open Objec	t Ctri+Ait+O							
		Cut	Ctrl+X							
		Copy	Ctrl+C							
		rdste								
		Delete	Del							
		Rename	F2	J						




	C: Configuring hardware for SIMATIC PC station					
7	After inserting CP 5611, the property dialog of the Profibus interface for CP 5611 opens.					
	Use the Parameter tab register in the address field to set the desired Profibus address of the communication processor.					
	Use the lower selection field Subnet to assign the entry PROFIBUS(1) to the communication processor. Close the dialog with OK.					
	Properties - PROFIBUS interface CP 5511 (R0/S2)					
	General Parameters					
	Address: 3					
	Transmission rate: 1.5 Mbps					
	<u>S</u> ubnet:					
	not networked PROFIBUS(1) 1.5 Mbps	<u>N</u> ew				
		Properties				
	Dejete					
	Ca	ncel Help				



## D: Loading hardware configuration for SIMATIC PC station

	D: Loading hardware configuration for SIMATIC PC station				
1	The hardware configuration created in the HWConfig program must be transferred to the PC station.				
	Loading of the hardware configuration uses the toolbar button of the HWConfig program shown in the following.				
	Download to Module				
2	A dialog opens which allows selection of components to be loaded.				
	In the current example, all selectable components must be marked. Close the dialog with OK.				
	Select Target Module				
	Target Modules:				
	Module Index				
	CP 5511 1				
	Station Manager 125				
	Select <u>All</u>				
	OK Cancel Help				

D: Loading hardware configuration for SIMATIC PC station						
The Select Node Address dialog opens.						
On the configuration side (STEP7), the station manager represents the configuration of the entire SIMATIC PC station.						
Close the dialog with OK.						
Select node address						
Over which station address is the programming device connected to the module Station Manager?						
<u>B</u> ack: 0 🚍						
<u>S</u> lot: 125						
Target Station: I Local						
Can be reached by means or gareway						
Enter connection to target station:						
125 Stationma						
Accessible Nodes						
<u>View</u>						
OK Cancel Help						



## E: Configuring hardware for SIMATIC 400

	E: Configu	iring hardwa	re for SIMAT	C 400
1	Using Using the Hardware	) on compone are item. Usir t will start the	ent SIMATIC 4 ng <sup>7</sup> OD on the HWConfig pro	00(1) in the right window will display Hardware item or <sup>7</sup>
		Open Object	: Ctrl+Alt+O	
		Cut Copy Paste	Ctrl+X Ctrl+C Ctrl+V	
		Delete	Del	
		Rename	F2	
2	The HWCo It is used to its propertie	nfig program o exactly speces.	opens. cify the hardwa	re used in the PLC, and to configure
3	Using the s program, th hardware c	subsequently ne hardware o components.	displayed butt catalog opens.	on in the toolbar of HWConfig This is used to select the required



	E: Configuring hardware for SIMATIC 400					
6	Arrangement of add Drag&Drop for the respective slots in t	ditional hardware components in n desired components from the harc he module rack.	nodule rack. This uses lware catalog in their			
	The example uses 1. A power supply u	a power supply unit PS 407 10A. <sup>-</sup> unit of this type uses two slots.	This is inserted in slot			
	The example uses 3. If the module is i	a CPU 414-2 as central module. T nserted into the module rack, its P	his is inserted in slot roperty dialog opens.			
7	The Property dialog	og of the Profibus interface of CPU 414-2 opens.				
	Use the Parameter tab register in the address field to set the desired Profibus address of the central module. In creating the data base file for communication processor CP 1413 in the computer, this address is one of the parameters to be set.					
	Use the lower select the central module. Profibus is called.	ction field Subnet to assign the ent Using the Properties button, the F Both dialogs are closed with OK.	ry PROFIBUS(1) to Properties dialog of			
	Properties - PROFIB	US interface DP (R0/S3.1)	$\mathbf{X}$			
	General Parameters	]				
	Address:	4 💌 If a subnet is sele	cted,			
	the next available address is suggested. Highest address: 126					
	Transmission rate: 1.5	МБрз				
	Subnet:					
	not networked PROFIBUS(1)	1.5 Mbps	New			
	Properties - PROFIE	US	Properties			
	General Network Se	ettings				
	Name:					
	S7 subnet ID:	0061 - 0002				
	Project path:	S7_OPC				
	Storage location of the project:	C:\Program Files\Siemens\SIMATIC.NCM\s7pr	oj\S7_OPC			
	Author:					
	Date created:	01.02.2005 13:36:29				
	Last modified:	01.02.2005 13:39:51				
	Comment.		<u> </u>			
	ОК		Cancel Help			

	E: Configuring hardware for SIMATIC 400				
8	In the following, the fully configured hardware design of the example is shown.				
	(0) UR1				
	1 📱 PS 407 10A				
	3         CPU 414-2 DP           X2         DP   PROFIBUS(1): DP master system (1)				
	X1 MPI/DP 4				
9	Settings made in the HWConfig program must be saved. This is done using the toolbar button displayed in the following.				
	Save and Compile				

## F: Loading hardware configuration for SIMATIC 400

	F: Loading hardware configuration for SIMATIC 400					
1	Loading of the hardware configuration uses the toolbar button of the HWConfig program shown in the following.					
2	A dialog opens which allows selection of components to be loaded. In the current example, all selectable components must be marked. Close the dialog with OK. Select Target Module Target Modules: Module Racks Slot CPU 414-2 DP 0 3					
	OK <u>Cancel</u> Help					

	F: Loading	hardware configu	uration for S		400	
3	The Select N	Node Address dial	og opens.			
	Close the dia	alog with OK.				
	Select node address					
	Over which st	ation address is the prog	ramming device o	connected to	o the module (	CPU 414-2 DP?
	Back:     Image: Slot:       Slot:     Image: Slot:					
	Target Station	Can be reac	hed by means of	gateway		
		Connection to target sta	tion		1st gatewa	у
	Туре	Address	S7 subnet ID	Туре	Address	
	PROFIBUS	2	0061-0002	Local	1	
	(OK	]			Cancel	Help
4	Configuratio have to be p	n data are now tra out into the STOP s	insferred to tl status.	he PLC. I	ndividual	modules may
	The HWCon	ifig program may b	e terminated	I.		
	Components 400(1).	s newly added are	displayed in	SIMATIC	C Manager	r for SIMATIC
+00(1).         SIMATIC 400(1)						

## G: Testing of hardware configuration

	G: Testing of hardware configuration			
1	Testing of hardware configuration decision			
	If the key switch of the central module is put into RUN or RUN-P position, and the operational switch of the communication processor is put into RUN position, only status LEDs indicating the RUN state should be lit.			
	If this is not the case, an error has occurred. This error may be determined using the steps described in the following. However, these step should also be implemented even if no error is indicated by the status LEDs. This will allow recognition of non-critical errors and faulty configurations.			

G: Testing of ha	rdware configurat	ion			
Testing of configu	uration in central mo	odule.			
This uses the Module Information dialog in SIMATIC Manager. This dialog					
is opened using $\mathcal{A}$ on the entry of the central module in the left window					
and Target Syste	and Target System   Module Information.				
The General tab	register displays va	rious general data of the central			
module. The Stat	us field will display	the current Module Information as w			
as existing errors	, if any.				
The Diagnostic B	uffer tab register di	splay detailed information on existing			
errors and their c	orrection.				
The dialog is clos	ed by clicking the C	Close button.			
Module Informa	tion - CPU 414-2 DP				
Path: S7_OPC\SIMA	TIC 400(1)\CPU 414-2 DP	Operating mode of the CPU: 🚸 RUN			
Status: OK	1	Not a force job			
General	Diagnostic Buffer	Lommunication Stacks     Memory Scan Cycle Time			
·					
Description:	CPU 414-2 DP	System Identification: SIMATIC 400			
<u>∨</u> ersion:	Order No./ Description	Component Version			
	6ES7 414-2×G03-0AB0	Hardware 4			
	J				
Rack:	0	Address:			
Slot:	3				
<u>S</u> tatus:	Module available and o.k.				
	1	1			
Close <u>L</u>	Ipdate <u>P</u> rint	Help			

	G: Testing of hardware configuration					
3	Testing of com	munication processo	or configuration.			
	This uses the Module Information dialog in SIMATIC Manager. This dialo					
is opened using $\sqrt[6]{CR}$ on the entry of the communication processor						
	on.					
	The General ta	b register displays v	arious general data	of the module.		
	Module Inform	nation - CP 5611				
	PU: ① RUN odule: ① RUN					
	Description:	CP 5611	System Identification: SIMATIC 400			
	<u>V</u> ersion:	Order No. / Description	Component	Version		
		6GK1 561-1AA00	Hardware	0		
			Filliwale	V 0.1.0		
	Rack:	1	Address;			
	Slot					
	<u>S</u> tatus:			<u>^</u>		
	Close	Update Print	Spe <u>c</u> ial Diagnostics	Help		

## H: Creating STEP7 program

	H: Creating STEP7 program						
1	Creating STEP7 program						
	For the current example project, only one operations block, OB1, and one data block are needed. OB1 is available by default. The needed data block						
	must first be created. This is done in SIMATIC Manager using $\mathcal{T}$ Blocks subitem of entry S7 program(1) of the configured central m and Insert New Object $\rightarrow$ Data Block.						
	The property dialog of the data block opens. Enter DB75 as the nam the block and close the dialog by clicking OK.						
	⊡ 🚺 CPU 416-1 ⊡ 🛐 S7 Proj	gram(1) urces					
		Cut	Ctrl+X				
		Paste	Ctrl+V				
		Insert New Object	Organization Block				
		PLC	۲	Function Block			
		Rewiring		Function			
		Compare Blocks		Data Block			
		Reference Data	•	Data Type			
		Check Block Consistency		Variable Table			
		Print	•				
		Rename	F2				
		Object Properties	Alt+Return				
		Special Object Properties	•	J			

	H: Creating STEP7 program					
2	The newly created data block DB75 is displayed in the right window of the project.					
	Using <sup>7</sup> D on it or using <sup>7</sup> R and Ope may be programmed. The program KOF	n Object, the contents of the block P/AWL/FUP is started.				
	Open Object Ctrl+Alt+O					
	Cut         Ctrl+X           Copy         Ctrl+C           Paste         Ctrl+V					
	Delete Del					
	Insert New Object PLC	•				
	Compare Blocks Reference Data	•				
	Print	•				
	Rename F2 Object Properties Alt+Return Special Object Properties	•				
3	The program KOP/AWL/FUP opens. The New Data Block dialog appears and OK.	I must be acknowledged by clicking				

	H: Creatin	ig STEP7 progr	am							
4	Programm	ing of DB75.								
	Here, two tags of length 16 bits are created. Their sum is supposed to be determined in OB1 and written to another tag of length 16 bits.									
	Furthermore, two tags of length 16 bits are created, whose values are to be cyclically incremented in OB1.									
	The following shows the completely programmed data block DB75.									
	🖶 DB75 -	- S7_IEH\SIMATIC	: 400	D(1)\CPU	416-1					
	lddress	Name	Тур	e		Initial va	lue Comment			
	0.0		STR	UCT						
	+0.0	Var_01	WOR	Ð		W#16#0	Value 1			
	+2.0	Var_02	WOR	D		W#16#0	Value 2			
	+4.0	Var_03	WOR	Ð		W#16#0	Summ			
	+6.0	Var_04	WOR	Ð		W#16#0	Inc 1			
	+8.0	Var_05	WOR	D		W#16#0	Inc 2			
	=10.0		END	_STRUCT						
	<	]					>			
0	Manager u Properties	ymbolic name m Ising UR on th menu item. DPC IMATIC 400(1) CPU 414-2 DP	e da	ta block	d. This and so ame m data	s is done in election of t Sym	SIMATIC he Object bolic name			
	Erregram(3) Erregram(3) Erregram(3) Erregram(3) Erregram(3) Erregram(3)			DB75	Оре	n Object	Ctrl+Alt+O			
					Cut	~	Ctrl+X			
					Pas	te	Ctrl+V			
	⊨ <u>≙</u> 9	MATIC PC Station(	1)		Dele	ete	Del			
					Inse PLC	ert New Object	: +			
					Com	npare Blocks erence Data				
					Prin	t	•			
					Ren	ame	F2			
					Obj	ect Properties.	Alt+Return			
					Spe	cial Object Pro	perties 🕨 🕨			

	H: Creating STEP7 p	orogram					
6	The Properties - Data issued here, and the	Block dialog opens. A symb dialog must be closed therea	olic name must be fter by clicking OK.				
	Properties - Data Block						
	General - Part 1 General	- Part 2 Calls Attributes					
	Name:	DB75					
	<u>S</u> ymbolic Name:	DB75					
	Symbol <u>C</u> omment:						
	Created in Language: Project Path:	DB S7_OPC\SIMATIC 400(1)\CPU 414-2 Program(3)\Block s\DB75	DP\S7				
	Storage location of project:	C:\Program Files\Siemens\SIMATIC.N	NCM\s7proj\S7_OPC				
	Date created:	Code Ir	nterface				
	Last modified:	01/02/2005 4:58:32 PM 0	1/02/2005 4:58:32 PM				
	C <u>o</u> mment:						
		J	<u>×</u>				
	OK		Cancel Help				
7	PLC. This is done usi Please make sure that operational switch por	ng the toolbar button displayed at any loading of the central n sitions STOP or RUN-P.	st be loaded into the ed in the following. nodule is possible only in				
8	Programming of OB1						
	This must be opened	beforehand in program KOP	/AWL/FUP.				
	Initially, two values cr saved in DB75.	eated in DB75 are added and	d the result is again				
	Netzwerk 1: Add	dition					
	Adding two 16- The result is 16-Bit Value	Bit Values stored in another					
	OPN DB L DBI L DBI +I T DBI	75 v 0 v 2 v 4					

H: Cr	eating ST	EP7 progra	m	
Novt	the count		rootod	in DR75 is implemented even second
INEXI,			realeu	i in DB75 is implemented every second.
Net	work 2:	Second	Cycle	Э
Gen	eration	of a se	cond	cycle at M 0.0
	AN	М	0.0	
	L	S5T#1S		
	SD	Т	1	
	A =	т м	1 0 0	
	_	11	0.0	
Netu	work 3	Countin	g in	a second cycle
Cou: At	nting a 10000. y	value i reset to	na: n	second cycle
110	10000, 1		·	
	AN	M N 0 0 1	0.0	
	ас т.	NDUT DBM	6	
	L	1	0	
	+I			
	Т	DBW	6	
	L	10000		
	<i TC</i 	M001		
	JC T.	NOOT		
	T	DBW	6	
моо:	1: NOP	0		
Next, OB1. Net	the count work 4 :	of a value o Countin	reated	I in DB75 is implemented for each run of the cycle time
Cou At	nting a 10000,	value e reset to	each 0	time the OB is executed
	L	DBW	8	
	Ц + Т	T		
	T	DBW	8	
	L	10000		
	<1			
	JC	M002		
	L m	U שפת	8	
мол	2: NOP	0 D	U	
The C the re	OB1 block r espective to	must be sav polbar butto	/ed an/ n.	d loaded into the PLC. This is done using
Thus,	, the STEP	7 project is	compl	ete and ready to run. The KOP/AWL/FUP
progr	am may be	terminated		-

## I: Testing of STEP7 program

	I: Testing of	STEP7	' progra	am				
1	Testing of pro	ogram ι	using ST	TEP7 softwa	re.			
	A tag table is created for this. This is done in SIMATIC Manager us on the entry of the configured central module and Target System Monitor / Modify Tag.							
	Error S7 Pro Error S7 Pro Error S6 Error Ble	Cut Copy Paste Delete		Ctrl+X Ctrl+C Ctrl+V <b>Del</b>				
		Insert	New Objec	:t	• I	_		
		PLC			-	Сору	RAM to ROM	
		Run-T	ime Proper	ties		CPU N	Aessages	
		Renan	ne	F2	_	Monitor/Modify Variables		
		Objeci Specia	t Properties Il Object Pr	s Alt+Ret operties	urn	Hardv Modu Opera Clear, Set Ti	vare Diagnostics le Information ating Mode /Reset me of Day	Ctrl+D Ctrl+I
2	An editor is d In the followir are entered.	isplaye ng, the	d to cre complet	ate and use te tag table is	such a s show	tag t n. All	able. tags created	l in DB75
	<b>VAT_20</b>				)			
	Addres	is	Symbol	Display formal	: Status	value	Modify value	
	1 DB75.D	BW 0		DEC	12		12	
	2 DB75.D	BW 2		DEC	12		12	
	3 DB75.D	BW 4		DEC	24			
	4 DB75.D	BW 6		DEC	1083			
	5 DB75.D	IRM 8		DEC	1703			
					<u></u>			

	I: Testing of STEP7 program
3	Monitoring current tag values.
	By clicking the toolbar button shown in the following, the current values of respective tags in the PLC are displayed in the Status Value column.
	Monitor variable.
ļ	Controlling of tag values.
	In the Control Value column, values may be entered. By clicking the toolbar button displayed in the following, these values are written to the corresponding tags in the PLC.
	Please make sure that any controlling of tags is possible only in operational switch position RUN-P.
	Modify variable
4	The so-created tag table may now be saved.
	In the current example, it is saved under the name VAT1. If the program function in the PLC has now been checked, the tag table may be closed. Thus, configuration of the STEP7 project is complete and SIMATIC Manager may be terminated.
	I VAT1

## 3.5.4 Configuring S7-OPC Server

The following description shows in detail the necessary configuration steps for configuring the S7-OPC server.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the STEP7 project S7OPC.

- A: Establishing a connection
- B: Testing the S7-OPC server

#### A: Establishing a connection



	A: Establishing a connection	
3	The Insert New Connection Dialog opens.	
	This dialog displays all configured Profibus participants. The CPU is selecte in our example. In the Connection - Type field, select S7 Connection.	d
	Close the dialog with OK.	
	Insert New Connection	
	Connection Partner	
	<ul> <li>In the current project</li> <li>ST_OPC</li> <li>SIMATIC 400(1)</li> <li>CPU 414-2 DP</li> <li>(Unspecified)</li> <li>All broadcast stations</li> <li>All multicast stations</li> <li>In unknown project</li> </ul>	
	Project: S7_OPC	
	Module:         CPU 414-2 DP	
	Connection          Image: S7 connection         Image: Display properties before inserting	
	OK <u>Apply</u> Cancel Help	

	A: Establishing	a connection					
4	The Properties - proper partners on the part of th Close the dialog	<ul> <li>S7 Connection dialog have been entered an e OPC server.</li> <li>with OK.</li> </ul>	l oper d if ai	ns. It must n active co	be checke nnection i	ed if the s establish	ed
	Properties - S7 co	nnection				D	<
	General OPC Conn	ection Parameters Status Informa	ition				
	- Local Connection	End Point	Con	nection identifica	ation		
	Eixed configur	ed dynamic connection	Loca	al ID: connection_1			
	Establish an a	ctive connection	VFD	Name:			
	<u>S</u> end operatin	g mode messages	OPC	CServer			
	- Connection Path-	Lo <u>c</u> al		Partner			
	End Point:	SIMATIC PC Station(1)/ OPC Server		SIMATIC 400 CPU 414-2 D	(1)/ P		
	Int <u>e</u> rface:	CP 5511	•	CPU 414-2 DI	P, DP(R0/S3)	•	
	Subnet:	PROFIBUS(1) [PROFIBUS]		PROFIBUS(1)	) [PROFIBUS]		
	Address:	3		2			
					Add <u>r</u> ess	Details	
	OK				Cancel	Help	
5	In order to chec	k the correct connection	on cor	nfiguration	. select the	e OPC serv	/er
-	in the NetPro pr	ogram using <sup>4</sup> R. In	the a	opearing m	nenu, the o	connection	-
	partner is select	ed by Highlight $\rightarrow$ (	Conne	ection Part	ner.		
	SIMA	TIC PC Station(1)					
		C Se					
		Insert New Connection	Ctrl+	-N			
	3	Highlight		•	Connection	n Partner	
		Download		+ [			
		Rearrange					
		Object Properties	Alt+I	Return			



## B: Testing the S7-OPC server

	B: Testing the S7-OPC server					
1	Testing the S7-OPC server using the OPC Scout program.					
	This is started using Start $ ightarrow$ SIMATIC $ ightarrow$ SIMATIC NET $ ightarrow$					
	PROFIBUS $\rightarrow$ SOFTNET PROFIBUS $\rightarrow$ OPC Scout.					
	OPC Scout					
2	The OPC Scout program opens.					
	In the left window all available OPC servers are listed. Among others, the list of local servers contains the entry for the S7-OPC server. This is the					
	entry OPC.SimaticNET. Using <sup>1</sup> OD on the OPC.SimaticNET entry, a connection to the S7-OPC server is established.					
	Erver(s) Coal Server(s) DCC.SimaticNET ⊕ ∰ Remote Server(s)					
3	The Add Group dialog is displayed.					
	Using it, a new group may be created in the S7-OPC server. Such a group					
	facilitates the data exchange between OPC server and OPC client. The					
	is set to 2000 ms. The group is created by clicking OK.					
	Add Group					
	Enter a 'Group Name':					
	S7_OPC_Test-group					
	Create new group active					
	Requested update rate in ms					
	DExtended OK Cancel Apply					
4	The new group is displayed as a subitem of the S7-OPC server in the left					
	window. However, it is empty at this point. For this group, the data must now be specified which are to be requested from the OPC server. The data					
	made available by the OPC server are referred to as items.					
	Using <sup>1</sup> D on the Group entry in the left window, the required items are					
	now specified.					



	B: Testing the S7-OPC server					
6	The Define New Item dialog opens.					
	Using it, a new item may be created. In the current example, the first item to be created corresponds to the first of five tags created during the creation of the STEP7 program in DB75.					
	corresponds to a signed 16-bit value. In the Address	s field	the byte	number		
	0 is entered. This corresponds to the tag's byte num	nber in t	the data	block. In		
	the Number of Values field, a 1 is entered. Close the	e dialog	g with Oł	Κ.		
	🔯 Define new item					
	OBJECTTYPE S7					
	<u>D</u> atatype <u>A</u> ddress Bjt Nr. Va	alue cour	nt			
	INT 🔽 0 1					
	0	1				
	8	το 5				
	Item Alias:					
	,					
	OK Cancel	App	0			
		POLICE	X.			
7	The middle column will now display the newly define	ed item				
	For the remaining four tags of DB75, analog to the p	oreviou	sly desc	ribed		
	procedure, items must be defined. However, the res	spective	e byte nu	imber of		
	these tags must be used.					
	In order to insert the just defined items into the grou	p, thes	e must b	)e are		
	inserted into the group by clicking OK.		s. They a			
	Name					
	○ DB75,INT000,1 ○ DB75,INT000,1					
	○ DB75,INT002,1 ○ DB75,INT004.1					
	○ DB75,INT006,1					
	O DB75,INT008,1					
8	The just inserted items are listed in the right window	, of the	OPC Sc	out		
0	program.		51 5 00	Jour		
	In the Value column, the current tag values are disp	layed.				
	The OPC Scout program may now be terminated. H	loweve	r, there i	s also		
	the option of saving the just created project.					
	Item Names	Value	Format	Туре		
	1 [S7:S7_Connection_01/FD1/CP_H1_1:]DB75,INT000,1	0	Original	integer 16		
	2 [S7:S7_Connection_01/VFD1/CP_H1_1:]DB75,INT002,1	12	Original	integer 16		
	3 [S7:S7_Connection_01/FD1/CP_H1_1:]DB75,INT004,1	12	Original	integer 16		
	4 [S7:S7_Connection_01/VFD1/CP_H1_1:]DB75.INT006,1 5 [S7:S7_Connection_01/VED1/CP_H1_1:]DB75.INT006,1	7230	Uriginal Original	integer 16		
		1310	onginal	integer 16		

# 3.5.5 Creating WinCC Project WinCC\_S7\_OPC

The following description shows in detail the necessary configuration steps for creating and commissioning of WinCC project S7\_OPC.

### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project S7\_OPC.

- A: Installing OPC server
- B: Creating WinCC project
- C: Establishing connection
- D: Conventional configuration
- E: Creating WinCC picture

## A: Installing OPC server

	A: Installing OPC ser	ver			
1	During the installation of same time as an option same time, it can be in	of WinCC, th n. If the OPC stalled after	ne ( C se the	OPC server may be insta erver has not been install a fact without any probler	lled at the ed at the ns.
	Select Components				
	Activate or deactivate the respectively. Components	components w	hich	should be installed or deinstalled	ł,
	WinCC	298 MB	^	Data Access	4 MB
	🗸 Help	49 MB		Alarm & Events	2 MB
	Communication	4 MB		Historical Data Access	2 MB
	OPC Server	10 MB		<ul> <li>HDA Write Access</li> </ul>	2 MB
	Options	45 MB	~	XML Data Access	0 MB
	Description Worldwide standardized software interface for pr	and common ma ocess connectio	inuf ins	acturer Available: < <u>B</u> ack <u>N</u> ext >	7408 MB Cancel

## **B: Creating WinCC project**

	B: Creating WinCC project
1	Creating a new WinCC project in WinCC Explorer.
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center 6.0.
	WinCCExplorer
2	WinCC Explorer is opened.
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.
	The following example project creates a single-user project.
	Finish the dialog with OK.
	WinCC Explorer
	Create a New Project
	Single-User Project
	률 <mark>ዿ</mark> ◯ Multi-User Project
	C Client Project
	C Open an Existing Project
	Cancel

B: Creating WinCC project				
The Create a New Project dialog opens. Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_S7_OPC. Furthermore, in the Project Path field, the storage location of the new project must be set.				
The Create a New Project dia Create a new project Project Name: WINCC_S7_OPC New Subfolder: WINCC_S7_OPC You can use this dialog box to create a new WinCC project.	Project Path c:\\wincc\winccprojects Folder: [] Drive: C:	Create button.		
	B: Creating WinCC project The Create a New Project dia Enter a project name for the r of this manual begin with a ch contain a description of comm type used. The current examp Furthermore, in the Project Pa project must be set. The Create a New Project dia Create a new project Project Name: WINCC_S7_OPC New Subfolder: WINCC_S7_OPC You can use this dialog box to create a new WinCC project.	B: Creating WinCC project The Create a New Project dialog opens. Enter a project name for the new project. WinCC projects of this manual begin with a character sequence of WinCC, contain a description of communication partners, as well a type used. The current example has the name WinCC_S7 Furthermore, in the Project Path field, the storage location project must be set. The Create a New Project dialog is closed by clicking the of Create a new project Project Name: WINCC_S7_OPC New <u>Subfolder</u> : WINCC_S7_OPC You can use this dialog box to create a new WinCC project. Drive: Create a new WinCC		

## C: Establishing connection

	C: Establishing connection			
1	The new project is displayed in WinCC Explorer.			
	Installing of required communication driver. This is done using ${}^{\circ}\overline{\mathbb{C}}\mathbb{R}$ on the Tag Management item and Add New Driver.			
	Find			
	Properties			
2	The Add New Driver Dialog opens.			
	It offers a selection of all communication drivers available for installation. In the current example, the OPC communication driver is required. It must be selected in the dialog. Close the dialog with Open.			
	Add new driver			
	Look in: 🗀 bin 💽 🖛 🗈 📸 🎫			
	DLCache			
	OPC.chn     Im SIMATIC S5 Profibus FDL.chn     Im Profibus DP.chn     Im SIMATIC S5 Programmers Port 4			
	Profibus FMS.chn     SIMATIC 55 Serial 3964R.CHN			
	SIMATIC 505 TCPIP.chn     SIMATIC 57 Protocol Suite.chn     SIMATIC 55 Etherpet Laver 4 CHN     SIMATIC 11 Etherpet Laver 4 CHN			
	File <u>n</u> ame: OPC.chn <u>Open</u>			
	Files of type: WinCC Communication Driver (*.chn)  Cancel			
3	The newly added OPC communication driver is displayed as a subitem of			
	The OPC communication driver receives a channel unit.			
	Establishing a connection to a certain OPC server, as well as selection of			
	items required from this server, may be facilitated using the OPC Item			
	Manager. This is started using UR over the entry for OPC Groups (OPCHN Unit #1) channel unit and System Parameters.			
	OPC Groups (OPCHILLOB #1)			
	System Parameter			
	Find			
	Properties			
	Propercies			

	C: Establishing connection		
4	The OPC Item Manager opens. Here the desired OPC server may be selected. It may be located on the local computer or on another computer accessible through a network connection. In the current example, the desired OPC server is located on the local computer. Using $\overset{\frown}{}$ D at the LOCAL item, all OPC servers available on the local computer are listed. Select the entry for OPC.SIMATICNET of the S7-OPC server.		
	items made available by the S7-OPC server.         OPC Item Manager         Ele View Options Help         Microsoft Terminal Services         Microsoft Vindows Network         Web Client Network         Web Client Network         OPC.SimaticNET.DP.1         OPC.SimaticNET.PD	puter	
	Browse E Select the desired OPS server from the list.	s Server	
5	The Filter Criteria dialog opens. This allows you more detailed specification of the type of desired iteryou wish a display of available items, no settings need to be made the dialog may be concluded with Continue. Filter Criteria	ems. If here.	
	C: Establishing connection		
---	---		
6	A dialog for the selection of desired items is displayed.		
	In the current example, only DB75 is available as subitem of Group DB. Group DB75 contains the five items defined in the previous section using OPC Scout. These represent the five tags created in the PLC. The five items of DB75 may be selected in the right window. Using the Add Items button, these may be inserted into the WinCC project.		
	OPC.SimaticNET - (DIETRICH-XP-02)		
	OPC SimatioNET       Items       Data Type         SourceServers       DB75/INT2.1         DXConnectionsRoot       DB75/INT4.1         ServerStatus       DB75/INT6.1         DP2:       DB75/INT8.1         VP2:       DB75/INT8.1         SourceServers       DB75/INT8.1         ServerStatus       DB75/INT8.1         SourceServerServerStatus       DB75/INT8.1         SourceServerServe		
	<- Back Item Properties		
7	However, a new connection must be established beforehand where these items can be inserted as WinCC tags.		
	This connection can be generated automatically by the OPC Item Manager. The New Connection dialog opens. Only the name of the new connection needs to be specified. The current example uses the name S7_OPC_01 for it. Close the dialog with OK.		
	New Connection		
	Please enter a name for the new connection:		
	\$7_0PC_01		
	OK Cancel		

	C. Establishing connection
	C: Establishing connection
8	The Add Tag dialog is displayed.
1	Here you specify which connection the tags should be added to. In the
1	connection S7 OPC 01. This must be selected in the lower Add Here
field.	
I	The tag names used by OPC Item Manager may have optionally added a
	prefix and a suffix. In the current example, the tag name should be preceded by the prefix S16x_S7OPC01
	The WinCC tags are created using the Finish button.
	The dialog to select the desired items may be concluded using the Finish button. The OPC Item Manager is closed using the Finish button.
	Add Tags
	Tags to be added:
	1
	Tag names should be completed as follows: Prefix Name Suffix
	S16x_S70PC01 ExampleTag
	Example: S16x_S70PC01_ExampleTag
i i	Add here:
i '	
	S7_OPC_01
	<- Back Finish
9	The following display lists WinCC tags generated by the OPC Item Manager.
i '	Name Type Parameters
1	S16x_S70PC01_DB75_INT0_1 Sig "S7:[S7_Connection_01/VFD1/CP_H1_1:]DB75,INT0,1", "", 2
i '	S16x_S70PC01_DB75_INT2_1 Sig "S7:[S7_Connection_01/VFD1[CP_H1_1:]DB75,INT2,1", ", 2
1	S16x_S70PC01_DB75_INT4_1 Sig "S7:[S7_Connection_01]VFD1[CP_H1_1:]0B75,INT4,1", "", 2 S16v_S70PC01_DB75_INT6_1 Sig "S7:[S7_Connection_01]VFD1[CP_H1_1:]0B75,INT6,1", "", 2
1	S16x_S70PC01_DB75_INT8_1 sig "S7:[S7_Connection_01/VFD1/CP_H1_1:]DB75,INT8,1", ", 2

# **D: Conventional configuration**

	D: Conventional configuration	
1	Aside from the procedure described in the above table for automatically creating a connection for the OPC communication driver, there is also the option of establishing this in the conventional way. The required actions are described in this step. Creating a new connection is facilitated using OR over the entry for the OPC communication driver channel unit and New Connection. The Properties Connection dialog opens. Enter the name of the new connection on the General tab register.	
	Using the Properties button, the dialog for Properties of New Connection opens.	
	Connection properties	
	General	
	Name: S7_OPC_01 Properties	
	Unit: OPC Groups (OPCHN Unit #1)	
	Server List	
	Please make certain that the connection name does not include any national special characters or the characters §, ' or *.	
	OK Cancel Help	

D: Conventional configuration
In the Properties of New Connection dialog, the OPC server to be used must be specified. In the OPC Server Name field, the name of the OPC server to be used must be entered. In the field below, enter the name of the computer where the OPC server to be used is located.
can be established to the desired OPC server.
Using the OK button, the new connection is created.
S7_OPC_01 Properties
OPC Group Setting
OPC Server Name 🔽 XML DA server
OPC.SimaticNET
Run the server on another computer: <u>I</u> est Server
<local></local>
Read data from:
In here, specify the OPC server and, if necessary, the computer that you want to access.
OK Cancel Help
Server Test
Test OK. This server supports the OPC interface.
OK

	D: Conventional configuration
3	Aside from the procedure described in the above table for automatically creating the tags, there is also the option of establishing this in the conventional way. The required actions are described in this step.
	Creating a new tag is facilitated using ${}^{\frown}\mathbb{B}R$ on the entry for the respective connection, in the current example the connection S7_OPC_01 and New Tag.
	The Tag Properties dialog is displayed.
	Here the name of the tag and its data type must be specified. Using the Select button, its address must be specified.

	D: Conventional configuration		
4	The Address Properties dialog opens.		
	In the Item Name field, the name of the desired item in the OPC server must be specified. This name contains the address information. The syntax of this address information is explained using the first tag to be created as part of this example. Its Item Name is [S7:S7_Connection_01 VFD1 CP_H1_1:]DB75,INT0,1.		
	S7 specifies the used OPC server type (FMS or DP are additional available OPC servers by SIMATIC NET, for example).		
	S7_Connection_01 is the name of the S7 connection.		
	VFD1 is the VFD name (Virtual Field Device).		
	CP_H1_1: is the used access point.		
	DB75 indicates the data block number.		
	INT0 states whether or not this is a signed 16-bit value with a starting address of 0.		
	1 states that this is a single tag, as opposed to an array consisting of several tags.		
	Exact adherence to the required syntax is important.		
	NewTag Properties		
	Item Name: [S7:S7_Connection_01/VFD1/CP_H1_1:]DB75,IN		
	Access Path:		
	Data Type: Signed 16-Bit Array		
	Please enter the name and the access path of the OPC item and select its data type.		
	OK Cancel Help		

### E: Creating WinCC picture



	E: Creating WinCC picture		
3	After placement of the I/O field on the picture, its configuration dialog opens.		
	In the Tag field, the tag S16x_S7OPC01_DB75_INT0_1 is set using the button shown in the following.		
	Tag updates are left at 2 seconds. The addition their default values. Finish the dialog with OK.	al set options should retain	
	I/O-Field Configuration		
	Tag: CO1_DB75_INTO_1		
	Update 2 s		
	Type C Output C Input © Both		
	- Format		
	Font Size 12		
	Font Name Arial		
	Cancel		

	E: Creating WinCC picture
4	Changes of output format for I/O field.
	Open its property dialog. This is done by clicking OR on the I/O field and Properties.
	<ul> <li>Cut Ctrl+X</li> <li>Copy Ctrl+C</li> <li>Duplicate</li> <li>Paste Ctrl+V</li> <li>Delete Del</li> <li>Customized object</li> <li>Group object</li> <li>Linking</li> <li>Configuration Dialog</li> </ul>
5	The Object Properties dialog opens. On the Properties tab register, select the Output/Input entry in the left window. Using OD on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is
	capable to display signed values with a maximum of 5 digits.
6	Creating an additional four I/O fields to display the remaining tags. The procedure is analogous to Steps 2 to 5 as described.



# 3.5.6 Diagnostics of Communication Link Using OPC

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_S7\_OPC and the SIMATIC S7 station.

### A: WinCC Explorer

	A: WinCC Explorer		
1	Diagnostics of communication link in WinCC Explorer.		
	Switch the WinCC_S7_OPC project into Runtime. This is done in WinCC Explorer using the toolbar button displayed in the following.		
	Activate The created WinCC picture com_3_S7OPC_01.pdl may also be switched directly from Graphics Designer into Runtime.		
2	In WinCC Explorer, using the menu Tools $\rightarrow$ Connection Status, a dialog may be opened to monitor all configured connections. However, this menu item is only active if the project is in Runtime.		
	Tools		
	Language		
	Status of <u>D</u> river Connections		
	Status of Server Connections		
	Status of Client Connections		

	A: WinCC Explorer		
3	The Status - Logical Connections dialog is opened.		
	This dialog lists all configured connections. In the current example, only the connection S7_OPC_01 exists.		
	The displayed values correspond to the status at the moment the dialog was opened. By selecting the corresponding checkbox, a cyclic display update may also be achieved.		
	Status - Logical Connections		
	Tag ID       Name       Status       Tag read       Read requ       Tag written       Write requ         2       S7_OPC_01       OK       O       O       O       O		
	Update Cyclic update ( <u>4 *</u> x 250 ms ) <u>Update</u> <u>H</u> elp		
4	Another option to obtain information on the connection status in general but also on the connection status of individual tags is provided by Tag Management		
	The status of a configured connection may be obtained as a tooltip by simply moving the mouse over it.		
	Name Parameters		
	S7_OPC_01 OPC.SimaticNet; <local>; 0,00; 0; 0; 1</local>		
	The current process value of a certain tag, as well as its status, may be obtained as a tooltip by simply moving the mouse over it. This procedure allows determination of errors of a single tag only, not of errors concerning the entire connection.		
	Name Type		
	S16x_S70PC01_01 Signed 16-bit value		
	Process value: 34 Quality: c0 Last Change:2/2/2005 11:53:50 AM		

# **B: Channel Diagnosis**

	B: Channel Diagnosis		
1	Diagnostics of communication lir program.	nk using the WinCC C	Channel Diagnosis
	This is started using Start $\rightarrow$ s Channel Diagnosis.	SIMATIC -> WinCO	C → Tools →
	Channel Diagnosis		
2	The WinCC Channel Diagnosis p The Channels/Connections tab r status of each configured connect one second. The update cycle m	program is opened. egister displays exac ction. The default valu ay be changed in the	et information on the ue for display update is a lower input field.
🔹 WinCC Channel Diagnosis			? 🛛
	Channels/Connections Configuration		🔲 Always on top
	E ✓ OPC ✓ S7_OPC_01	Counters Requested Tags Data Change Notifications Data Change Notification Tags Synchronous Reads Synchronous Writes Synchronous Writes Synchronous Write Tags Additem failures OPC Groups Items added Server uses DataAccess Server Status Last Error Last Error Name Last Error Icall	Value 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	Cyclic Update		

# 3.6 Communication with SIMATIC S7 Using PROFIBUS

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on <a href="http://support.automation.siemens.com/WW/view/en/21320307">http://support.automation.siemens.com/WW/view/en/21320307</a>).

There is the option of copying the following components to hard disk:



The STEP7 project to be generated.



The WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between SIMATIC S7 and WinCC. Profibus is used to implement the communication link. The CP 5613 communication processor used on the computer has its own CPU. This removes communication loads from the computer's CPU load.

#### Summary on Example Design



On the computer side, the network connection (PROFIBUS) is established using a CP 5613 communication processor.

In the WinCC project, the SIMATIC S7 Protocol Suite communication driver must be installed. Using its PROFIBUS channel unit, the connection to SIMATIC S7 is configured.

The PLC is equipped with a central module CPU 417-4. Connection to the network is established using the CP443-5 BASIC communication processor. In order to configure this communication processor with STEP7 software, the NCM S7 PROFIBUS options package is required.

### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Commissioning of CP 5613 communication processor
- Generation of STEP7 project S7\_PB
- Generation of WinCC project WinCC\_S7\_PB
- Diagnostics of communication link

#### **Required software**

Name	Description
SIMATIC NET	Using installation from SIMATIC NET, all necessary drivers are installed.
STEP7	STEP7 Software with option package NCM for PROFIBUS to generate the STEP7 project.
WinCC	WinCC with SIMATIC S7 Protocol Suite communication driver to generate the WinCC project.

#### Required hardware on computer

Name	Description
Communication Processor	Communication processor CP 5613 to establish connection to communication processor in PLC.

### Required hardware in the PLC

Name	Description
Rack	Module support UR1.
Power supply unit	Power supply unit PS 407 20A in slots 1 to 3.
Central module	Central module CPU 417-4 in slot 4.
Communication Processor	Communication processor CP 443-5 BASIC in slot 7.

### 3.6.1 Commissioning of CP 5613 Communication Processor

The following description shows detailed configuration steps necessary for successful commissioning of the CP 5613 communication processor. It is assumed that the communication processor was previously installed.

### **Summary of Configuration Steps**

The following is a summary list of all necessary configuration steps for implementing the communication processor CP 5613.

- A: Assembly of communication processor in computer
- B: Assigning communication processor
- C: Testing of communication processor

#### A: Configuration of communication processor

	A: Configuration of c	communication p	rocessor
1	A: Configuration of c In Program Start → "Setting PC station", th menu "General", the m Configuration Console File Action View Help ← → È I 2	SIMATIC → S ne communication nodule operation r	BIMATIC NET → Settings → processor may be configured. In mode must be set to PG Operation.
	SIMATIC NET Configuration Applications Modules CP5613 CP5613 Softeet DP trace CP5614 Softeet DP trace CP5614 Softeet DP trace CP5614 Softeet DP trace Access points	Type of module: Mode of the module: Interface profile for: (CP5613(FWL) (CP5613(PP0)FIBUS) <aktiv> CP5613(Auto) Module reaction: Restart Apply Cance</aktiv>	PROFIBUS PG operation PG operation Configured mode CP 5613 el Help



# B: Assigning communication processor

	B: Assigning communication processor
1	In Program Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ "Setting PC Station", the just installed interface must be assigned to the access point CP_L2_1:
	The access point CP_L2_1: is the default access point used for PROFIBUS communication in WinCC. It was created automatically during installation of SIMATIC NET.
	Configuration Console
	Eile Action View Help
	PC Station       Access points         SIMATIC NET Configuration       Access point         Image: Simatic Net Configuration       Image: Simatic Net Configuration         Image: Simatic Net Configuration       Image: Simatic Net Configuration
	CCBSS points  CP_L2_1:  CP_SM_1:  CP_TCPIP:  S7ONLINE PC internal (local) KBUS  CP_H1_1:  FWL_LOAD  MINI
2	In the Access Point folder, the entry CP_L2_1: must be selected as <sup>-</sup> UD. In the upper field, select the CP5613 (PROFIBUS) entry by using the pull- down menu. This concludes the assignment between access point and communication processor.
	CP_L2_1 Properties
	Ccess point
	Access point: CP_L2_1:
	Associated interface parameter assignment:
	CP5613_5614(PROFIBUS)
	Module:
	CP5613/CP5614
	If you change an access point of a PROFIBUS module to another interface parameter assignment of the same module, all other access points that point to the old interface parameter assignment will be remapped to the new interface parameter assignment.
	OK <u>Apply</u> Cancel Help

# C: Testing of communication processor

		wination was a second
	C: Testing of commu	nication processor
1	Testing the proper inst using the "Setting PC S	allation of the CP 5613 communication processor Station" program.
	In order to perform net must be selected in the 5613.	work diagnostics, the Network Diagnostics folder e respective module. In our case it is module CP
	On the right side, the N displayed. Here you m	Network Diagnostics PROFIBUS Parameter window is ay check station address and bus parameters.
	Configuration Console	
	<u>File Action View H</u> elp	
	← → 🗈 🖬 😫	
	PC Station	Network Diagnostics PROFIBUS parameters
	SIMATIC NET Configuration     Applications     Modules     P-     CP5613	Operating state/network diagnostics Station address: 3 Test> OK Bus parameters:
	eneral 🐨 Version	Bus parameters Value
	Address	Baud rate: 1.5 Mbps Highest station address (HSA): 126
	Network Diagnos	Min. station delay responder (Min Tsdr): 11 tBit May station delay responder (May Tsdr): 150 (Bit
	Softnet DP trace	Setup time (Tset): 1 tBit
	Intel 21143-Based P     CR circulation	Quiet time for modulator (Tqui): UtBit Slot time (tSlot): 300 tBit
	Access points	Gap update factor: 10 Retruitmet: 1
		Version: Siemens AG, SOFTNET PB, HW:ASPC2 STEP D , SW:V 6.2.620.3112 Oct
		Help
	< · · · · · · · · · · · · · · · · · · ·	



# 3.6.2 Creating STEP7 Project S7\_PB

The following description shows in detail the necessary configuration steps for creating and commissioning of STEP7 project S7\_PB.

### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the STEP7 project S7\_PB.

- A: Installation of hardware
- B: Creating STEP7 project
- C: Configuring hardware for SIMATIC PC station
- D: Loading hardware configuration for SIMATIC PC station
- E: Configuring hardware for SIMATIC 400
- F: Loading hardware configuration for SIMATIC 400
- G: Testing of hardware configuration
- H: Creating STEP7 program
- I: Testing of STEP7 program

### A: Installation of hardware

	A: Installation of hardware
1	Assemble the used modules on the module supports.
	In the current example, these are a power supply unit PS 407 20A, a central module CPU 417-4, as well as a communication processor CP 443-5 BASIC.
	Establish the connection between programming device and programming interface of the central module.
	Establish the connection between the computer's communication processor CP 5613 to communication processor CP 443-5 BASIC in the PLC.

# **B: Creating STEP7 project**

	B: Creating STEP7 project
1	Creating a new STEP7 project in SIMATIC Manager.
	This is started using Start $ ightarrow$ SIMATIC $ ightarrow$ SIMATIC Manager.
2	The SIMATIC Manager opens.
	Using menu item File $\rightarrow$ New, the dialog to specify parameters of a new STEP7 project opens.
	Enter the name of the newly created project in the Name field. Names of STEP7 projects created as part of this manual must start with the character sequence S7. Furthermore, they contain a description of the communication type used. The current example has the name S7_PB.
	By default, projects are saved in directory C:\PROGRAM FILES\SIEMENS\STEP7\S7proj. However, this may be changed at any time by clicking the Browse button.
	The New dialog is closed by clicking the OK button
	New Project
	User projects Libraries Multiprojects
	Name Storage path
	☐ Add to current multiproject
	Name: <u>I</u> ype:
	S7_PB Project
	Storage location (path):
	C:\Program Files\Siemens\SIMATIC.NCM\s7proj <u>B</u> rowse
	OK Cancel Help

# C: Configuring hardware for SIMATIC PC station

	C: Configu	uring hardwa	re for SIMATIC	PC station	
1	The new p	roject is displa	ayed in SIMATIC	Manager.	
	Hardware These are Furthermo	must be confi one SIMATIC re, for their ne	gured for it. Thre 2 400 station as v etwork links, one	ee components are need well as one SIMATIC P( Profibus is required.	ded. C station.
	These com on the nam station, Ins Object	nponents are on ne of project S sert New Obje Profibus.	obtained in SIMA S7_PB and Inser oct → SIMATIO	ATIC Manager using Us t New Project → SIM C PC station as well as	ing <sup>~</sup> <sup>0</sup> R IATIC 400 Insert New
		Cat	Ctrl+C		
		Paste	Ctrl+V		
		Delete	Del	-	
		Insert New Ohie	ect )	SIMATIC 400 Station	li i
		PLC	)	SIMATIC 300 Station	
		Bonomo	E2	SIMATIC H Station	
		Object Propertie	es Alt+Return	SIMATIC PC Station	
	1000			Other station	
				SIMATIC 55	
					-
				MPI	
				PROFIBUS Industrial Ethernet	
				PTP	
				S7 Program	
				M7 Program	
2	The two co SIMATIC N	omponents jus Manager.	st added are disp	played in the right windo	ow of
	SIMATIC 40	00(1) 🛕 SIMATI	C PC Station(1)	<b>음음</b> MPI(1)	PROFIBUS(1)
	Using Usin	ng <sup>- (†</sup> D on co	mponent SIMAT	TC PC Station(1) in the	right
	window wil	ll display the H	Hardware item. l	Jsing <sup>∽</sup> ÜD on the Hard	ware item or
	<sup>-/</sup> <sup>(</sup> <sup>(</sup> R and (	Open Object o	on it will start the	HWConfig program.	
	📲 Hardware				
		Open Object	Ctrl+Alt+O		
		Cut	Ctrl+X		
		Сору	Ctrl+C		
		Paste	Ctrl+V		
		Delete	Del		
		Rename	F2		

	C: Configuring har	dware for SIMATIC PC station
3	In order to enable a name of the PC stat Editor.	connection to the configured PC station later on, the ion must agree with the name in Station Configuration
	The Station Configu Configuration Editor	ration Editor is started using Start $ ightarrow$ Station .
	In the example, the	PC station is named SIMATIC PC Station(1).
	SIMATIC Manager - [S7_PB -	
	File Edit Insert PLC View	Components Diagnostics
		Chairer CIMATIC DC Chaire(1) Moder DUN D
	SIMATIC PC Station(1)	Station name Run/Stop Conn A
		Cancel Help
		9
		10 11
		12 13
		14 15 19
	Press F1 to get Help.	Add Edit Delete Ring (N
		ОК Нер
4	The HWConfig prog	ram opens.
	It is used to exactly its properties.	specify the hardware used in the PLC, and to configure
	HW Kontig	
5	Using the subseque program, the hardwa hardware componer	ntly displayed button in the toolbar of HWConfig are catalog opens. This is used to select the required hts.
	Catalog	



	C: Configuring bardware for SIMATIC PC station
7	After incerting CD 5012, the preparty dialog of the Drefibus interface for
1	CP 5613 opens.
	Use the Parameter tab register in the address field to set the desired Profibus address of the communication processor.
	Use the lower selection field Subnet to assign the entry PROFIBUS(1) to the communication processor. Close the dialog with OK.
	Properties - PROFIBUS interface CP 5613 (R0/S1)
	General Parameters
	Address: 3 ▼
	Highest address: 126 Transmission rate: 1.5 Mbos
	Subat
	PR not networked PR not
	Properties
	Dejete
	OK Cancel Help
8	Furthermore, insert an application into slot 2 of the module rack using
	example is shown.
	1 FIF CP 5613
	3 4
9	Settings now made must be saved in program HWConfig and must be compiled. This is done using the toolbar button displayed in the following.
	Save and Compile
	[bave and compile]

	D: Loading hardware configuration for SIMATIC PC station
1	Loading of the hardware configuration uses the toolbar button of the HWConfig program shown in the following.
2	A dialog opens which allows selection of components to be loaded. In the current example, all selectable components must be marked. Close the dialog with OK.
	Select Target Module       Image         Iarget Modules:       Index         Module       Index         CP 5613       1         Application       2         Station Manager       125         Select <u>All</u> OK

# D: Loading hardware configuration for SIMATIC PC station

<b>.</b>			
D: Loadi	ng hardware configur	ation for SIM	ATIC PC station
The Sele	t Node Address dialog	is displayed.	
On the configuration	nfiguration side (STEP tion of the entire SIMA <sup>−</sup>	7), the station	manager represents the
Close the	dialog with OK.		
Select no	de address		
Over whic Manager	h station address is the program	nming device conn	ected to the module Station
Back:			
<u></u> dok.			
<u>S</u> lot:	125		
Target St	ation: 💌 Local		
	C Can be reacher	d by means of gate	way
Enter co	nnection to target station:		
Index	Module type Station name	CPU name Plar	nt designation
125	Stationma		
Accessibl	e Nodes		
		⊻iew	



# E: Configuring hardware for SIMATIC 4001

	E: Configuring hardware for SIMATIC 4001				
1	Using Using Using Using Using the Hardware	on compone re item. Using will start the Open Object Cut	nt SIMATIC 4 g D on the HWConfig pro	00(1) in the right window will display Hardware item or <sup>~</sup>	
		Copy Paste	Ctrl+C Ctrl+V		
	-	Delete	Del		
		Rename	F2		
2	The HWCor It is used to its propertie Its Konfig	nfig program exactly spec s.	opens. ify the hardwa	are used in the PLC, and to configure	
3	Using the su program, the hardware co	ubsequently o e hardware c omponents.	displayed butt atalog opens.	on in the toolbar of HWConfig This is used to select the required	



	E: Configuring hardware for SIMATIC 4001				
5	The HWConfig program displays the presently still empty module support. It has been assigned to rack number 0. In configuring the connection in the WinCC project, the rack number is one of the parameters to be set.				
	(0) UR1 2 3 4 5 6 7 -				
6	Arrangement of additional hardware components in module support. This uses Drag&Drop for the desired components from the hardware catalog in their respective slots in the module support.				
The example uses a power supply unit PS 407 20A. This is inserted in 1. A power supply unit of this type uses two slots. The example uses a CPU 417-4 as central module. This is inserted in In configuring the connection in the WinCC project, the slot number of central module is an additional parameter to be set.					

	E: Configuring hardware for SIMATIC 4001					
7	The property dialog of the PROFIBUS interface of CP 443-5 BASIC is displayed.					
	Use the Parameter tab register in the address field to set the desired address of the communication processor. The current example specifies this as 14. In configuring the connection in the WinCC project, this station address is an additional parameter to be set.					
	Use the lower selection field Subnet to assign the entry PROFIBUS(1) to the communication processor.					
	Specify properties of PROFIBUS(1). Its Properties dialog opens by clickin the Properties button.					
	Properties - PROFIBUS interface CP 443-5 Basic (R0/S7)					
	General Parameters					
	Address:					
	Highest address: 126					
	Transmission rate: 1.5 Mbps					
	Subnet:					
	PROFIBUS(1) 1.5 Mbps					
	OK Cancel Help					

	E: Configuring hardware for SIMATIC 4001					
<ul> <li>8 The Properties - PROFIBUS dialog opens.</li> <li>Specify properties of the PROFIBUS network using the Network Sett tab register. Use the same network settings as during installation of communication processor CP 5613.</li> <li>The example uses a transmission rate of 1.5 Mbit/s for the PROFIBU network. The highest PROFIBUS address is left on 126, the maximum to be set. Use Universal (DP/FMS) as the profile.</li> <li>Close the dialog by clicking OK. The Properties dialog of the PROFIE interface of CP 443-5 BASIC is also closed by clicking OK.</li> </ul>						
	Properties - PROFIBUS					
	General Network Settings					
	Highest PROFIBUS Address: 126	Change         Change         Kbps         5 Kbps         5 Kbps         5 Kbps         6 Address         Bus Parameters				
	<u>I</u> ransmission Rate: 93.75 187.5 500 k 1.5 M					
	Profile: DP Stand Unive User-					
	ОК	CancelHelp				
9	In the following, the fully config shown.	ured hardware design of the example is				
	(0) UR1	Hardware Catalog 🛛 🔀				
	1 📳 PS 407 20A 🔷	Profile Standard				
	4       Image: CPU 417-4         ×2       DP         ×1       MPI/DP         IF1       MPI/DP         IF2       6         7       Image: CP 443-5 Basic         8       9         10       11         12       Image: Vertical state	PROFIBUS DP         PROFIBUS-PA         SIMATIC 300         Image: Simatric 400         Image: Simatric 400      <				

	E: Configuring hardware for SIMATIC 4001		
10 Settings made now must be saved in program HWConfig and must compiled. This is done using the toolbar button displayed in the follow			
	Save and Compile		

# F: Loading of hardware configuration

	F: Loading of hardware configuration									
1	he hardware configuration created in program HWConfig must be ransferred to the PLC.									
	This is done using the toolbar button displayed in the following.									
	Download to Module									
2	A dialog opens which allows selection of components to be loaded.									
	In the current example, all sele make sure that any loading of t operational switch positions ST	ectable components must be m the central module is possible FOP or RUN-P. Close the dialo	arked. Please only in og with OK.							
	Select Target Module									
	Target Modules:									
	Module	Racks Slot								
	CPU 417-4 CP 443-5 Basic	0 4 0 7								
	Select <u>A</u> ll									
	ОК	Cancel Help								
F	: Loading	of hardware conf	figuration							
-------------	-----------------------------	---	--------------------------------	-------------------------	---------------------------	--------------------------	--	--	--	--
Т	he Select N	Node Address dial	og opens.							
+ S 4	lere you sta STEP7 softv	ate which node ad ware and central m	dress is used nodule. The a	d for comi address o	municatior f the centr	n between al module i				
C	Close the di	alog with OK.								
	Select node	address								
	Over which s	ation address is the prog	ramming device (	connected to	the module C	PU 417-4?				
	Back:									
	Clat.									
	<u>3</u> 100.	4 🖃								
	Target Station: O Local									
		Can be read	hed by means of	gateway						
		Connection to topost sta	1st gateway							
	Type	Address	S7 subpet ID	Type	Address	,				
	PROFIBUS	4	0062-0002	local	1					



## G: Testing of hardware configuration

	G: Testing of hardware configuration							
1	Testing of hardware configuration decision							
	If the key switch of the central module is put into RUN or RUN-P position, and the operational switch of the communication processor is put into RUN position, only status LEDs indicating the RUN state should be lit.							
	If this is not the case, an error has occurred. This error may be determined using the steps described in the following. However, these step should also be implemented even if no error is indicated by the status LEDs. This will allow to recognize non-critical errors and faulty configurations.							

G: Testing of ha	rdware configura	tion						
 Testing of config	uration in central m	odule.						
This uses the Mo	dule Information di	alog in SIMATIC Man	ager. This dialog					
	·伯o							
is opened using	UR on the entry of	of the central module i	in the left window					
and Target Syste	m Diagnostic	s/Settings Modu	ile Information.					
The General tab register displays various general data of the central module. The Status field will display the current Module Information as well as existing errors, if any.								
The Diagnostic B errors and their c	uffer tab register d orrection.	isplay detailed inform	ation on existing					
The dialog is close	sed by clicking the	Close button.						
🔞 Module Informa	tion - CPU 417-4							
Path: S7_PB\SIMATI Status: OK	C 400(1)\CPU417-4 DP	Operating mode of the CPU: Not a force job	\land RUN					
Time System	Performance Data	Communication	Stacks					
General	Diagnostic Buffer	Memory	Scan Cycle Time					
Description:	CPU 417-4	System Identification: SIMATIC 400						
⊻ersion:	Order No./ Description	Component	Version					
	6ES7 417-4HL01-0AB0	Hardware	1					
		Firmware	V 3.1.0					
Rack:	0	Address: ····						
Slot:	3							
<u>S</u> tatus:	Module available and o.k.							
Close L	pdate <u>P</u> rint		Help					

	G: Testing of	hardware configur	ation						
3	Testing of com	munication process	or configuratio	n.					
	This uses the Module Information dialog in SIMATIC Manager. This dialog								
	is opened using $\checkmark \Box R$ on the entry of the central module in the left windo								
	and Target Sys	stem - Diagnost	ics/Settings -	Module	Information.				
	The General ta	b register displays v	arious genera	I data of the	e module.				
	A dialog for mo	ore detailed diagnost	tics of the com	munication	processor				
	may be opened	d using the Special I	Diagnostics bu	tton.	proceed				
	Module Inform	nation - CP M3-5 Rasio							
	Path: S7_PB\SIM	ATIC 400(1)/CP 443-5 Basic	 Operating mode	of the CPU: 🗸					
	Status: OK		Operating mode	of the module:	RUN				
	General Diagnostic Buffer								
	Description:	ntification: SIMA	TIC 400						
	Version:				<u>.</u>				
	<u>v</u> ersion.	Urder No.7 Description		Ve 1	rsion				
			Firmware	v	5.2.0				
	Back:	0	۵ddress:	E 16379					
	Slot:	5	, Idarotti	2 10010					
	Status:	Module available and o.k.							
	_								
		J							
		Undate Print	Special Diago	ostics	Help				
				55005					

## H: Creating STEP7 program

	H: Creating STE	EP7 program							
1	Creating STEP7 program								
	For the current example project, only one operations block, OB1, and one data block are needed. OB1 is available by default. The needed data block								
	must first be created. This is done in SIMATIC Manager using $\sqrt{CR}$ on the Blocks subitem of entry S7 program(1) of the configured central module and Add New Object $\rightarrow$ Data Block.								
	The property dia the block and clo	log of the data block op ose the dialog by clicking	ens. Enter DB g OK.	75 as the name for					
	⊡ 🚺 CPU 417-4 ⊟ 🛐 S7 Program(1) 🛅 Sources								
ļ		Cut	Ctrl+X						
,		Ctrl+C							
ļ		Ctrl+V							
		Delete	Del						
		Insert New Object	۱.	Organization Block					
		PLC	•	Function Block					
		Rewiring		Function					
ļ		Compare Blocks		Data Block					
ļ		Reference Data	•	Variable Table					
Check Block Consistency									
	Print								
,		Rename	F2						
		Object Properties	Alt+Return						
	L	Special Object Properties	۲.						

	H: Creating STEP7 program
2	The newly created data block DB75 is displayed in the right window of the project. Using $\overset{\frown}{\square}$ D on it or using $\overset{\frown}{\square}$ R and Open Object, the contents of the block may be programmed. The program KOP/AWL/FUP is started.
	Open Object Ctrl+Alt+O
	CutCtrl+XCopyCtrl+CPasteCtrl+VDeleteDelInsert New Object>PLC>Compare Blocks>Reference Data>Print>RenameF2Object PropertiesAlt+ReturnSpecial Object Properties>
3	The program KOP/AWL/FUP opens. The New Data Block dialog appears and must be acknowledged by clicking OK. KOP AWL FUP

	H: Creati	ng STEP7 pr	ogram								
4	Programm	ning of DB75									
	Here, two determine	tags of lengt ed in OB1 and	h 16 bits are creat d written to anothe	ed. Their sum is r tag of length 16	supposed to be bits.						
	Furthermo	ore, two tags	of length 16 bits a	re created, whos	e values are to be						
	The following shows the completely programmed data block DP75										
	DB75 S7_IEH\SIMATIC 400(1)\CPU 416-1										
	Iddrogg	Name	Time	Initial val	ue Coment						
	0.0		STRUCT								
	+0.0	Var 01	MORD	N#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								
	<				>						
	make sure that any loading of the central module is possible only in operational switch positions STOP or RUN-P.										
6	Programm	ning of OB1.									
	This must	t be opened b	peforehand in prog	ram KOP/AWL/F	UP.						
	Initially, tw	vo values cre	ated in DB75 are a	added and the re	sult is again saved						
	Netzwei	r <b>k 1:</b> Addi	ition								
		+ 1C D									
	The re 16-Bit	two 16-8 sult is s Value	tored in anot	her							
OPN DB 75 L DBW 0 L DBW 2 +I T DBW 4											

	H: Creating STEP7 program
	Next, the count of a value created in DB75 is implemented every second.
	Network 2: Second Cycle
	Generation of a second cycle at M 0.0
	AN M 0.0 L S5T#1S SD T 1 A T 1 = M 0.0
	Network 3: Counting in a second cycle
	Counting a value in a second cycle At 10000, reset to 0
	AN M 0.0 JC M001 L DBW 6 L 1 +T
	T DBW 6 L 10000 <i JC M001</i 
	L 0 T DBW 6 M001: NOP 0
	Next, the count of a value created in DB75 is implemented for each run of OB1.
	Network 4: Counting in the cycle time
	Counting a value each time the OB is executed At 10000, reset to O
	L DBW 8 L 1 +I
	T DBW 8 L 10000 <i< th=""></i<>
	JC M002 L 0 T DBW 8 M002: NOP 0
7	The OB1 block must be saved and loaded onto the PLC. This is done using the respective toolbar button. Thus, the STEP7 project is complete and ready to run. The KOP/AWL/FUP program may be terminated

## I: Testing of STEP7 program

	I: T	esti	ing of	f STE	<b>P7</b>	progra	am				
1	Tes	ting	of pr	ogran	nι	ising ST	TEP7 softwa	re.			
	A tag table is created for this. This is done in SIMATIC Manager usin on the entry of the configured central module and Target System — Monitor / Modify Tag.									using <sup>√</sup> ÜR →	
	CPU 417-4 Cut Ctrl+X Copy Ctrl+C Paste Ctrl+V Deleta Del										
				Incert I	Jou	Object					
				PLC	acr.	robject		•	Copy R	AM to ROM	
	Run-Time Properties Rename F2				CPU Me Display Monitor	essages / Force Values r/Modify Variables	;				
			1000	Special	ОЬ	ject Prope	rties	•	Hardwa Module Operat Clear/F Set Tim	are Diagnostics 9 Information ing Mode Reset ne of Day	Ctrl+D Ctrl+I
2	An editor is displayed to create and use such a tag table. In the following, the complete tag table is shown. All tags created in DB75 are entered.										
	₩ VAT_20										
			Addre	ss		Symbol	Display forma	t Sta	tus value	Modify value	
	1		DB75.	DBW	0		DEC	12		12	
	2		DB75.	DBW	2		DEC	12		12	
	3		DB75. DD75		4 C		DEC	24	00		
	+ 5		DB75.	DBW	0		DEC	17	03		
	6		5510.		Ĵ						
										ii	

	I: Testing of STEP7 program
3	Monitoring current tag values.
	By clicking the toolbar button shown in the following, the current values of respective tags in the PLC are displayed in the Status Value column.
	Monitor variable.
	Controlling of tag values.
	In the Control Value column, values may be entered. By clicking the toolbar button displayed in the following, these values are written to the corresponding tags in the PLC.
	Please make sure that any controlling of tags is possible only in operational switch position RUN-P.
	Modify variable
4	The so-created tag table may now be saved.
	In the current example, it is saved under the name VAT1. If the program function in the PLC has now been checked, the tag table may be closed. Thus, configuration of the STEP7 project is complete and SIMATIC Manager may be terminated.
	I VAT1

## 3.6.3 Creating WinCC Project WinCC\_S7\_PB

The following description shows in detail the necessary configuration steps for creating and commissioning of WinCC project S7\_PB.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project S7\_PB.

- A: Creating WinCC project
- B: Establishing connection
- C: Creating WinCC tags
- D: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project									
1	Creating a new WinCC project in WinCC Explorer.									
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.									
	WinCCExplorer									
2	WinCC Explorer is opened.									
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.									
	The following example project creates a single-user project.									
	Finish the dialog with OK.									
	WinCC Explorer									
	Create a New Project									
	Single-User Project									
	∰ <mark>/</mark> ⊂ Multi-User Project									
	🕵 🔿 Client Project									
	🖉 Open an Existing Project									
	Cancel									

	A: Creating WinCC project								
3	The Create a New Project dialog opens. Enter a project name for the new project. WinCC projects created as part								
	of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_S7_PB.								
	Furthermore, in the Project Path field, the storage location of the new project must be set. The Create a New Project dialog is closed by clicking the Create button.								
	Create a new project		? 🔀						
	Project Name:	Project Path c:\\wincc\winccprojects Eolder:	Cr <u>e</u> ate <u>C</u> ancel						
	WinCC_S7_PB	I J	<u>H</u> elp						
	You can use this dialog box to create a new WinCC project.	Dri <u>v</u> e:							

## **B: Establishing connection**

	B: Establishing connection		
1	The new project is displayed in WinCC Explorer.		xplorer.
	Installing of rec	quired communication driven nagement item and Add N	er. This is done by clicking <sup>v</sup> CR ew Driver.
	⊡∰ Tag Manaq È⊖ Intern	gement al tage Add New Driver	
		Find	
		Properties	
2	The Add New I	Driver Dialog opens.	
	It offers a selection of all communication drivers available for installation. For communication with SIMATIC S7, the SIMATIC S7 Protocol Suite driver is required. It must be selected in the dialog. Close the dialog with Open.		
	Add new driver		
	Look jn: 🗀 t	Din	- 🛋 🖆 🎫
	PDLCache		SIMATIC S5 Ethernet TF.CHN     SIMATIC S5 Profibus FDL.chn
	Profibus DP.     Profibus EM	.chn 5. chn	SIMATIC S5 Programmers Port 4
		5. TCPIP.chn	SIMATIC S7 Protocol Suite.chn
	SIMATIC 55	Ethernet Layer 4.CHN	🗟 SIMATIC TI Ethernet Layer 4.Cl
	<		
	File <u>n</u> ame:	SIMATIC S7 Protocol Suite.chn	<u>O</u> pen
	Files of <u>type</u> :	WinCC Communication Driver (*.	chn) 💌 Cancel

	B: Establishing connection	
3	The newly added driver SIMATIC S7 Protocol Suite displays as a subitem of Tag Management.	
	The driver contains nine different channel units. In order to operate two CP 5613 communication processors on a computer, two channel units are available for PROFIBUS.	
	The current example uses the PROFIBUS channel unit. A new connection	
	must be created for it. This is done using ${}^{\checkmark} \mathbb{C} \mathbb{R}$ on the PROFIBUS and New Connection entry.	
	<ul> <li>SIMATIC S7 PROTOCOL SUITE</li> <li>Industrial Ethernet</li> <li>Industrial Ethernet (II)</li> <li>MPI</li> <li>Named Connections</li> </ul>	
	PROFIBIUE     New Driver Connection	
	€ Slot PLC System Parameter	
	Soft PLC Find     TCP/IP Paste	
	Properties	

	B: Establishing connection	
4	The property dialog of the connection opens.	
	Enter the name of the new connection on the General tab register. It S7_PB_01 in the current example.	is
	Specify connection parameters using the Properties button.	
	Connection properties	
	General	
	Name: S7_PB_01 Properties	
	Unit: PROFIBUS	
	DIETRICH-XP-02	
	OK Cancel Help	

	B: Establishing connecti	on	
5	The Connection Parameter dialog opens.		
	Enter the address set for the CP 443-5 BASIC communication processor in the address field. In the current example, this is the address 14.		
	Furthermore, Rack Number to be addressed must be e central module and not the here.	er as well as Slot Number of entered. Please make sure t ose of the communication pr	the central module hat values for the rocessor are entered
	Close the dialog with OK.		
	Connection Parameter -	PROFIBUS	
	Connection		1
	S7 Network Address		
	Station Address:	14	
	Segment- <u>I</u> D:	0	
	<u>R</u> ack Number:	0	
	Slo <u>t</u> Number:	0	
	Send/receive ra <u>w</u> da	ta block	
	Connection Resource:	02	
	[OK]	Cancel	Help

	B: Establishing connection	
6	Setting of system parameters for PROFIBUS channel unit.	
	This setting uses the System Parameters dialog which opens using on the PROFIBUS and System Parameters entry.	Ĥĸ
	On the Channel tab register, different settings for communication an communication monitoring may be specified. However, these do not to all channel units of the communication driver.	d apply
	System Parameter - PROFIBUS	
	SIMATIC S7 Unit	
	Cycle management	
	🔽 by PLC 🔽 Change driven transfer	
	Lifebeat monitoring	
	Monitoring of CPU-stop	
	✓ Activate	
	OK Cancel Help	

	B: Establishing connection	
7	On the Unit tab register, it must be specified which access point the connection to the PLC should use.	
	<ul> <li>Default setting is access point CP_L2_1: . The access point CP_L2_1: was assigned the CP 5613 communication processor in the Setting PG/PC Interface program. If this access point is supposed to be set automatically, it must be checked whether or not the correct one is used especially when using multiple communication processors.</li> <li>Close the dialog with OK.</li> </ul>	
	System Parameter - PROFIBUS	
	SIMATIC S7 Unit	
	Select logical device name	
	CP-Type/Bus Profile: PROFIBUS	
	Logical <u>d</u> evice name: CP_L2_1;	
	Set automatically	
	Job processing	
	☐ <u>W</u> rite with priority	
	Enter a new device name or select the requested device from the list.	
	OK Cancel Help	

#### **C: Creating WinCC tags**



	C: Creating WinCC tags	
2	The property dialog of the t The example uses S16x_S is of data type Signed 16-B of the new tag is set.	ag is displayed. 7PB01_01 as the name for the first tag. The tag it Value. Using the Select button, the address
	Tag properties	
	General Limits/Reporting	
	Properties of Tags	
	<u>N</u> ame: A1	6x_S7PB01_01
	Data <u>T</u> ype : Si	gned 16-bit value
	Length: 2	
	Adapt format :	IT C N/ I
	<u>Project-wide update</u>	C Computer-local update
	Linear scaling	T-VI B-
	Process Value Hange	Tag Value Hange
	Value2	Value2
		OK Cancel Help

	C: Creating WinCC tags
3	The Address Properties dialog is displayed.
	Enter DB as data range and the value 75 as DB No. In the Address field,
	set Word and set the value to 0 in the DBW field. Finish the dialog with
	OK. The Property dialog of the tag is also closed by clicking OK.
	The just created tag has been addressed to the area of the PLC where the
	Address properties 🛛 🔀
	Address
	Address
	Description
	Data DB ▼ DB No. 75
	Address Word
	DBW 0 Length 1
	🗐 Quality Code
	OK Cancel Help
4	Creating the remaining required WinCC tags.
	The procedure is analogous to Steps 1 to 3 as described. Names, data
	types, and addresses of tags used in this example may be obtained from
	the following display.
	Name Type Parameters
	S16x_S7PB01_01 Signed 16-bit value DB75,DW0
	S16x_S7PB01_02 Signed 16-bit value DB75,DW2
	516x_57P801_03 Signed 16-bit value DB75,DW4
	S16x_S7P801_04 Signed 16-bit value DB75,DW6
1	

#### **D: Creating WinCC picture**



	D: Creating WinCC picture	
3	After placement of the I/O field on the picture, its configuration dialog opens.	
	In the Tag field, the tag S16x_S7PB01_01 is set using the button shown in the following.	
	Tag updates are left at 2 seconds. The additional their default values. Finish the dialog with OK.	l set options should retain
	I/O-Field Configuration	
	Tag: S16x_S7PB01_01	
	Update 2 s	
	Туре	
	C Output C Input C Both	
	Format	
	Font Size 12	
	Font Name Arial	
	Color	
	Cancel	

	D: Creating WinCC pict	ure	
4	Changes of output forma	it for I/O field.	
	Open its property dialog. This is done by clicking <sup>3</sup> UR on the I/O field and Properties.		
	0.000		
		Ctrl+X Ctrl+C	
	Duplicate		
	R Paste	Ctrl+V	
	Delete	Del	
	Customized	l <u>o</u> bject ▶	
	<u>G</u> roup obje	ct 🕨	
	Linking	•	
	Co <u>n</u> figurati	ion Dialog	
	P <u>r</u> operties		
	On the Properties tab register, select the Output/Input entry in the left window. Using D on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is capable to display signed values with a maximum of 5 digits.		
	Properties Events		
	⊡ I/O Field	Attribute Static Dynamic	
	Geometry Colors Styles Font Flashing	Field Type       I/O Field         Output Value       0.0000000( \$ S16x_S7PB01_01         Data Format       Decimal         Output Format       \$99999         Apply on Full       No	
	Miscellaneous	Apply on Exit No	
	Output/Input	Clear on New Input Yes	
		Hidden Input No 🥇 💌	
6	Creating an additional fo	ur I/O fields to display the remaining tags.	
	The procedure is analog	ous to Steps 2 to 5 as described.	



## 3.6.4 Diagnostics of Communication Link Using PROFIBUS

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_S7\_PB and the SIMATIC S7 station.

Diagnostics of an example in accordance with the following description is only meaningful if the following checks listed have successfully been concluded.

- Testing of communication processor
- Testing of hardware configuration
- Testing of STEP7 program

## A: WinCC Explorer

	A: WinCC Explorer	
1	Diagnostics of communication link in WinCC Explorer. Switch the WinCC_S7_PB project into Runtime. This is done in WinCC Explorer using the toolbar button displayed in the following.	
	The created WinCC picture com_S7PB_01.pdl may also be switched directly from Graphics Designer into Runtime.	
2	In WinCC Explorer, using the menu Tools → Status of Driver Connections, a dialog may be opened to monitor all configured connections. However, this menu item is only active if the project is in Runtime. Tools Language Status of Driver Connections Status of Server Connections Status of Connections	
5	The Status - Logical Connections dialog is opened. This dialog lists all configured connections. In the current example, only the connection S7_PB_01 exists. The displayed values correspond to the status at the moment the dialog was opened. By selecting the corresponding checkbox, a cyclic display	
	Statur, Logical Connections	
	Tag ID     Name     Status     Tag read     Read requ     Tag written     Write requ       2     S7_PB_01     OK     3055     O     O     O	
	Update Cyclic update ( 4 $\div$ x 250 ms ) Update <u>H</u> elp <u>Close</u>	

	A: WinCC Explorer
4	Another option to obtain information on the connection status in general but also on the connection status of individual tags is provided by Tag Management.
	The status of a configured connection may be obtained as a tooltip by simply moving the mouse over it.
	Name Parameters La
	57_PB_01 L2,14 0,,0,0,02 2/
The current process value of a certain tag, as well as its status, m obtained as a tooltip by simply moving the mouse over it. This pro allows determination of errors of a single tag only, not of errors co the entire connection.	
	Name     Type     Parameters     Last Cha       S16x_S7PB01_01     Signed 16-bit value     DB75,DW0     2/2/2005       Process value: 0     Quality: c0       Last Chasses     2/2/2005
	The current process value of a certain tag, as well as its st obtained as a tooltip by simply moving the mouse over it. allows determination of errors of a single tag only, not of e the entire connection. Name Type Parameters Last Cha S16x_S7PB01_01 Signed 16-bit value DB75,DW0 2/2/2009 Process value: 0 Quality: c0 Last Change:2/2/2005 2:38:15 PM

## **B: Channel Diagnosis**

	B: Channel Diagnosis				
<ol> <li>Diagnostics of communication link using the WinCC Channel Diag program.</li> </ol>			Channel Diagnosis		
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Tools $\rightarrow$ Channel Diagnosis.				
	Channel Diagnosis				
2	2 The WinCC Channel Diagnosis program is opened. The Channels/Connections tab register displays exact information				
	status of each configured connection. The default value for display upd is one second. The update cycle may be changed in the lower input fiel				
	🔹 WinCC Channel Diagnosis		? 🛛		
	Channels/Connections Configuration		🗖 Always on top		
	B✓ SIMATIC S7 PROTOCOL SUITE ↓-✓ S7_PB_01	Counters State Error Code Error Count Unit Device PDU Size Request Counter Response Counter Own Cycles AS Cycles Max. AS Cycles ConnectionEstablishMode ForceConnectionState ForceConnectionState ProjectedConnectionAddress	Value           ready           none           0           PROFIBUS           CP_L2_1:           480           6           28           0           1           32           ready           automatic           up           projected           L2,3 0,,0,3,02		
3	In case a connection problem exists, the right window will display in the				
	Error Code line a value indicatin	g a more specific ca	use of the problem.		
	More detailed information on error codes may be obtained by clicking T R on the Error Code entry. This will display a description of the respective error code. Furthermore, possible error causes are displayed.				
	Error 7001 - CEC_STPCHK Communication aborted due to stop check. • The connection was aborted by the channel because a VMD state of the CPU - STOP, HOLD or DEFECTIVE - was detected.				

# 3.7 Redundant Communication with SIMATIC Highly Available Through CP 1613

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on <a href="http://support.automation.siemens.com/WW/view/en/21320307">http://support.automation.siemens.com/WW/view/en/21320307</a>).

There is the option of copying the following components to hard disk:



The STEP7 project to be generated.



WinCC\_Redundancy

The WinCC project to be generated.

This chapter describes in detail commissioning of an H Station and commissioning of the communication link to a WinCC Station. The communication link is implemented by using the redundant Industrial Ethernet.

#### **Summary on Example Design**



On the computer side, the Ethernet network connection is established using a CP 1613 communication processor.

Both PLCs SIMATIC S7 are equipped with a central module CPU 417-4 H. Connection to the network is established using two CP443-1 communication processors. SIMATIC NET software must be installed to configure these communication processors.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Commissioning of CP 1613 communication processor
- Generation of STEP7 project S7\_Redundancy
- Generation of WinCC project WinCC\_S7\_Redundancy
- Diagnostics of communication link

#### **Required software**

Name	Description
SIMATIC NET	Using the installation from SIMATIC NET, all drivers are installed.
STEP7	STEP7 Software with option package NCM for Industrial Ethernet to generate the STEP7 project.
WinCC	WinCC with SIMATIC S7 Protocol Suite communication driver to generate the WinCC project.

#### Required hardware on computer

Name	Description
Communication Processor	Two communication processors CP 1613 to establish connection to communication processor in PLC.

#### Required hardware in the PLC

Name	Description	
Rack	Module rack UR-H.	
Power supply unit	Power supply unit PS 407-4.	
Central module	Central module CPU 417-4.	
Communication Processor	Communication processor CP 443-1.	

#### 3.7.1 Commissioning of CP 1613 Communication Processor

The following description shows detailed configuration steps necessary for successful installation of the CP 1613 communication processor. It is assumed that SIMATIC NET is already installed on your configuration computer. Furthermore, it is assumed that the communication processor was previously installed.

#### **Summary of Configuration Steps**

The following is a summary list of all necessary configuration steps for commissioning of the CP 1613 communication processor.

- A: Configuration of communication processor
- B: Assigning of access point
- C: Testing of communication processor

## A: Configuration of communication processor

	A: Configuration of communication processor				
1	In Program Start → SIMATIC → SIMATIC NET → Settings → "Setting PC station", the communication processor may be configured. In menu "General", the module operation mode must be set to PG Operation.				
	Elle Action View Help				
	PC Station				
	SIMATIC NET Configuration     Applications	Type of module:	Ethernet		
	Modules     OP1613	Mode of the module:			
	General		Configured mode		
	Address	Interface profile for:	CP1613		
		CP1613(RFC1006) CP1613(ISO)	<ul> <li>Sector</li> </ul>		
		Module reaction:			
	CP simulation	Restart			
	Apply Cancel Help				


	A: Configuration of communication processor					
4	In the General menu, the Mode. This change leads In the example, the index changes are saved using confirmed by clicking OK.	operation mode of to a display of the is set to 1 and the the Apply button. T	the module is set to Configured Index and Module Name fields. module name to CP 1613. The The displayed note may be			
	Configuration Console					
	<u>File Action View Help</u>	Eile Action View Help				
	PC Station	General Module properties				
	Applications Modules	Type of module: Mode of the module:	Ethernet			
			Configured mode			
			Index: 1			
		Interface profile for	CD1612			
		CP1613(BEC1006)	CFIEI3			
		CP1613(ISO)				
		Module reaction:				
		Restart				
	Access points	Apply Cance	el Help			

## B: Assigning of access point

	B: Assigning of access point		
1	In Program Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC NET $\rightarrow$ Settings $\rightarrow$ "Setting PC Station", the just installed communication processor must be assigned the access point CP_H1_1: .		
	The access point CP_H1_1: is the default access point used for TCP/IP communication in WinCC. It was created automatically during installation of SIMATIC NET.		
	Configuration Console		
	<u>File A</u> ction <u>V</u> iew <u>H</u> elp		
	C Station     Access points     Access points     Access point     Access point     Access point     Access point     Access point     Access point		
	Applications     Green Access point Interface parameter assignment Module		
	Access points		
	S7ONLINE PC internal (local) KBUS		
	₩CP_H1_1:		
	T S FWL_LOAD		
	In the upper field, select the CP1613(RFC1006) entry by using the pull- down menu. This concludes the assignment between access point and communication processor.		
	New access point		
	Access point		
	Access point:		
	CP-TCPIP:		
	Associated interface parameter assignment:		
	CP1613(RFC1006)		
	Module:		
	CP1613		
	If you change an access point of a PROFIBUS module to another interface parameter assignment of the same module, all other access points that point to the old interface parameter assignment will be remapped to the new interface parameter assignment.		
	OK Cancel Help		

## C: Testing of communication processor

	C: Testing of communication processor				
1	Testing the proper installation of the CP 1613 communication processor using the "Setting PC Station" program.				
	<ul> <li>This is started by clicking Start → SIMATIC → SIMATIC NET → Settings → Setting PC Station.</li> <li>In order to test the protocols, select the "Protocol" folder of the respective module. In our case it is module CP 1613.</li> <li>On the right side of the window, the CP 1613 Industrial Ethernet dialog is displayed.</li> </ul>				
	Configuration Console         Ele Action Yew Help         Image: Structure of the structure o				
2	Testing of proper installation used the "Test" buttons. Upon successfully tested protocols, a dialog is displayed as follows.				
	Image: Second				

	C: Testing of commu	nication processor			
3	In order to check the Send/Receive function, open the directory SR Test. Again, in order to test, operate the buttons.				
	Configuration Console				
	PC Station	SR test       Test page for the Send/Receive function         Version:       V 6.620.2003.3131         Test ISO       ··>         Test ISO       ··>         Test RFC1006       ··>			
		Help			
4	If diagnostics yields a negative result, the cause of the error must be found, and the error must be corrected. Some tools and tips on this subject may be found in chapter "Is the computer communication module operable?". This test may also be performed using the "Setting PG/PC Interface" program, however, the "PG Operation" operation mode is required to do so.				

#### 3.7.2 Creating STEP7 Project S7\_Redundancy

The following description shows in detail the necessary configuration steps for creating and commissioning of STEP7 project S7\_Redundancy.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project S7\_7 Redundancy.

- A: Installation of hardware
- B: Creating STEP7 project
- C: Configuring hardware
- D: Loading hardware configuration for SIMATIC
- E: Configuring PC station
- F: Loading hardware configuration into CP1613
- G: Creating connection to WinCC application
- H: Testing of hardware configuration
- I: Creating STEP7 program
- J: Testing of STEP7 program

#### A: Installation of hardware

	A: Installation of hardware
1	Assemble the used modules on the module supports.
	In the current example, these are two power supply units PS 407 10A, two central modules CPU 417-4 with two H-Sync modules each, as well as two communication processors CP 1613.
	Establish the connection between programming device and programming interface of the central module.
	Establish the connection between the computer's communication processor CP 1613 to communication processor CP 443-1 in the PLC.

## **B: Creating STEP7 project**

	B: Creating STEP7 project			
1	Creating a new STEP7 project in SIMATIC Manager.			
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ SIMATIC Manager.			
	SIMATIC Manager			
2	The SIMATIC Manager opens.			
	Using menu item File $\rightarrow$ New, the dialog to specify parameters of a new STEP7 project opens.			
	Enter the name of the newly created project in the Name field. Names of STEP7 projects created as part of this manual must start with the character sequence S7. Furthermore, they contain a description of the communication type used. The current example has the name S7_Redundancy.			
	By default, projects are saved in directory C:\PROGRAM FILES\SIEMENS\STEP7\S7proj. However, this may be changed at any time by clicking the Browse button.			
	The New dialog is closed by clicking the OK button			
	New Project       Image: Storage path         User projects       Libraries         Name       Storage path			
	☐ Add to current multiproject			
	Name: <u>Type:</u>			
	Project			
	Storage location (path):			
	C:\Program Files\Siemens\SIMATIC.NCM\s7proj <u>B</u> rowse			
	Cancel Help			

## C: Configuring hardware

	C: Configuring hardware				
1	The new project is displayed in SIMATIC Manager.				
	Hardware must be configured for it. Three components are needed. These				
	are a SIMATIC H station, the Industrial Ethernet for network access, and a				r network access, and a
	SIMATIC PC sta	tion.			
	These componer	nts are o	htained in SI	MATIC Mana	ger using $\mathcal{A}_{R}$ on the
	name of project 9	S7 Redu	indancy and	Insert New P	roject $\rightarrow$ SIMATIC
	station Insert Ne	w Obiec	t - SIMA	TIC PC static	on as well as Insert New
	$Object \rightarrow Ind$	ustrial E	thernet.		
	S7 Bedundar				
		Cut		Ctrl+X	
		Copy	/	Ctrl+C	
		Past	e	Ctrl+V	
				D -l	
		Delei		Del	
		Inse	rt New Object	۱.	SIMATIC 400 Station
		PLC		+	SIMATIC 300 Station
		Repa	ame	F2	SIMATIC H Station
		Obie	ct Properties	Alt+Return	SIMATIC PC Station
					Other station
					SIMATIC 55
					MPI
					PROFIBUS
					Industrial Ethernet
					PTP
					S7 Program
					M7 Program
-					
2	The two components just added are displayed in the right window of				
		er.			
	SIMATIC H-Station(	1]	🖳 Pl	Station *	MPI(1) Ethernet(1
	Using <sup>2</sup> On com	nponent	SIMATIC H S	Station(1) in t	ne right window will
	display the Hard	ware iter	n. Using ິປີເ	O on the Hard	dware item or $\checkmark \Box R$ and
	Open Object on i	it will sta	rt the HWCo	nfig program.	
	📲 Hardware			1.	
	Ope	en Object	Ctrl+Alt+O		
	Cut		Ctrl+X		
	Cop	y .	Ctrl+C		
	Pas	te	Ctrl+V		
	Dele	ete	Del		
		ame	E2		
		ane	Γ4	1	

	C: Configuring hardware			
3	The HWConfig program opens.			
	It is used to exactly specify the hardware used in the PLC, and to configure its properties.			
	HW Konfig			
4	Using the subsequently displayed button in the toolbar of HWConfig program, the hardware catalog opens. This is used to select the required hardware components.			
	Catalog			



	C: Configuring hardware		
6	The HWConfig program displays the presently still empty module rack. These have been assigned rack numbers 0 and 1.		
	(0) UR2-H 1 2 3 4 5 6 7 7 0 1 1 1 2 3 4 5 6 7 7 0 1 1 1 1 2 3 4 5 6 6 7 7 0 0 0 0 0 0 0 0 0 0 0 0 0		
7	Arrangement of additional hardware components in module support. This uses Drag&Drop for the desired components from the hardware catalog in their respective slots in the module support.		
The example uses a power supply unit PS 407 10A. This is inserted 1. A power supply unit of this type uses two slots.			
	The example uses a CPU 417-4 H as central module. This is inserted in slo 3. H-Sync modules are used at the interfaces. In configuring the connection in the WinCC project, the slot number of the central module is an additional parameter to be set.		
	Furthermore, a CP 443-1 communication processor is needed. However, this is available from the hardware catalog only if the NCM S7 Industrial Ethernet option package has been installed. if the CP 443-1 communication processor is inserted into the module support, its properties dialog opens.		

	C: Configuring hardware		
8	The property dialog of the Ethernet interface of CP 443-1 is displayed. Use the Parameter tab register in the MAC address field to set the desired Ethernet address of the communication processor. The current example specifies this as 08.00.06.01.00.00. Use the lower selection field Subnet to assign the entry Ethernet(1) to the communication processor. Close the dialog with OK.		
	Properties - Ethernet interface CP 443-1 (R0/S4)         General Parameters         MAC address:       08-00-06-01-00-00         If a subnet is selected, the next available addresses are		
	✓ IP protocol is being used         IP address:       140.80.0.1         Subnet mask:       255.255.0.0         ✓ Use router         Address:       140.80.0.1		
	not networked       Image: Comparison of the second		
	OK Cancel Help		



## D: Loading hardware configuration into SIMATIC

	D: Loading hardware configuration into SIMATIC		
1	Hardware configuration for the SIMATIC H station created in the HWConfig program must be transferred to the PLC.		
	This is done using the toolbar button displayed in the following.		
	<b>Š</b>		
	Download to Module		
2	A dialog opens which allows selection of components to be loaded.		
	Only one CPU may be loaded at any time. Please make sure that any		
	loading of the central module is possible only in operational switch positions		
	STOP of RUN-P. Close the dialog with OK.		
	Select Target Module		
	To which H CPU do you want to download?		
	CPU 417-4 H 0 3		
	CPU 417-4 H(1) 1 3		
	OK Cancel Help		
3	The Select Node Address dialog is displayed.		
	Here you state which node address is used for communication between		
	STEP7 software and central module.		
	Close the dialog with OK.		
4	Configuration data are now transferred to the PLC. Individual modules may		
	have to be put into the STOP status.		
	Steps 1 to 3 must be repeated in order to load the other CPU named CPU		
	417-1 H(1), including configuration data.		
	The HWConfig program may be terminated.		
	Components newly added are displayed in SIMATIC Manager for SIMATIC		
	E-M SIMATIC H-Station(1)		
	📜 🛛 🔛 CPU 417-4 H		
	🗄 🌉 CPU 417-4 H(1)		
	⊞·न <b>ड</b> CP 443-1(1)		

## E: Configuring PC Station

	E: Configuring PC Station				
1	Using <sup>1</sup> D on component PC Station in the right window will display the				
	Hardware item. Using ´ÜD on the Hardware item or ´ÜR and Open Object on it will start the HWConfig program.				
	Hardware	Open Obie		1	
		Open Obje			
		Cut	Ctrl+X Ctrl+C		
		Paste	Ctrl+V		
		Delete	Del		
		Rename	F2		
2	The HWCo	onfig program	n opens.	97 	
	It is used to	exactly spe	ecify the hardwa	are used in the PLC, and to	
	configure it	s properties			
	HW Konfig				
	- The modul	e rack is aut	omatically inse	rted into the program.	
	3				
	6		~		
3	Lising the s	subsequently	/ displayed but	on in the toolbar of HWConfig	
5	program, the hardware of	ne hardware components.	catalog opens	This is used to select the required	



	E: Configuring PC Station
6	The property dialog of the Ethernet interface of CP 1613 is displayed. Use the Parameter tab register in the MAC address field to set the desired Ethernet address of the communication processor. In the current example, this is set as 08.00.06.6D.98.78 for the first CP 1613, and set as 08.00.06.6D.98.79 for the second CP 1613. In configuring the connection in the WinCC project, this Ethernet address is an additional parameter to be set. Use the lower selection field Subnet to assign the entry Ethernet(1) to the communication processor. Close the dialog with OK.
	Properties - Ethernet interface CP 1613 (R0/S1)
	General       Parameters         Image: Set MAC address / use ISQ protocol         MAC address:       08-00-06-6D-98-78         If a subnet is selected, the next available address is suggested.
	Image: Protocol is being used         IP address:       140.80.0.4         Subnet mask:       255.255.0.0         Image: Description of the second s
	··· not networked ···     New       Ethernet(1)     Properties       Dejete
	OK Cancel Help
7	In the following, the fully configured hardware design of the example is shown.
8	Settings made must be saved in the HWConfig program and must be compiled in order to load the data onto the module. This is done using the toolbar button displayed in the following.

## F: Loading hardware configuration into CP 1613

	F: Loading	j hardwa	re confi	guration	into C	P 161	3		
1	The hardware configuration created in the HWConfig program must be transferred to the PC station. In order to implement this, the name of the PC station in SIMATIC Manager must be identical with the name in Station Configuration Editor. The example uses the name PC Station. Equally, the sequence of components in HWConfig must be identical with the indices.								
	The Station Configuration Editor is started using Start → Station								ו
	Conliguration	on Editor	Editor [(						
	Components								
	Station	Prestation	*		Mode:	BU	NP		
	Station.	FLStation			moue.		N_F		
	Index 1		1	Type CP 1613		Ring	Status	Run/Stop	
	2		, 1(1)	CP 1613				ŏ	
	3	WinCC A	Application	WinCC App	olication		R	õ	
	4	-					Callon,		
	5								
	6								
	7								
	8								-
	10								
	11								
	12								
	13								
	14								
	15								
	<								>
	1								
		<u>v</u> dd	Ē	dit		<u>)</u> elete		Ring <u>O</u> N	
	<u>S</u> tatio	n Name	Import	Station				Disab <u>l</u> e Stal	ion
	<u>о</u> к	]						<u> </u>	
2	Loading int	o the PC	station in	e facilitat	ad usin	a the	toolbar	button of	the
۷	HWConfig	program	describe	d in the f	ollowin	g. g.	looidal		
	<b>1</b>								
	いて Download t	o Module							

	F: Loading hardware configuration into CP 1613							
3	A dialog opens which allows selection of components to be loaded. Everything must be selected in the current example. Close the dialog with OK.							
	Select Target Module							
	Target Modules:							
	CP 1613 1 CP 1613(1) 2 WinCC Application 3 Station Manager 125							
Select <u>All</u>								
	OK Cancel Help							
4	The Select Node Address dialog opens.							
	Here you state which node address is used for communication between STEP7 software and central module.							
	Close the dialog with OK.							
5	Configuration data are now transferred to the PLC. Individual modules may have to be put into the STOP status.							
	The HWConfig program may be terminated.							
	Components newly added are displayed in SIMATIC Manager for SIMATIC H-Station(1).							
	S7_Redundancy         SIMATIC H Station(1)         Image: SIMATIC H Station(1)							

#### G: Creating connection to WinCC application



	G: Creating connection to WinCC application
3	The Insert New Connection dialog is displayed. In the upper window, select the entry for both CPUs of the SIMATIC H station. In the Connection - Type field, select the Highly Available S7 Connection entry using the pull-down menu. Close the dialog with OK.
	Insert New Connection
	Connection Partner
	In the current project S7_Redundancy SIMATIC H Station(1) CPU 417-4 H/CPU 417-4 H(1) (Unspecified) All broadcast stations All multicast stations In unknown project
	Project:       S7_Redundancy         Station:       SIMATIC H Station(1)         Module:       CPU 417-4 H/CPU 417-4 H(1)
	Connection         Iype:       S7 connection fault-tolerant         Image: Display properties before inserting
	OK Apply Cancel Help

	G: Creatin	g conne	ction to W	inCC app	lication				
4	The Properties - Highly Available S7 Connection dialog opens. Here you must check again if the connection was configured properly. Close the dialog by clicking the OK button.								
	Properties - fault-tolerant \$7 connection								
	General Status	Information							
	Local Connection End Point     Eixed configured dynamic connection     De-way     Establish an active connection     Send operating mode messages				Connection identification Local ID: S7 connection_1 VFD Name: Application				
	Connection Pa	Logal			Partner				
	End Point:	Application		-	CPU 417-4 H (R0/S3)				
	Local interfa	JUP 1613	Address	Subnet	Partner interface	Address			
	CP 1613 CP 1613		08-00-06-6D-98-78 08-00-06-6D-98-73	Ethernet(1) Ethernet(1)	CP 443-1 (R0/S5) CP 443-1(1) (R1/S	08-00-06 5) 08-00-06	-1F-F0-11 -1F-F0-32		
						Add <u>r</u> ess	Details		
	Redundancy	ax. CP redundan	cy (with 4 connection	a paths)					
	ОК					Cancel	Help		
5	The connection be saved a toolbar but	ction has table of nd comp ton of the	now been the NetPro biled in orde NetPro pr	establishe program. er to be loa ogram as o	d and is displa The current co ded into the m displayed in th	ayed in the onfiguration odule. Thi e following	n must nov s uses the J.		
	Save and	Compile							
6	Using the c module.	lisplayed	l toolbar bu	ttons, the o	changes must	be loaded	into the		
	Download t	<mark>o Module</mark>							



## H: Testing of hardware configuration

	H: Testing of hardware	configuration	
1	Testing of hardware conf In a SIMATIC H station, H CPUs are turned into ope switch, there is constant one CPU is brought into to CPU will assume the task the RUN status will assum the Slave turns into Mast the CPUs are switches in switches, only the status LEDs are supposed to be If this is not the case, an using the steps described	figuration decision both CPUs run redundantly. This means if both erational status RUN or RUN-P using the key synchronization between data from both CPUs the STOP status, for whatever reason, the oth sk of the failed CPU. The CPU which first reach ime the Master function. If the Master CPU fails ter. This ascertains a highly available operation nto the RUN position using the operational LEDs indicating the RUN status, and the mod e lit.	n er nes s, n. If lule also
	be implemented even if r allow to recognize non-cr	no error is indicated by the status LEDs. This verifical errors and faulty configurations.	vill

n. resund of n	ardwara configura	tion				
0	aruware configurat					
l esting of configuration in central module.						
This uses the Module Information dialog in SIMATIC Manager. This dialo						
s opened usina	<sup>-</sup> <sup>C</sup> R on the entry c	of the central modu	le in the left v			
and Target System   Module Information						
The Module Info	prmation dialog of th	e central module is	displayed			
The General tak	register displays y	arious general data	of the centra			
module. The Sta	atus field will displays	the current Module	e Information			
as existing error	s, if any.					
The Diagnostic	Buffer tab register d	isplay detailed info	rmation on ex			
errors and their	correction.					
The dialog is clo	sed by clicking the (	Close button				
	Jood by onorang the					
<b>O</b> Module Inform	ation - CPU 417-4 H					
Path:  Test_DH\SIM	ATIC 400\CPU 414-2 DP	Operating mode of the CP Not a force job	U: 🕕 RUN			
Time Sustem	Performance Data	Communication	Stacks			
General	Diagnostic Buffer	Memory	Scan Cycle Time			
Description:	CPU 417-4 H	System Identification:	SIMATIC 400			
<u>V</u> ersion:	Order No. / Description	Component	Version			
			1 WIWIWII			
	6ES7 417-4HL01-0AB0	Hardware	1			
	6ES7 417-4HL01-0AB0	Hardware Firmware	1 V 3.1.0			
Rack:	6ES7 417-4HL01-0AB0	Hardware Firmware Address:	1 V 3.1.0			
Rack: Slot:	6ES7 417-4HL01-0AB0	Hardware Firmware Address: ····	1 V 3.1.0			
Rack: Slot:	6ES7 417-4HL01-0AB0	Hardware Firmware Address:	1 V 3.1.0			
Rack: Slot: Status:	6ES7 417-4HL01-0AB0	Hardware Firmware Address:	1 V 3.1.0			
Rack: Slot: <u>S</u> tatus:	6ES7 417-4HL01-0AB0	Hardware Firmware Address:	1 V 3.1.0			
Rack: Slot: <u>S</u> tatus:	6ES7 417-4HL01-0AB0	Hardware Firmware Address:	1 V 3.1.0			
Rack: Slot: <u>S</u> tatus:	6ES7 417-4HL01-0AB0	Hardware Firmware	1 V 3.1.0			
Rack: Slot: <u>S</u> tatus:	6ES7 417-4HL01-0AB0	Hardware Firmware Address:	1 V 3.1.0			
Rack: Slot: <u>S</u> tatus:	6ES7 417-4HL01-0AB0	Hardware Firmware Address:	1 V 3.1.0			

	H: Testing of	hardware configura	ation					
3	Testing of com	munication processo	or configuration.					
	This uses the Module Information dialog in SIMATIC Manager. This dialog							
	is opened using $\mathcal{A}$ on the entry of the communication processor in the							
	left window and Target System $\rightarrow$ Module Information							
	The Medule In	formation dialog of the		aaaaar ia				
	displayed	formation dialog of th	te communication pr					
	The General ta	ab register displays v	arious general data	of the module.				
	A dialog for mo be opened usir	ore detailed diagnosting the Special Diagn	ics of the communication of the communication.	ation processor ma				
	🔞 Module Inform	nation - CP 443-1						
	Path: S7_Redund Status: OK	ancy\SIMATIC H-Station(1)\CP	Operating mode of the CPL Operating mode of the modu	l: 🐠 RUN Jle: 🐠 RUN				
		C Burrer		1				
	Description:	CP 443-1	System Identification:	SIMATIC 400				
	<u>V</u> ersion:	Order No. / Description	Component	Version				
		6GK7 443-1EX02-0XE0	Hardware	1				
			Firmware	V 5.2.0				
	Rack:	0	Address: I 8187					
	Slot:	5						
	<u>S</u> tatus:	Module available and o.k.						
	Class	Undate Drint	Special Disgregation	H ala				

	H: Testing of ha	rdware configuration						
4	The NCM S7 Industrial Ethernet Diagnostics dialog is displayed. The CP Information tab register displays general information on the module. Among others, the set network address may be checked. The dialog is closed by clicking the Close button. The Module Information dialog may also be closed by clicking the Close button.							
	NCM S7 Diagnostics - Diagnostics Operating Mode Modules Diagnostic Buffer Diagnostic Buffer Connections	CP 443-1 0/6 08-00-06-92-18-C8 OI         Diagnostic Buffer View Options Help         Image: Comparison of the system of the syst	Address of gateway: Address of dest. station network attachment: Slot:	 08-00-06-92-18-C8 5				
	Press F1 for help			1.				

## I: Creating STEP7 program

	I: Creating ST	EP7 program					
1	Creating STEP	7 program					
	For the current example project, only one operations block, OB1, and one data block are needed. OB1 is available by default. The needed data block						
	must first be created. This is done in SIMATIC Manager using $\checkmark \square R$ on the Blocks subitem of entry S7 program(1) of the configured central module and Insert New Object $\rightarrow$ Data Block.						
	The property di the block and c	alog of the data block op lose the dialog by clickin	ens. Enter g OK.	r DB75 as the name for			
	⊡- I CPU 416-1 ⊡- ഈ S7 Program(1) ഈ Sources						
		Cut	Ctrl+X				
		Сору	Ctrl+C				
		Paste	Ctrl+V				
		Delete	Del				
		Insert New Object		Organization Block			
		PLC		<ul> <li>Function Block</li> </ul>			
		Rewiring		Function			
		Compare Blocks		Data Block			
		Reference Data		Data Type			
	Check Block Consistency						
		•					
		Rename	F2				
		Object Properties	Alt+Return	1   ·			
		Special Object Properties		•			

	I: Creating STEP7 program								
2	The newly created data block DB75 is displayed in the right window of the project. Using <sup>1</sup> D on it or using <sup>1</sup> R and Open Object, the contents of the block may be programmed. The program KOP/AWL/FUP is started.								
	- DBZ								
		Open Object	Ctrl+Alt+O						
	-	Cut	Ctrl+X	_					
		Сору	Ctrl+C						
		Paste	Ctrl+V						
		Delete	Del						
		Insert New Object		•					
		PLC		•					
		Compare Blocks							
		Reference Data		•					
		Print		•					
		Rename	F2						
		Object Properties	Alt+Return						
	Ļ	Special Object Properties		•					

	I: Creatin	g STEP7 pro	ogram			
3	The progr	am KOP/AW	L/FUP is displayed.			
	The New Data Block dialog appears and must be acknowledged by clicking OK.					
	KOP AWL FUP					
4	Programm	ning of DB75.				
	Here, two determine	tags of lengt d in OB1 and	h 16 bits are created written to another	d. Their sum is sup tag of length 16 bit	posed to be s.	
	Furthermo	ore, two tags incremented	of length 16 bits are in OB1.	e created, whose va	alues are to be	
	Tags crea WinCC pr created.	ted in data bl oject. To do s	lock DB75 are supp so, WinCC tags with	osed to be visualiz a corresponding ad	ed in the dresses are	
	The follow	ing shows th	e completely progra	ammed data block	DB75.	
	■ DB75	S7_IEH\SIM	ATIC 400(1)\CPU 41	6-1		
	lddress	Name	Туре	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	The data I This is do make sure operationa	block must be ne using the e that any loa al switch posi	e saved. Furthermon toolbar button displa ding of the central r tions STOP or RUN	re, it must be loade ayed in the followin nodule is possible I-P.	ed into the PLC. g. Please only in	

Drogrop		. i piogra	am
Flogran	nming o	f OB1.	
This mu	st be or	pened befor	prehand in program KOP/AWL/FUP.
Initially	two vali	ues creater	d in DB75 are added and the result is again sa
in DB75			a in DB75 are added and the result is again sa
Netzwe	erk 1	: Additi	lon
Addin	g two	16-Bit	Values
The r 16-Bi	esult t Val:	is stor ue	red in another
	OPN	DB	75
	L	DBW	0
	L	DBW	2
	+I		
	Т	DBW	4
Next, th	e count	of a value	created in DB75 is implemented every second
Netwo	rk 2:	Second	Cycle
Gener	ation	of a se	econd cycle at M 0.0
COULCE			
Gener			
	AN	M	0.0
	AN L	M s5r#1s	0.0 3
	AN L SD	M S5T#1S T	0.0 5 1
	AN L SD A	M S5T#1S T T	0.0 3 1 1
	AN L SD A =	M S5T#1S T T M	0.0 3 1 1 0.0
Netwo	AN L SD A =	M S5T#1S T M Countin	0.0 3 1 1 0.0 ng in a second cycle
Netwo	AN L SD A = r <b>k</b> 3}:	M S5T#1S T M Countin value i	0.0 3 1 1 0.0 ng in a second cycle in a second cycle
Netwo Count At 10	AN L SD A = rk 3}: ing a 000,	M S5T#1S T M Countin value i reset to	0.0 3 1 1 0.0 ng in a second cycle in a second cycle o 0
Netwo Count At 10	AN L SD A = rk 3: ing a 000,	M s5T#1s T M Countin value i reset to M	0.0 3 1 1 0.0 ng in a second cycle in a second cycle o 0
Netwo: Count At 10	AN L SD A = rk 3: ing a 000, : AN JC	M S5T#1S T M Countin value i reset to M M001	0.0 3 1 1 0.0 ng in a second cycle in a second cycle o 0
Netwo: Count At 10	AN L SD A = rk 3}: ing a 000, AN JC L	M S5T#1S T M Countin value i reset to M M001 DBW	0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 0.0 6
Netwo: Count At 10	AN L SD A = rk 3}: ing a 000, AN JC L L	M S5T#1S T M Countin value i reset to M M001 DBW 1	0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 0.0 6
Netwo: At 10	AN L SD A = rk 3: ing a 000, AN JC L L +I	M S5T#1S T M Countin value i reset to M MOO1 DBW 1	0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 0.0 6
Netwo: At 10	AN L SD A = rk 3}: ing a 000, AN JC L L L H T	M S5T#1S T M Countin value i reset to M MOO1 DBW 1 DBW	0.0 3 1 1 0.0 ng in a second cycle in a second cycle 0.0 0.0 6 6
Netwo At 10	AN L SD A = rk 3}: ing a 000, AN JC L L +I T L	M S5T#1S T T M Countin value i reset to M M001 DBW 1 DBW 1	0.0 3 1 1 0.0 ng in a second cycle in a second cycle 0.0 0.0 6 6
Netwo Count At 10	AN L SD A = rk 3}: ing a 000, AN JC L L +I T L <i< td=""><td>M S5T#1S T T M Countin value i reset to M M001 DBW 1 DBW 1 0000</td><td>0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 0.0 6 6</td></i<>	M S5T#1S T T M Countin value i reset to M M001 DBW 1 DBW 1 0000	0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 0.0 6 6
Netwo Count At 10	AN L SD A = rk 3: ing a 000, ing a 000, L L L L L L L JC	M S5T#1S T T M Countin value i reset to M M001 DBW 1 DBW 10000 M001	0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 6 6
Netwo Count At 10	AN L SD A = rk 3}: ing a 000, C L L L L L L L L L L L L L	M S5T#1S T T M Countin value i reset to M M001 DBW 1 DBW 1 0000 M001 0	0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 6 6
Netwo: Count At 10	AN L SD A = rk 3}: ing a 000, C L L L L L L L L L T L JC L T	M S5T#1S T M Countin value i reset to M M001 DBW 1 DBW 10000 M001 0 DBW	0.0 1 1 0.0 ng in a second cycle in a second cycle 0.0 6 6 6

	I: Creati	ng STEF	97 progra	m			
	Next, the count of a value created in DB75 is implemented for each run of						
	OB1.						
	Network 4: Counting in the cycle time						
	Count	ing a	value e	ach time the OB is executed			
	At 10	000, r	eset to	0			
		L	DBW	8			
		L	1				
		+I					
		Т	DBW	8			
		L	10000				
		<i< th=""><th></th><th></th></i<>					
		JC	M002				
		L	0				
		Т	DBW	8			
	M002:	NOP	0				
7	The OB1 the respo	l block m	nust be sav olbar butto	ved and loaded into the PLC. This is done using n.			
	Thus, the program	e STEP7 may be	' project is terminated	complete and ready to run. The KOP/AWL/FUP			

## J: Testing of STEP7 program

	J: Testing of STEP7 program							
1	Testing	of prog	gram u	ısir	ng STEP	7 software.		
	A tag table is created for this. This is done in SIMATIC Manager using $\checkmark$ R on the entry of the configured central module and Target System $\rightarrow$ Monitor / Modify Tag.							
		J 416-1 S7 Prc Sc Bl Bl -	Cut Copy Paste Delete Insert I PLC Run-Tir Renam Object Special	ne F e Proj Obj	Properties perties ject Properti	Ctrl+X Ctrl+C Ctrl+V Del F2 Alt+Return es	Copy RAM to RO CPU Messages Monitor/Modify V Hardware Diagno Module Informati Operating Mode. Clear/Reset	M ariables ostics ion Ctrl+D Ctrl+I
2	An edito In the fo are ente	r is dis llowing red. <b>T 20</b>	played , the d	d to cor	o create ann plete ta	and use such a g table is show	a tag table. m. All tags cr	eated in DB75
		Addres			Sumbol	Dicplay format	Status value	Madifu ualua
	1	DB75.0	SS NRW	0	Бушрог	Display formac	12	Moully value
	2	DB75.0	)BW	2			12 12	12
	3	DB75.0	)BW	4			12 24	16
	4	DB75.0	)BW	6		DEC	1083	
	5	DB75.0	)RW	8		DEC	1703	
	6			Ĵ				

	J: Testing of STEP7 program
3	Monitoring current tag values.
	By clicking the toolbar button shown in the following, the current values of respective tags in the PLC are displayed in the Status Value column.
	Monitor variable.
	Controlling of tag values.
	In the Control Value column, values may be entered. By clicking the toolbar button displayed in the following, these values are written to the corresponding tags in the PLC.
	Please make sure that any controlling of tags is possible only in operational switch position RUN-P.
	Modify variable
4	The so-created tag table may now be saved.
	In the current example, it is save under the name VAT1. If the program function in the PLC has now been checked, the tag table may be closed. Thus, configuration of the STEP7 project is complete and SIMATIC Manager may be terminated.
	H VAT1

# 3.7.3 Creating WinCC Project WinCC\_Redundancy

The following description shows in detail the necessary configuration steps for creating and commissioning of WinCC project WinCC\_Redundancy.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project WinCC\_Redundancy.

- A: Creating WinCC project
- B: Establishing connection
- C: Creating WinCC tags
- D: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project			
1	Creating a new WinCC project in WinCC Explorer.			
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.			
	WinCCExplorer			
2	WinCC Explorer is opened.			
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.			
	The following example project creates a single-user project.			
	Finish the dialog with OK.			
	WinCC Explorer			
	Create a New Project			
	Single-User Project			
	■ 🗸 ⊂ Multi-User Project			
	Client Project			
	C Open an Existing Project			
	Cancel			
	A: Creating WinCC project	t		
---	---	---	---	--
3	The Create a New Project d	lialog opens.		
	Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_Redundancy.			
	Furthermore, in the Project Path field, the storage location of the new project must be set.			
	The Create a New Project d	lialog is closed by clicking the (	Create button.	
	Create a new project		? 🔀	
	Project Name: WinCC_Redundancy New <u>S</u> ubfolder: WinCC_Redundancy You can use this dialog box to create a new WinCC project.	Project Path c:\\wincc\winccprojects <u>Folder:</u> [] Drive: Drive:	Cr <u>e</u> ate <u>C</u> ancel <u>H</u> elp	

# **B: Establishing connection**

	B: Establishing connection			
1	The new project is displayed in WinCC Explorer.			
	Installing of required communication driver. This is done by clicking ${}^{\checkmark}\!$			
	E IIII Tag Management			
	Properties			
2	The Add New Driver Dialog opens.			
	It offers a selection of all communication drivers available for installation. For communication with SIMATIC S7-H using Industrial Ethernet, the SIMATIC S7 Protocol Suit.chn driver is required. It must be selected in the dialog. Close the dialog with Open.			
	Add new driver			
	Look jn: 🔁 bin 💽 🗲 🗈 📸 🎹 -			
	PDLCacheIs SIMATIC S5 Ethernet TF.CHNOPC.chnIs SIMATIC S5 Profibus FDL.chnProfibus DP.chnIs SIMATIC S5 Programmers Port AProfibus FMS.chnIs SIMATIC S5 Serial 3964R.CHNSIMATIC 505 TCPIP.chnIs SIMATIC S7 Protocol Suite.chnSIMATIC S5 Ethernet Layer 4.CHNIs SIMATIC TI Ethernet Layer 4.CH			
	File name:         SIMATIC S7 Protocol Suite.chn         Open			
	Files of type: WinCC Communication Driver (*.chn) 💌 Cancel			

	B: Establishing connection		
3	The newly added driver SIMATIC S7 Protocol Suite displays as a subitem of Tag Management.		
	The driver contains a channel unit with the name Named Connections. A		
	new connection must be created for it. This is done using ${}^{\checkmark}\!$		
	SIMATIC S7 PROTOCOL SUITE         Industrial Ethernet         Industrial Ethernet (II)         Industrial Et		
4	The property dialog of the connection opens. Enter the name of the new connection on the General tab register. The current example uses Redundancy.		
	Connection properties		
	General       Mame:     Redundancy       Unit:     Named Connections		
	DIETRICH-XP-02		

	B: Establishing connection	
5	Under Properties, in the Application Name field, WinCC Application m specified using the pull-down menu. The WinCC application is availab only after error-free loading of the PC station. A name must be entere the Connection Name field. Close this dialog by clicking OK, and close the Connections Properties dialog as well.	lust be ble d in s
	Connection Parameter - Named Connections	
	S7 Network Address         Application name:       WinCC Application         Connection name:       WinCC-Connection	
	OK Cancel Help	

# C: Creating WinCC tags

	C: Creating WinCC	tags		
1	Creating WinCC tags required for example.			
	This is done by clicking $\overline{CR}$ on the entry for the newly created connection Redundancy and New Tag.			
	<ul> <li>SIMATIC S7 PROTOCOL SUITE</li> <li>Industrial Ethernet</li> <li>Industrial Ethernet (II)</li> <li>MPI</li> <li>Named Connections</li> </ul>			
	Redunda=	New Group		
	PROFIBUS (I	New Tag		
	E Slot PLC	Find		
		Cut		
		Сору		
		Paste		
		Delete		
		Properties		

	C: Creating WinCC tags	
2	The property dialog of the tag is displayed.	
	The example uses S16x_S7_Redundancy_01 as the name for the first The tag is of data type Signed 16-Bit Value. Using the Select button, the address of the new tag is set. Both dialogs are closed with OK.	tag. e
	Tag properties	×
	General Limits/Reporting	
	Properties of Tags	
	Name:     S16x_S7_Redundancy_01       DataType :     Signed 16-bit value	
	Length: 2	
	Address: D875,DW0 Select	
	Address properties	
	Address	
	Description	
	CPU 🗾	
	Data DB 💌 DB No. 75	
	Address Word	
	DBW 0 Length 1	
	🗖 Quality Code	
	OK Cancel Help	

	C: Creating WinCC tags		
3	Creating the remaining required WinCC tags.		
	The procedure is analogout types, and addresses of ta the following display.	is to Steps 1 to 2 a gs used in this exa	s described. Names, data mple may be obtained from
	Name	Туре	Parameters
	S16x_S7_Redundancy_01	Signed 16-bit value	DB75,DW0
	🔁 S16x_S7_Redundancy_02	Signed 16-bit value	DB75,DW2
	S16x_S7_Redundancy_03	Signed 16-bit value	DB75,DW4
	S16x_S7_Redundancy_04	Signed 16-bit value	DB75,DW6
	S16x_S7_Redundancy_05	Signed 16-bit value	DB75,DW8

#### **D: Creating WinCC picture**



	D: Creating WinCC picture	
3	After placement of the I/O field on the picture, its configuration dialog opens.	
	In the Tag field, the tag S16x_S7_Redundancy_01 is set using the button shown in the following.	
	Tag updates are left at 2s. The additional set options should retain their default values as well. Finish the dialog with OK.	
	I/O-Field Configuration	
	Tag: S16x_S7_Redunda	
	Update 2 s	
	C Output C Input C Both	
	Format	
	Font Size 12	
	Font Name Arial	
	OK Cancel	

	D: Creating WinCC picture		
4	Changes of output format for I/O field.		
	Open its property dialog. This is done by clicking ${}^{\checkmark}\!$		
	0.000		
	B Copy Ctrl+C : Duplicate		
	🔂 Paste Ctrl+V		
	D <u>e</u> lete Del		
	Customized object		
	Group object		
	Linking •		
	Configuration Dialog		
	Properties		
5	The Object Properties dialog is displayed.		
	On the Properties tab register, select the Output/Input entry in the left		
	editable. Enter the new format s99999. Using this format, the I/O field is		
capable to display signed values with a maximum of 5 digits.			
	Close the dialog with OK.		
	Object Properties		
	- 22 22 1/0 Field 10 Field 1		
	Properties Events		
	Image: Instant set inst		
6	Creating an additional three I/O fields to display the remaining tags.		
	The procedure is analogous to Steps 2 to 5 as described.		

	D: Creating WinCC picture		
7	The picture must be saved. In the example project, it was save under the name graph_Redundancy_01.pdl. The picture may be switched directly from Graphics Designer into Runtime by using the button displayed in the following.		
	Runtime Once the picture is in Runtime, the PLC has been started, and the network connection has been established, the current tag values of the PLC are displayed. These may also be changed by input of values into the individual I/O fields.		
	WinCC-Runtime -		
	Communication SIMATIC S7 Redundancy		
	+12 Inc: +7812 + +12 +24		
	If no connection to the PLC exists, the I/O fields are shown in gray tones. In this case, some error must exist in some part of the communication link.		

#### 3.7.4 Diagnostics of Redundant Communication Connection Using Industrial Ethernet

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_Redundancy and the SIMATIC S7 station.

Diagnostics of an example in accordance with the following description is only meaningful if the following checks listed have successfully been concluded.

- Commissioning of CP 1613 communication processor
- Testing of communication processor
- Generation of STEP7 project S7\_Redundancy
- Testing of S7 program

# A: Channel Diagnosis

	A: Channel Diagnosis		
1	Diagnostics of communication link us program.	sing the WinCC Channel Diagnosis	
	This is started using Start → SIM Channel Diagnosis.	$ ATIC \rightarrow WinCC \rightarrow Tools \rightarrow$	
	Channel Diagnosis		
2	The WinCC Channel Diagnosis program is opened.		
	The Channels/Connections tab regis status of each configured connection is one second. The update cycle ma	ster displays exact information on the n. The default value for display updat y be changed in the lower input field.	e
	🔹 WinCC Channel Diagnosis	?	$\mathbf{x}$
	Channels/Connections Configuration	Always on to	P
	B ✓ SIMATIC S7 PROTOCOL SUITE Coun PLC F Requ Requ Resp Own 1 AS Cy Max. Cycle VMD Conn Force Projec Altern K	ters Value Flags 0607 rest Queue Size 0 rest Queue Size 0 rest Counter 8 onse Counter 60 Cycles 0 ycles 1 AS Cycles 32 : 0 verflow 0 State run-red ectionState redundant ectionState redundant ectionState up ©ConnectionAddress projected ctedConnectionAddress NC.''WinCC-Verbindung''.	
	Cyclic Update		

	A: Channel Diagnosis		
3	In case a connection problem exists, the right window will disp Error Code line a value indicating a more specific cause of the		
	More detailed information on error codes may be obtained by clicking ${}^{\checkmark}\mathbb{C}\mathbb{R}$ on the Error Code entry.		
	This will display the description of the respective error code co the online help of WinCC. Furthermore, possible error causes displayed.		
	Error 7001 - CEC_STPCHK		
	Communication aborted due to stop check.		
	<ul> <li>The connection was aborted by the channel because a VMD state of the CPU - STOP, HOLD or DEFECTIVE - was detected.</li> </ul>		

#### **Communication WinCC - SlotPLC** 3.8

The program SlotPLC serves to test Step7 programs on the PC. Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on http://support.automation.siemens.com/WW/view/en/21320307).

There is the option of copying the following components to hard disk:



The STEP7 project to be generated.



The WinCC project to be generated.

This chapter describes in detail the commissioning of a communication link between a WinCC project and SlotPLC.

#### **Summary on Example Design**



WinCC V6.0, WinLC and Step7

The example worked with programs only. Programs WinCC, Step7 and WinLC are installed on the computer used.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Installation of WinAC Basis
- Generation of STEP7 project S7\_SlotPLC
- Creating WinCC project WinCC\_SlotPLC
- Diagnostics of communication link

#### **Required software**

Name	Description
SIMATIC NET	Using installation of SIMATIC NET, all necessary drivers are installed.
Win AC	Using the installation of Win AC, Win LC is also installed as an option.
STEP7	STEP7 software to create STEP7 program.
WinCC	WinCC with SIMATIC S7 Protocol Suite communication driver to generate the WinCC project.

# 3.8.1 Installation of WinAC Basis

Installation of WinAC Basis is performed using the SIMATIC WinAC CD. After inserting the CD, the installation starts automatically but may also started manually by executing the file Setup.exe.

The following description gives a short summary for successful software installation.

#### **Summary of Installation Steps**

The following summary lists the required steps for successful installation of the WinAC software

- A: Installation of software
- B: Summary of installed components

#### A: Installation of software



	A: Installation of software	
3	During installation, the Setting PG/PC Interface program opens. CP5611 was automatically assigned to access point COMPUTING. Finish the program with OK.	
	Set PG/PC Interface	
	Access Path Access Point of the Application:	
	COMPUTING> CP5611(MPI)	
	(Interface for S7DOS)	
	Interface Parameter Assignment Used: CP5611(MPI) <active> Properties</active>	
	Image: Work of the second s	
	CP5611(FWL) CP5611(MPI) <active> Copy Dejete</active>	
	Parameter assignment of your communications processor CP5611 for an MPI network)	
	Interfaces	
	Add/Remove:Select	
	Cancel Help	

	A: Installation of software
4	The computer must be restarted after installation.
	SIMATIC WinAC Basis V4.0-Setup: Installation completed
	Simatic       Setup has successfully installed and configured the software on your computer.         You can find information in the "readme" file.       The computer has to be restarted. Setup can restart the computer now, or you can do it yourself later.         • Yes, restart the computer now.       • Yes, restart the computer now.         • No, the computer will be restarted later.       • No, the computer will be restarted later.
	<pre>     Kate And And And And And And And And And And</pre>

# **B: Summary of installed components**

	B: Summary of installed	com	ponents		
1	In the Start menu, the item SIMATIC.	PC	Based Cont	rol	was created under $ ightarrow$
	🛅 SIMATIC 🔶 🕨	6	AuthorsW	×	
		<b></b>	Product notes	•	
		6	WinCC	•	
		6	Documentation	•	
		6	SIMATIC NET	•	
		6	STEP 7	×	
		<b>A</b>	SIMATIC Manager		
		6	PC Based Control	×	Computing Configuration
					Computing SoftContainer
					💯 Computing TagFile Configurator
					VinLC

#### 3.8.2 Creating STEP7 Project S7\_SlotPLC

The following description shows in detail the necessary configuration steps for creating and commissioning of STEP7 project S7\_SlotPLC.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the STEP7 project S7\_SlotPLC.

- A: Creating STEP7 project
- B: Configuring hardware
- C: Loading of hardware configuration
- D: Creating STEP7 program
- E: Testing of STEP7 program

# A: Creating STEP7 project

	A: Creating STEP7 project
1	Creating a new STEP7 project in SIMATIC Manager.
	This is started using Start $ ightarrow$ SIMATIC $ ightarrow$ SIMATIC Manager.
	SIMATIC Manager
2	The SIMATIC Manager opens.
	Using menu item File $\rightarrow$ New, the dialog to specify parameters of a new STEP7 project opens.
	Enter the name of the newly created project in the Name field. Names of STEP7 projects created as part of this manual must start with the character sequence S7. Furthermore, they contain a description of the communication type used. The current example has the name S7_SlotPLC.
	By default, projects are saved in directory C:\PROGRAM FILES\SIEMENS\STEP7\S7proj. However, this may be changed at any time by clicking the Browse button.
	The New dialog is closed by clicking the OK button
	User projects Libraries Multiprojects Name Storage path
	Add to current multiproject
	S7 SoftPLC
	Storage location (path): C:\Program Files\Siemens\SIMATIC.NCM\s7proj Browse
	Cancel Help

# B: Configuring hardware

	B: Config	uring hardw	are		
1	The new p Hardware is a SIMAT	project is disp must be cont FIC PC statio	layed in SIMATI figured for it. Onl n.	C Manager. y one component is required	I. This
	The comport project S7	onent is adde _SlotPLC an	ed in SIMATIC M d Insert New Pro	anager using ${}^{\frown} \mathbb{B} \mathbb{R}$ on the na ject $\rightarrow$ SIMATIC PC Stati	ame of on.
		Cut Copy Paste	Ctrl+X Ctrl+C Ctrl+V		
	Í	Delete Insert New C PLC	Del Dbject	SIMATIC 400 Station     SIMATIC 300 Station	
		Rename Object Prope	F2 erties Alt+Return	SIMATIC H Station SIMATIC PC Station Other station SIMATIC 55 PG/PC	
				MPI PROFIBUS Industrial Ethernet PTP	
				S7 Program M7 Program	
2	Using display the Open Obje	D on compor e Hardware it ect on it will s	ent SIMATIC PC em. Using <sup>1</sup> D tart the HWConf	Station(1) in the right windo on the Hardware item or ig program.	ow will R and
	DU Hardware	e Open Objec	t Ctrl+Alt+O		
		Cut Copy Paste	Ctrl+X Ctrl+C Ctrl+V		
		Delete	Del		
		Rename	F2		
3	It is used t its properti	onfig progran to exactly spe ies.	n opens. ecify the hardwar	e used in the PLC, and to co	onfigure
	HW Konfig				

	B: Configuring hardware
4	Using the subsequently displayed button in the toolbar of HWConfig program, the hardware catalog opens. This is used to select the required hardware components.
	Catalog
5	The hardware catalog and the presently still vacant PC module rack are displayed.
	(0) PC      1     2     3     4     5     6     7     ·······················



# C: Loading of hardware configuration

	C: Loading of hardware configuration
1	Prior to loading, the WinLC program must be started. This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ PC Based Control $\rightarrow$ WinLC.
	WinLC
2	Afterwards, the following window is shown.
	The module displayed in the window is reset by using the <u>MRES</u> button, and switched into programmable run mode using the <u>RUN-Po</u> button.
	WinLC File <u>CPU Help</u> SIEMENS PS ON BATF CPU INTF RUN EXTF STOP BUSF1 BUSF3 BUSF4 FRCE RUN STOP MRES
3	The hardware configuration created in the HWConfig program must be transferred to the PC station. In order to implement this, the name of the PC station in SIMATIC Manager must be identical with the name in Station Configuration Editor. In the example, the PC station is named SIMATIC PC Station(1).
	The Station Configuration Editor is started using Start $\rightarrow$ Station Configuration Editor. Using the Station Name button, the name issued for the PC station here may be changed.
	Loading of the hardware configuration uses the toolbar button of the HWConfig program shown in the following.
	Download to Module

	C: Loading of hardware configuration
4	A dialog opens which allows selection of components to be loaded. Close the dialog with OK.
	Select Target Module
	Target Modules:
	WinLC 2 Station Manager 125
	Select <u>A</u> ll
	OK Cancel Help
5	Now the configuration data are transferred to the WinLC program. "Simulated modules" may have to be put into the STOP status. The HWConfig program may be terminated. Components newly added are displayed in SIMATIC Manager for SIMATIC
	PC Station(1).          SIMATIC Manager - [S7_SoftPLC C:\Prog         File       Edit         Insert       PLC         View       Options         Window       Help         ST_SoftPLC         ST_SOftPLC

# D: Creating STEP7 program

	D: Creating ST	EP7 program		
1	Creating STEP	7 program		
	For the current data block are r	example project, only or needed. OB1 is available	ne operations e by default.	block, OB1, and one The needed data block
	must first be cre Blocks subitem and Insert New	eated. This is done in SI of entry S7 program(1) Object	MATIC Mana of the config	ager using <sup>V</sup> ÜR on the ured central module
	The property di the block and c	alog of the data block or lose the dialog by clickir	oens. Enter D ng OK.	B75 as the name for
	- 📓 WinLC ⊡- 🛐 S7 Program	m(1) es		
	Elocks	Cut	Ctrl+X	
		Сору	Ctrl+C	
		Paste	Ctrl+V	_
		Delete	Del	
		Insert New Object	•	Organization Block
		PLC	•	Function Block
		Rewiring		Function Data Block
		Compare Blocks		Data Type
		Reference Data	•	Variable Table
		Check Block Consistency		-
		Print	•	
		Rename	F2	
		Object Properties	Alt+Return	
		Special Object Properties	•	

	D: Creating STEP7 program	
2	The newly created data block DB75 is c project.	pened in the right window of the
	Using <sup>1</sup> D on it or using <sup>1</sup> R and Operative may be programmed. The program KOR	en Object, the contents of the block P/AWL/FUP is started.
	Open Object Ctrl+Alt+C	
	Cut Ctrl+X Copy Ctrl+C Paste Ctrl+V	
	Delete Del	
	Insert New Object PLC	• •
	Compare Blocks Reference Data	•
	Print	•
	Rename F2 Object Properties Alt+Return Special Object Properties	•
3	The program KOP/AWL/FUP opens.	
	The New Data Block dialog appears an clicking OK.	d must be acknowledged by
	KOPAWLFUP	

	D: Creati	ng STEP7 p	orogram					
4	Programming of DB75.							
	Here, two tags of length 16 bits are created. Their sum is supposed to be determined in OB1 and written to another tag of length 16 bits.							
	Furtherm be cvclica	ore, two tage ally incremer	s of length 16 bits nted in OB1.	are created, whose	values are to			
	The following shows the completely programmed data block DB75.							
	■ DB75	S7_IEH\SIA	NATIC 400(1)\CPU	416-1				
	lddress	Name	Туре	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					
	<				>			
<u>,</u>	Download Programm This mus	<u>ן</u> ning of OB1. t be opened	beforehand in pr	ogram KOP/AWL/FU				
	Initially, to saved in Net zwei	wo values cr DB75. r <b>k 1</b> : Add	eated in DB75 ar	e added and the resu	P. Ilt is again			
	Initially, tw saved in I Netzwei	wo values cr DB75. rk 1: Add	eated in DB75 ar	e added and the resu	P. Ilt is again			
	Initially, to saved in Netzwer Adding The re 16-Bit	wo values cr DB75. rk 1: Add two 16-E sult is e Value	eated in DB75 ar ition it Values stored in and	e added and the resund	P. Ilt is again			

	D. 0	4: m m OT					
	D: Crea	ting ST	EP/ progr	am			
	Next, the count of a value created in DB75 is implemented every second.						
	Network 2: Second Cycle						
	Gener	ation	of a se	cond cycle at M 0.0			
		AN	M	0.0			
		L GD	S5T#1S m	1			
		A	T	1			
		=	Μ	0.0			
	Netwo:	rk 3:	Countin	g in a second cycle			
	Count At 10	n a second cycle O					
		AN	M	0.0			
		JC	M001				
		L	DBW 1	6			
		+Т Т	T				
		Т	DBW	6			
		L	10000				
		<i </i 	<b>MOO</b> 1				
		JC T.	MUUL N				
		T	DBW	6			
	M001:	NOP	0				
	Next, the OB1. Netwo Count At 10	e count ork 4 : ing a	of a value of Countin value e reset to	g in the cycle time each time the OB is executed			
		L L	DBW 1	8			
		+I m	DDM				
		T L	рвю 10000	0			
		~I	10000				
		JC	M002				
		L	0				
	M002.	T Nop	U DRM	o l			
-	The OB	1 block	must be sa	ved and loaded onto the PLC. This is done			
	using th	ising the respective toolbar button.					
	Thus, th KOP/AV	ie STEF VL/FUP	7 project is program m	s complete and ready to run. The hay be terminated.			

# E: Testing of STEP7 program

_								
	E: Testing of STEP7 program							
1	Testing of program using STEP7 software.							
	A tag ta R on th Monitor	IC Manager Target Syste	using					
	• 🔝 Wini • • • 57	Cut Copy Paste Delete Insert Nev	w Object	Ctrl+X Ctrl+C Ctrl+V Del	_			
		PLC	,,		Copy RAI	M to ROM		
		Run-Time	Run-Time Properties			sages		
		Bename		F2	Monitor/N	Modify Variables		
		Object Properties Special Object Properties		Alt+Return es I	Hardware Module Ir Operatin Clear/Re Set Time	dware Diagnostics Jule Information Ctrl+D grating Mode Ctrl+I ar/Reset Time of Day		
2	An edite In the fe are ente	or is displa ollowing, th ered.	yed to cre ne complet	ate and use s te tag table is	such a tag t shown. All	able. tags created	d in DB75	
	S VA	T_20						
	1 2 3 4 5 6	Address DB75.DBW DB75.DBW DB75.DBW DB75.DBW DB75.DBW	Symbol 0 2 4 6 8	Display format DEC DEC DEC DEC DEC DEC	Status value 12 12 24 1083 1703	Modify value 12 12		

	E: Testing of STEP7 program
3	Monitoring current tag values.
	By clicking the toolbar button shown in the following, the current values of respective tags in the PLC are displayed in the Status Value column.
	Monitor variable.
	Controlling of tag values.
	In the Control Value column, values may be entered. By clicking the toolbar button displayed in the following, these values are written to the corresponding tags in the PLC.
	Please make sure that any controlling of tags is possible only in operational switch position RUN-P.
	Modify variable
4	The so-created tag table may now be saved.
	In the current example, it is save under the name VAT1. If the program function in the PLC has now been checked, the tag table may be closed. Thus, configuration of the STEP7 project is complete and SIMATIC Manager may be terminated.
	I VAT1

# 3.8.3 Creating WinCC Project WinCC\_SlotPLC

The following description shows in detail the necessary configuration steps for creating and commissioning of WinCC project WinCC\_SlotPLC.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project WinCC\_SlotPLC.

- A: Creating WinCC project
- A: Creating WinCC project
- C: Creating WinCC tags
- D: Creating WinCC picture

# A: Creating WinCC project

	A: Creating WinCC project						
1	Creating a new WinCC project in WinCC Explorer.						
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.						
	WinCCExplorer						
2	WinCC Explorer is opened.						
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.						
	The following example project creates a single-user project.						
	Finish the dialog with OK.						
	WinCC Explorer						
	Create a New Project						
	🔜 💿 Single-User Project						
	≝l ⊂ Multi-User Project						
	Client Project						
	C Open an Existing Project						
	Cancel						
	A: Creating WinCC project						
---	--	--	----------------				
3	The Create a New Project dialog opens.						
	Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_SlotPLC.						
	Furthermore, in the Project F project must be set.	Path field, the storage location	of the new				
	The Create a New Project di	alog is closed by clicking the (	Create button.				
	Create a new project		? 🛛				
	Project Name: WinCC_SoftPLC New <u>Subfolder:</u> WinCC_Soft_PLC You can use this dialog box to create a new WinCC project.	Project Path c:\\wincc\wincoprojects Eolder: [] Drive: Drive:	<u>Create</u>				

## **B: Establishing connection**

	B: Establishing connection		
1	The new project is displayed in WinCC Explorer.		
	Installing of required communication driver. This is done by clicking $\sqrt[6]{B}R$ of the Tag management item and Add New Driver.		
	☐- IIII Tag Management     Add New Driver		
	Properties		
2	The Add New Driver Dialog opens.		
	It offers a selection of all communication drivers available for installation. For communication with the WinLC station, the SIMATIC S7 Protocol Suite driver is required. It must be selected in the dialog. Close the dialog with Open.		
	Add new driver		
	Look jn: 🗀 bin 💽 🖛 🗈 📸 🎫		
	DLCache SIMATIC S5 Ethernet TF.CHN		
	OPC.chn     SIMATIC S5 Profibus FDL.chn     SIMATIC S5 Programmers Port (		
	Profibus FMS.chn     SIMATIC 55 Programmers Porce		
	SIMATIC 505 TCPIP.chn		
	SIMATIC S5 Ethernet Layer 4.CHN     SIMATIC TI Ethernet Layer 4.CH		
	File <u>n</u> ame: SIMATIC S7 Protocol Suite.chn <u>O</u> pen		
	Files of type: WinCC Communication Driver (*.chn)  Cancel		



	B: Establishing connection	
4	The property dialog of the connection opens.	
	Enter the name of the new connection on the General tab register. It is Slot PLC 01 in the current example.	
	Specify connection parameters using the Properties button.	
	Connection properties	
	General	
	Name: Soft_PLC_01 Properties	
	Unit: Soft PLC	
	Server List	
	DIETRICH-XP-02	
	Please make certain that the connection name does not include any national special characters or the characters §, ' or *.	
	OK Cancel Help	

	B: Establishing connection	
5	The Connection Parameter dialog opens.	
	On the Connection tab register, the parameters for the desired communication connection are specified.	
	In the Station Address field, enter the address of the station. In the Slot No. field, enter the assigned index of the WinLC station in the Station Configuration Editor.	
	Close the dialog with OK.	
	Connection Parameter - Soft PLC	
	Connection	
	_ Soft PLC	
	Station Address: 2	
	Slo <u>t</u> Number: 2	
	☐ Send/receive ra <u>w</u> data block	
	Connection Resource: 02	
	Cancel Help	

## C: Creating WinCC tags

	C: Creating WinCC	tags	
1	Creating WinCC tags required for example.		nple.
	This is done by clicking $\overline{CR}$ on the entry for the newly created connection Slot_PLC_01 and New Tag.		
	Soft PLC		
		New Group	
		New Tag	
		Find	
		Cut	
		Сору	
		Paste	
		Delete	
		Properties	

	C: Creating WinCC tag	js
2	The property dialog of the two sets of the example uses S16 is of data type Signed 1 the new tag is set.	he tag opens. <_SlotPLC_01 as the name for the first tag. The tag 6-Bit Value. Using the Select button, the address of
	Tag properties	
	General Limits/Reporting	)
	Properties of Tags	
	<u>N</u> ame:	S16x_SoftPLC_01
	Data <u>T</u> ype :	Signed 16-bit value
	Address:	Select
	Adapt <u>f</u> ormat :	ShortToSignedWord
	C <u>P</u> roject-wide upd	late C Computer-local update
	Linear scaling	
	Process Value Range-	Tag Value Range
	Value1	Value1
	Value2	Value2
		OK Cancel Help

	C: Creating WinCC tags		
3	The Address Properties dialog opens.		
	Enter DB as data range and the value 75 as DB No. In the Address field, set Word and set the value to 0 in the DW field.		
	The Address Properties dialog is closed by clicking OK, and the Tag Properties dialog is also closed using OK.		
	Address properties		
	Address		
	Description		
	Data DB VO. 75		
	Address Word		
	DBW 0 Length 1		
	🔲 Quality Code		
	Cancel Help		
4	Creating the remaining required WinCC tags.		
	The procedure is analogous to Steps 1 to 3 as described. Names, data		
	types, and addresses of tags used in this example may be obtained from the following display.		
	Name Type Parameters		
	S16x_SoftPLC_01 Signed 16-bit value DB75,DW0		
	S16X_S0TPLC_U2 Signed 16-bit value DB75,DW2		
	S16x_SoftPLC_04 Signed 16-bit value DB75,DW6		

#### D: Creating WinCC picture



	D: Creating WinCC picture	
3	After placement of the I/O field on the picture, its configuration dialog opens.	
	In the Tag field, the tag S16x_SlotPLC_01 is set using the button shown in the following.	
	Tag updates are left at 2s. The additional set options should retain their default values as well. Finish the dialog with OK.	
	I/O-Field Configuration	
	Tag: S16x_SoftPLC_01	
	Update 2 s	
	C Dutput C Input C Both	
	Format	
	Font Size 12	
	Font Name Arial	
	Cancel	

	D: Creating WinCC picture		
4	Changes of output format for I/O field.		
	Open its property dialog. This is done by clicking OR on the I/O field and Properties.		
	●		
	唱画 <u>C</u> opy Ctrl+C		
	Group object		
	Linking 🕨		
	Configuration Dialog		
	Properties		
5	The Object Properties dialog opens		
5	On the Properties tab register select the Output/Input entry in the left		
	window. Using $UD$ on the set output value will make the display field		
	editable. Enter the new format s99999. Using this format, the I/O field is		
	capable to display signed values with a maximum of 5 digits.		
	Close the dialog with UK.		
	Object Properties		
	IDField IDField		
	Properties Events		
	Image: Description of the state in the		
6	Creating an additional three I/O fields to display the remaining tags.		
-	The procedure is analogous to Steps 2 to 5 as described.		



## 3.8.4 Diagnostics of Communication Link Using SlotPLC

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_SlotPLC and the SIMATIC S7 station.

Diagnostics of an example in accordance with the following description is only meaningful if the following checks listed have successfully been concluded.

- Installation of Win AC Basis
- Generation of STEP7 project S7\_SlotPLC

#### A: WinCC Explorer

	A: WINCC Explorer		
1	Diagnostics of communication link in WinCC Explorer.		
	Switch the WinCC_SlotPLC project into Runtime. This is done in WinCC		
	Activate		
	The created WinCC picture SlotPLC_DWG_01.pdl may also be switched directly from Graphics Designer into Runtime.		
2	In WinCC Explorer, using the menu Tools $\rightarrow$ Status of Driver Connections, a dialog may be opened to monitor all configured connections.		
	However, this menu item is only active if the project is in Runtime.		
	Tools		
	Language		
	Status of <u>D</u> river Connections		
	Status of S <u>e</u> rver Connections		
	Status of ⊆lient Connections		
3	The Status - Logical Connections dialog is displayed		
0	This dialog lists all configured connections. In the current example, only the		
	connection Slot_PLC_01 exists.		
	The displayed values correspond to the status at the moment the dialog		
	was opened. By selecting the corresponding checkbox, a cyclic display		
	Status - Logical Connections		
	Tag ID         Name         Status         Tag read         Read requ         Tag written         Write requ		
	2 Soft_PLC UK 47 U U U		
	Update ( 4 - x 250 ms ) Update Help		

# 3.9 Communication WinCC - WinCC Using OPC DA

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on <a href="http://support.automation.siemens.com/WW/view/en/21320307">http://support.automation.siemens.com/WW/view/en/21320307</a>).

There is the option of copying the following components to hard disk:



The Server WinCC project to be generated.



The Client WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between two WinCC stations using OPC.

The WinCC OPC Server is installed on the computer serving as server which provides the data of a WinCC project to other applications on the computer, as well as to the entire connected network environment.

#### **Summary on Example Design**



The WinCC OPC Server must be installed from the WinCC CD on the computer serving as server. This may have already happened during installation of WinCC.

The WinCC OPC Client must be installed from the WinCC CD on the computer serving as client. This may have already happened during installation of WinCC.

Both WinCC stations may be connected using any network connection.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Configuration of WinCC stations
- Generation of WinCC project WinCC\_OPC\_SERVER
- Generation of WinCC project WinCC\_OPC\_CLIENT
- Diagnostics of communication link

#### **Required software**

Name	Description
WinCC	WinCC with OPC Server as well as OPC Client to create WinCC projects.

#### Required hardware on computer

Name	Description
Network connection	Any network connection to establish link to network.

## 3.9.1 Configuring WinCC Stations for OPC (WinCC - WinCC)

The following description contains notes to be taken into consideration during configuration of WinCC stations.

During access to an OPC server from a WinCC client station, three constellations are possible in general. These differ on where these two components are located.

- Server and client are on the same computer
- Server and client are on different computers but within the same work group
- Server and client are on different computers in the same domain, or in different domains in trust positions

The first of the above constellations is not goal-oriented for communication between a WinCC OPC server and a WinCC OPC client. This constellation, however, may very well be used in many cases, such as communication with the S7-OPC server.

In the following steps described, the local circumstances must be taken into consideration.

- A: Installing software components
- B: Organization of network
- C: Organization of user structure
- D: Setting DCOM configuration

## A: Installing software components

	A: Installing software components			
1	OPC server and OPC client of WinCC are required. The OPC servers are located on the WinCC Installation CD. The OPC client is automatically installed with WinCC.			
	The OPC server must be installed on the computer which will serve as server. This may have happened during installation of WinCC. However, it may also be installed after the fact without any problems.			
	Following installation of components on the respective computers, these computers must be rebooted.			
	Select Components			
	Activate or deactivate the components which should be installed or deinstalled, respectively. Components			
	WinCC 298 MB 🕢 🔽 Data Access 4 MB			
	✓ Help 49 MB Alarm & Events 2 MB			
	Communication 4 MB 🗾 🗹 Historical Data Access 2 MB			
	✓ OPC Server 10 MB     ✓ -HDA Write Access 2 MB			
	✓ Options     45 MB     ✓      ✓			
	Description Worldwide standardized and common manufacturer software interface for process connections			
	Available: 7408 MB			
	< <u>B</u> ack <u>N</u> ext > <u>C</u> ancel			

## **B: Organization of network**

	B: Organization of network			
1	Organization of network			
	Settings required for the respective computers for organizing the network are implemented in the Network program. This is started using Start $\rightarrow$			
	Settings Control Panel System.			
	either to a work group or to a domain by using the Change button.			
	Computer Name Changes			
	You can change the name and the membership of this computer. Changes may affect access to network resources.			
	Computer name:			
	OPC_Client			
	Full computer name: OPC_Client.zip.at			
	<u>M</u> ore			
	Member of			
	Omain:			
	zip.at			
	O <u>W</u> orkgroup:			
	OK Cancel			

## C: Organization of user structure

	C: Organization of user structure
1	Defining the user on both computers.
	This is facilitated on each computer using the User Manager program. This is started using Start $\rightarrow$ Programs $\rightarrow$ Administrative Tools $\rightarrow$ Computer Management.
	If a work group is used, it must be ascertained that the user of the client station is known at the server station. Furthermore, the user of the server station must be known at the client station in order to use full functionality of OPC.
	If the domain concept is used, no attention needs to be paid to this since all users in the entire domain are known. For cross-domain access to a server station, however, a reciprocal trust position of both domains is required.

## **D: Setting DCOM configuration**

	D: Setting DCOM configuration		
1	Following installation of WinCC, the DCOM settings of the OPC server of WinCC are configured properly.		
These settings must be changed			
	if the registered user of the OPC client or server computer does not hav administrator authorization		
	if the OPC server is registered under a different user account than the OPC client.		
2	Setting of DCOM configuration for WinCC-OPC server.		
	The settings for DCOM configuration are implemented using the DCOM Configuration Properties program. This can be started via Start $\rightarrow$ Run and entering the program name dcomcnfg.exe.		
	Run ? 🔀		
	Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.		
	Open: dcomcnfg.exe		
	OK Cancel Browse		
3	The Component Services application opens.		
	Select under Component Services $\rightarrow$ Station $\rightarrow$ DCOM Configuration the OPCServer.WinCC entry.		
	For the WinCC-OPC-HDA server, the OPCHDAServers.WinCC entry must be used. For the WinCC-OPC A&E server, the OPCServerAE.WinCC entry must be used.		
	In the pop-up menu of OPCServer.WinCC, select the Properties entry.		
	⊞-🏇 OPCServer.WinCC		
	View		
	Properties		
	Help		

D: Setting DCOM configuration	
Click on the Security tab register. In the Access Permissions area, mathe Customize option. Click the Edit button. The Properties of OPCServer.WinCC dialog is displayed.	ark
OPCServer.WinCC Properties	
General Location Security Endpoints Identity	
Launch and Activation Permissions	
⊂ <u>U</u> se Default	
<u>Customize</u> <u>E</u> dit	
Access Permissions	
C Use De <u>f</u> ault	
Custo <u>m</u> ize     E <u>dit     E</u>	
Configuration Permissions	
C Lise Default	
Customize     Edjt	
OK Cancel Apply	
	D: Setting DCOM configuration Click on the Security tab register. In the Access Permissions area, may the Customize option. Click the Edit button. The Properties of OPCServer.WinCC dialog is displayed. OPCServer.WinCC Properties General Location Security Endpoints Identity Launch and Activation Permissions C Lise Default Customize Location Permissions C Use Default Customize Location Permissions C Use Default Configuration Permissions C Use Default Configuration Permissions C Use Default Customize Edit DK Cancel Apply

	D: Setting DCOM configuratio	n		
5	The Access Permission dialog of	pens.		
	Add users Administrators, Intera Allow Authorization. Close the d	active, Everyor ialog by clickir	ne, Network and ng OK.	System with
	For the configuration phase, it m permissions to avoid problems b rights. After successful commiss restrictions on access authorizat configured.	nay be useful t beforehand du sioning of com tions for certai	o grant everyon e to insufficient munication, any n users may be	e access access desired easily
	Access Permission		? 🔀	
	Security			
	<u>G</u> roup or user names:			
	Everyone     Everyone     INTERACTIVE     NETWORK     NETWORK SERVICE			
		A <u>d</u> d	<u>R</u> emove	
	Permissions for Everyone	Allow	Deny	
	Local Access	<b>v</b>		
	Remote Access			
		ОК	Cancel	

	D: Setting DCOM configuration
6	In the Launch Permission area, mark the Customize option. Click the Edit button. The Launch Permission dialog opens. Add users Everyone and Network with Allow Authorization. Close the dialog by clicking OK.
	Launch Permission       ? ``         Security
	Add       Bemove         Permissions for Everyone       Allow       Deny         Local Launch       ✓       □         Remote Launch       ✓       □         Local Activation       ✓       □         Remote Activation       ✓       □         Remote Activation       ✓       □
7	OK Cancel Close the dialog by clicking OK.

## 3.9.2 Creating WinCC Project WinCC\_OPC\_SERVER

The following description shows in detail the necessary configuration steps for creating and successful commissioning of WinCC project WinCC\_OPC\_SERVER.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project WinCC\_OPC\_SERVER.

- A: Creating WinCC project
- B: Creating internal tags
- C: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project			
1	Creating a new WinCC project in WinCC Explorer.			
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.			
	WinUCExplorer			
2	WinCC Explorer is opened.			
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.			
	The following example project creates a single-user project.			
	Finish the dialog with OK.			
	WinCC Explorer			
	Create a New Project			
	🔜 💿 Single-User Project			
	■ 🚄 ⊂ Multi-User Project			
	C Client Project			
	🖉 Open an Existing Project			
	Cancel			

	A: Creating WinCC project				
3	The Create a New Project dialog opens.				
	Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_OPC_SERVER.				
	Furthermore, in the Project Path field, the storage location of the new project must be set.				
	The Create a New Project dia	alog is closed by clicking the C	Create button.		
	Create a new project		? 🔀		
	Project Name: WinCC_OPC_Server New Subfolder: WinCC_OPC_Server You can use this dialog box to create a new WinCC project.	Project Path c:\\wince\winceprojects <u>Folder:</u> [] Dri <u>v</u> e: E C:	Cr <u>e</u> ate <u>C</u> ancel <u>H</u> elp		

## **B: Creating internal tags**

	B: Creating internal tags		
1	Creating internal tags required for example.		
	This is done in Tag Management using OR on the entry for Internal Tags and New Tag. Tag Management Tag Management New Group New Tag Find Cut Copy Paste		
2	The property dialog of the tag opens.		
	The example uses S16i_OPCServer_01 as the name for the first tag. The tag is of data type Signed 16-Bit Value.		
	General   Limits/Reporting		
	Properties of Tags		
	Name: S16i_OPCServer_01		
	Data_ype: Signed 16-bit value		
	Lengm: J2		
	Address:		
	Project-wide update     C Computer-local update		
	Linear scaling		
	Process Value Range Tag Value Range		
	Value1 Value1		
	Value2 Value2		
	Cancel Help		

	B: Creating internal tag	js	
3	Creating the remaining required tags.		
	The procedure is analogous to Steps 1 to 3 as described. Names, data types, and addresses of tags used in this example may be obtained from the following display.		
I	Name	Type Parameters	
	🔁 @ConnectedRTClie	Unsigned 16-bit v	
	🔁 @CurrentUser	Text tag 8-bit cha	
	🔁 @DeltaLoaded	Unsigned 32-bit v	
	🔁 @LocalMachineName	Text tag 8-bit cha	
	🔁 @RedundantServe	Unsigned 16-bit v	
	S16i_OPCServer_01	Signed 16-bit value	
	S16i_OPCServer_02	Signed 16-bit value	
	S16i_OPCServer_03	Signed 16-bit value	
	S16i_OPCServer_04	Signed 16-bit value	

#### **C: Creating WinCC picture**



	C: Creating WinCC picture			
3	After placement of the I/O field on the picture, its configuration dialog opens.			
	In the Tag field, the tag SERVER_PC_S16i_OPCServer_01 is set using the button shown in the following.			
	Tag updates are set to Upon Change. The additional set options should retain their default values. Finish the dialog with OK.			
	I/O-Field Configuration			
	Tag: S16i_OPCServer_0			
	Update 2 s			
	C Output C Input C Both			
	Format			
	Font Size 12			
	Font Name Arial			
	Color			
	Cancel			

	C: Creating WinCC picture
4	Changes of output format for I/O field.
	Dpen its property dialog. This is done by clicking OR on the I/O field and Properties.
	0.000
	■ K Cut Ctrl+X B Copy Ctrl+C
	Duplicate
	D <u>e</u> lete Del
	Customized object
	Linking •
	Configuration Dialog
	Properties
5	On the Properties tab register, select the Output/Input entry in the left vindow. Using $\frac{1}{2}$ D on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is capable to display signed values with a maximum of 5 digits.
	🗖 Object Properties 🛛 🛜 🔀
	- 2 2 1/0 Field 10Field1
	Properties Events
	I/O Field       Attribute       Static       Dynamic       Cu       I         Geometry       Field Type       I/O Field       Image: Colors       Image: Colors
6	Creating an additional three I/O fields to display the remaining tags.
	he procedure is analogous to Steps 2 to 5 as described.

	C: Creating WinCC picture
7	Creating a simple tag simulation.
	The sum of tags S16i_OPCServer_01 and S16i_OPCServer_02 is supposed to be stored in tag S16i_OPCServer_03.
	The value of tag S16i_OPCServer_04 is supposed to be incremented every 250ms.
	The requirements posed are satisfied by two C actions. Each is generated using Properties $\rightarrow$ Geometry $\rightarrow$ Position X of the I/O field displaying the respective tag.
	A detailed description of the C action is found following this section.
8	The picture must be saved.
	In the example project, it was saved under the name com_3_OPCServer_01.pdl. The picture may be switched directly from Graphics Designer into Runtime by using the button displayed in the following.
	Runtime
	These may also be changed by input of values into the individual I/O fields.
	WinCC-Runtime -
	Communication
	OPC WinCC Server Station
	+5 Inc: +155 + +23
	+28

#### C action to generate sum

```
#include "apdefap.h"
    long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
    //get tag values
    int iValue_01 = GetTagSDWord("S16i_OPCServer_01");
    int iValue_02 = GetTagSDWord("S16i_OPCServer_02");
    //calculate sum and set tag value
    SetTagSDWord("S16i_OPCServer_03",(iValue_01 + iValue_02));
    //return constant property value
    return GetLeft(lpszPictureName,lpszObjectName);
}
```

- The above described C action is configured for the I/O Field3 object using Properties Geometry Position X. The C action is triggered upon changes of tags S16i\_OPCServer\_01 and S16i\_OPCServer\_02.
- The values of both tags S16i\_OPCServer\_01 and S16i\_OPCServer\_02 are read. Their sum is formed and written to tag S16i\_OPCServer\_03.
- The C action is configured for an object property which serves to provide a trigger. The current value of the property is returned to it.

#### C action for incrementing

```
#include "apdefap.h"
long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
//get tag value
int iValue = GetTagSDWord("S16i_OPCServer_04");
if (iValue < 10000)
{
    //increment and set tag value
    SetTagSDWord("S16i_OPCServer_04", ++iValue);
}
else
{
    //reset tag value
    SetTagSDWord("S16i_OPCServer_04", 0);
}
//return constant property value
return GetLeft(lpszPictureName,lpszObjectName);
}</pre>
```

- The above described C action is configured for the I/O Field4 object using Properties Geometry Position X. The C action is triggered at 250ms.
- The value of tag S16i\_OPCServer\_04 is read. If this has not yet reached 10000, it is incremented and rewritten into the tag. Otherwise the tag value is set to zero.
- The C action is configured for an object property which serves to provide a trigger. The current value of the property is returned to it.

## 3.9.3 Creating WinCC Project WinCC\_OPC\_CLIENT

The following description shows in detail the necessary configuration steps for creating and successful commissioning of WinCC project WinCC\_OPC\_CLIENT.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project WinCC\_OPC\_CLIENT.

- A: Creating WinCC project
- B: Establishing connection
- C: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project		
1	Creating a new WinCC project in WinCC Explorer.		
	WinCC Explorer is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.		
2	WinCC Explorer is opened.		
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.		
	The following example project creates a single-user project.		
	Finish the dialog with OK.		
	WinCC Explorer 🛛 🥐 🔀		
	Create a New Project		
	Single-User Project		
	≣ <mark>,</mark> C Multi-User Project		
	Client Project		
	C Open an Existing Project		
	Cancel		
	A: Creating WinCC project		
---	---	--	----------------
3	The Create a New Project dialog opens.		
	<ul> <li>Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_OPC_CLIENT.</li> <li>Furthermore, in the Project Path field, the storage location of the new project must be set.</li> </ul>		
	The Create a New Project dia	alog is closed by clicking the	Create button.
	Create a new project		? 🔀
	Project Name: WinCC_OPC_Client New <u>Subfolder:</u> WinCC_OPC_Client You can use this dialog box to create a new WinCC project.	Project Path c:\\wince\winceprojects <u>Folder:</u> [] Dri <u>v</u> e:	Cr <u>eate</u>

## **B: Establishing connection**

	B: Establishing connection		
1	The new project is displayed in WinCC Explorer.		
	Installing of required communication driver. This is done by clicking $ ightarrow  m DR$ of the Tag management item and Add New Driver.		
	Internal tage       Add New Driver         Internal tage       Add New Driver         Find       Properties		
2	The Add New Driver Dialog opens.		
	It offers a selection of all communication drivers available for installation. In the current example, the OPC communication driver is required. It must be selected in the dialog. Close the dialog with Open.		
	Add new driver		
	Look in: 🛅 bin 💽 🖛 🏗 🖝 🎫		
	PDLCache       SIMATIC S5 Ethernet TF.CHN         OPC.chn       SIMATIC S5 Profibus FDL.chn         Profibus DP.chn       SIMATIC S5 Programmers Port A         Profibus FMS.chn       SIMATIC S5 Serial 3964R.CHN         SIMATIC S05 TCPIP.chn       SIMATIC S7 Protocol Suite.chn         SIMATIC S5 Ethernet Layer 4.CHN       SIMATIC TI Ethernet Layer 4.CH         File name:       OPC.chn		
	Files of type: WinCC Communication Driver (*.chn)  Cancel		
3	The newly added OPC communication driver is displayed as a subitem of tag management. The OPC communication driver receives a channel unit. Establishing a connection to a certain OPC server, as well as selection of items required from this server, may be facilitated using the OPC Item Manager. This is started using BR on the entry for OPC Groups (OPCHN Unit #1) channel unit and System Parameters. DPC P OPC Find		
	Paste Properties		

	B: Establishing connection	
4	The OPC Item Manager opens. Here the desired OPC server may be selected. It may be located on the local computer or on another computer accessible through a network connection. In the current example, the desired OPC server, according to the following display, is located on the WinCCOPC Server computer in the ZIP domain.	
	Using OD on the entry of a work group or domain will list all	available
	<ul> <li>computers. Using UD on the entry of a computer will list all available OP servers.</li> <li>On the desired server station, the entry OPCServer.WinCC of the WinCCOPC server must be selected. Using the Browse Server button, you may obtain a summary of all items made available by this WinCC-OPC server. However, this is only the case if the WinCC project was opened from the server station.</li> </ul>	
	🔎 OPC Item Manager	
	Ele View Options Help · Microsoft Terminal Services Microsoft Windows Network Web Client Network ZIP WinCCOPC-Server Store PCServer WinCC	Computer OPC web server Browse Server
	Select the desired OPS server from the list.	

	B: Establishing connection
5	The Filter Criteria dialog opens. This allows you more detailed specification of the type of desired items. If
	you wish a display of available items, no settings need to be made here. The dialog may be concluded with Continue $\rightarrow$ .
	Filter Criteria
	Filter:
	Access Authorization
	<- Back
Ø	A dialog for the selection of desired items is opened. The four internal tags created previously in the server project are offered for selection as WinCCOPC server items. However, this is only the case if the WinCC project on the server station is in Runtime. These four items must be selected in the right window. Using the Add Items button, these may be inserted into the WinCC project.
	OPCServer.WinCC - (DIETRICH-XP-02)
	Items     Data Type       Ist of all tags     @ConnectedRTClients       Internal tags     @OurentUser       Image: Soript     @OurentWser       Image: Sories     Sories       Image: Sories
	C Back     Display Data Types     Add Items     Item Properties

	B: Establishing connection		
7	However, a new connection must be established beforehand where these items can be inserted as WinCC tags.		
	This connection can be generated automatically by the OPC Item Manager. The New Connection dialog is displayed. Only the name of the new connection needs to be specified. The current example uses the name WinCC_OPC_01. Close the dialog with OK.		
	New Connection		
	Please enter a name for the new connection:		
	WinCC_UPC_UI		
8	The Add Tag dialog opens.		
	Here you specify which connection the tags should be added to. In the current example, they are supposed to be added to the previously created connection WinCC_OPC_01. This must be selected in the lower Add Here field.		
	The tag names used by OPC Item Manager may have optionally added a prefix and a suffix. In the current example, the tag name should be preceded by the prefix SERVER_PC		
	The WinCC tags are created using the Finish button.		
	The OPC Item Manager is closed using the Finish button.		
	Add Tags		
	Tags to be added:		
	Tag names should be completed as follows: Prefix Name Suffix		
	SERVER_PC_ ExampleTag		
	Example: SERVER_PC_ExampleTag		
	Add here:		
	WinCC_OPC_CLIENT.MCP		
	<- Back Finish		

	B: Establishing connection		
9	The following display lists WinCC tags generated by the OPC Item Manager.		
	Name	Туре	Parameters
	SERVER_PC_S16i_OPCServer_01	Signed 16-bit value	"S16i_OPCServer_01", "", 2
	SERVER_PC_S16i_OPCServer_02	Signed 16-bit value	"S16i_OPCServer_02", "", 2
	SERVER_PC_S16i_OPCServer_03	Signed 16-bit value	"S16i_OPCServer_03", "", 2
	SERVER_PC_S16i_OPCServer_04	Signed 16-bit value	"S16i_OPCServer_04", "", 2

#### **C: Creating WinCC picture**



	C: Creating WinCC picture		
3	After placement of the I/O field on the picture, its configuration dialog opens.		
	In the Tag field, the tag SERVER_PC_S16i_OPCServer_01 is set using the button shown in the following.		
	<b>1</b>		
	Tag updates are left at 2s. The additional set op default values. Finish the dialog with OK.	ptions should retain their	
	I/O-Field Configuration		
	Tag: SERVER_PC_S16i		
	Update 2 s		
	C Output C Input C Both		
	Format		
	Font Size 12		
	Font Name Arial		
	Cancel		

	C: Creating WinCC picture		
4	Changes of output format for I/O field.		
	Open its property dialog. This is done by clicking OR on the I/O field and Properties.		
	Cubbo Cubbo Cut Ctrl+X Copy Ctrl+C Duplicate Customized object Group object Linking Configuration Dialog Properties		
5	The Object Properties dialog opens. On the Properties tab register, select the Output/Input entry in the left window. Using OD on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is capable to display signed values with a maximum of 5 digits.		
	Properties Events		
	Image: Description of the state in the		
6	Creating an additional three I/O fields to display the remaining tags.		
1	i ne procedure is analogous to Steps 2 to 5 as described.		

	C: Creating WinCC picture	
7	The picture must be saved. In the example project, it was saved under the name com_3_OPCClient_01.pdl. The picture may be switched directly from Graphics Designer into Runtime by using the button displayed in the following.	
	Runtime	
	Once the picture is in Runtime and the network connection has been established, the current tag values of the server project are displayed. These may also be changed by input of values into the individual I/O fields. Of course, the server project must also be in Runtime.	
	WinCC-Runtime -	
	Communication OPC WinCC Client Station	
	+5 Inc: +155	
	+ + + 23	
	+28	
If no connection exists, the I/O fields are shown in gray tones. In some error must exist in some part of the communication link.		
	+0	

## 3.9.4 Diagnostics of Communication Link Using OPC

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_OPC\_SERVER and the WinCC project WinCC\_OPC\_CLIENT.

Depending on transport protocol used (such as TCP/IP), time-outs of up to 6 minutes may occur. Therefore, under certain circumstances, corrections after connections disruptions may take effect after several minutes only.

- A: WinCC Explorer
- B: Channel Diagnosis

#### A: WinCC Explorer

	A: WinCC Explorer		
1	Diagnostics of communication link in WinCC Explorer.		
	Switch the WinCC_OPC_CLIENT project into Runtime. This is done in WinCC Explorer using the toolbar button displayed in the following. The WinCC_OPC_SERVER project must also be in Runtime.		
2	In WinCC Explorer, using the menu Tools $\rightarrow$ Connection Status, a dialog may be opened to monitor all configured connections. However, this menu item is only active if the project is in Runtime.		
	Language		
	Status of <u>D</u> river Connections		
	Status of S <u>e</u> rver Connections		
	Status of <u>⊂</u> lient Connections		
3	The Status - Logical Connections dialog is opened.		
	This dialog lists all configured connections. In the current example, only the		
	connection WinCC_OPC_01 exists.		
	The displayed values correspond to the status at the moment the dialog was opened. By selecting the corresponding checkbox, a cyclic display update may also be achieved		
	Status - Logical Connections		
	Tag ID     Name     Status     Tag read     Read requ     Tag written     Write req       2     WinCC_OPC_01     OK     0     0     0		
	Cvolic update ( 4 - x 250 ms ) Update Help Close		

	A: WinCC Explorer			
4	Another option to obtain information on the connection status in general but also on the connection status of individual tags is provided by tag management.			
	The status of a configured connection may be obta moving the mouse over it.	ained as a tooltip by simply		
	Name Parameters			
	WinCC_OPC_01 OPCServer.WinCC;  Status: OK  The current process value of a certain tag, as well	as its status, may be		
	obtained as a tooltip by simply moving the mouse over it. This procedu allows determination of errors of a single tag only, not of errors concer the entire connection.			
	Name Type	Parameters		
	SERVER_PC_S16i_ORCServer_01 Signed 16-bit value	"S16i_OPCServer_01", "", 2		
	SERVER_PC_S16i_OttoServer_02_Signed 16-bit value	"S16i_OPCServer_02", "", 2		
	SERVER_PC_S16i Process value: U	"S16i_OPCServer_03", "", 2		
	SERVER_PC_S16i Start value Last Change:2/3/2005 11:46:58 AM	"S16i_OPCServer_04", "", 2		

## **B: Channel Diagnosis**

	B: Channel Diagnosis		
1	Diagnostics of communication lin program.	nk using the WinCC	Channel Diagnosis
	This is started using Start $\rightarrow$ : Channel Diagnosis.	SIMATIC → WinC	$cc \rightarrow Tools \rightarrow$
	Channel Diagnosis		
2	The WinCC Channel Diagnosis The Channels/Connections tab r status of each configured conne one second. The update cycle m	program is opened. register displays exac ction. The default va nay be changed in th	ct information on the lue for display update is e lower input field.
	🎄 WinCC Channel Diagnosis	2	? 🗙
	Channels/Connections Configuration		Always on top
	B VOPC	Counters Requested Tags Data Change Notifications Data Change Notification Tags Synchronous Reads Synchronous Writes Synchronous Write Tags AddItem failures OPC Groups Items added Server Uses DataAccess Server Status Last Error Last Error Name Last Error In Call	Value            16         212           215         0           0x80040154         REGDB_E_CLASSNOT           CoCreateInstanceEx         >
	Cyclic Update		

# 3.10 Communication WinCC - WinCC Using OPC XML

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on http://support.automation.siemens.com/WW/view/en/21320307).

There is the option of copying the following components to hard disk:



The Server WinCC project to be generated.



The Client WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between two WinCC stations using OPC.

The WinCC OPC XML Server is installed on the computer serving as server which provides the data of a WinCC project to other applications on the computer, as well as to the entire connected network environment and the internet.

#### Summary on Example Design



The WinCC OPC XML Server must be installed from the WinCC CD on the computer serving as server. This may have already happened during installation of WinCC.

Both WinCC stations may be connected using any network connection or the internet.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Configuration of WinCC stations
- Generation of WinCC project WinCC\_OPC\_XML\_SERVER
- Generation of WinCC project WinCC\_OPC\_XML\_CLIENT
- Diagnostics of communication link

#### **Required software**

Name	Description	
IIS	Internet Information Server.	
.NET Framework	Microsoft .NET Framework Version 1.1.	
WinCC	WinCC with OPC Server as well as OPC Client to create WinCC projects.	

#### Required hardware on computer

Name	Description
Network connection	Any network connection to establish link to the internet.

### 3.10.1 Requirement for Utilization of OPC XML

OPX XML permits access to process tags through the internet. In order to operate OPC XML, additional software components must be installed. The following installation sequence must be observed.

- 1. Internet Information Server (IIS)
- 2. Microsoft .NET Framework V1.1
- 3. WinCC OPC XML Server

#### Internet Information Server (IIS)

The Internet Information Server must be installed prior to the WinCC OPC XML Server.

	Installation of IIS
1	Open Control Panel. In the Control Panel, select the Add or Remove Programs item.
2	In the Add or Remove Programs dialog, select Add or Remove Windows Components.
3	The Windows Components Wizard opens. In this dialog, select and install IIS.

#### Microsoft .NET Framework V 1.1

The .NET Framework is also a requirement for utilization of the WinCC OPC XML Server. You may download the setup for .NET Framework directly from the Microsoft homepage.

http://msdn.microsoft.com/downloads

# 3.10.2 Configuration of WinCC Stations for OPC XML

The following description contains notes to be taken into consideration during configuration of WinCC stations.

- A: Installing software components
- B: Setting of Authentication

## A: Installing software components

_	A: Installing software	compone	nts	
	Required are the WinC XML Client of WinCC. WinCC Installation CD installed with WinCC.	C OPC XM The WinCC . The WinC	IL Server as wel COPC XML serv COPC XML clie	as the WinCC OPC ers are located on th nt is automatically
	The WinCC OPC XML server must be installed on the computer which w serve as server. Requirements for installation and utilization of the WinCO OPC XML server are described in Chapter Requirements for Utilization of OPC-XML.			
	Following installation of computers must be rel	of compone booted.	nts on the respe	ctive computers, thes
	Select Components			
	Components           WinCC         298 MB         Data Access         4 MB			
	WinCC	298 MB	▲ ☑ Data Access	4 MB
	WinCC     Help     Grammunication	298 MB 49 MB 4 MB	<ul> <li>✓ Data Access</li> <li>✓ Alarm &amp; Even</li> <li>✓ Historical Data</li> </ul>	4 MB s 2 MB
	WinCC     Help     Communication     OPC Server	298 MB 49 MB 4 MB 13 MB	Data Access     Alarm & Even     Historical Data     -HDA Write	4 MB s 2 MB Access 2 MB Access 2 MB
	<ul> <li>✓ WinCC</li> <li>✓ Help</li> <li>✓ Communication</li> <li>✓ OPC Server</li> <li>✓ Options</li> </ul>	298 MB 49 MB 4 MB 13 MB 45 MB	<ul> <li>Data Access</li> <li>Alarm &amp; Evenl</li> <li>Historical Data</li> <li>-HDA Write</li> <li>XML Data Acc</li> </ul>	4 MB s 2 MB Access 2 MB Access 2 MB ess 2 MB
	<ul> <li>✓ WinCC</li> <li>✓ Help</li> <li>✓ Communication</li> <li>✓ OPC Server</li> <li>✓ Options</li> <li>✓ Description</li> <li>OPC XML-Data Access W XML-DA client application Version 5.0 or later is recommended</li> </ul>	298 MB 49 MB 4 MB 13 MB 45 MB ebservice for co s according to 9 juired here.	Data Access     Alarm & Even     Historical Data     -HDA Write     XML Data Acc     XML Data Acc     Specification 1.0. Inte	4 MB s 2 MB Access 2 MB Access 2 MB ess 2 MB ess 2 MB ess 2 MB
	<ul> <li>✓ WinCC</li> <li>✓ Help</li> <li>✓ Communication</li> <li>✓ OPC Server</li> <li>✓ Options</li> <li>Description</li> <li>OPC XML-Data Access W XML-DA client application Version 5.0 or later is rec</li> </ul>	298 MB 49 MB 4 MB 13 MB 45 MB ebservice for co s according to 9 juired here.	Data Access     Alarm & Even     Historical Data     Historical Data     Historical Data     XML Data Acc     XML Data Acc     Specification 1.0. Inte	4 MB s 2 MB Access 2 MB Access 2 MB ess 2 MB ess data to any OPC met Information Service Available: 7260 MB

## **B: Setting of Authentication**

	B: Setting of Authentication		
1	Access authorizations must be set on the computer which serves as WinCC OPC XML server.		
	Open the Management Panel for Internet Information Services. The Management Panel is opened in Windows XP using Start → Control Panel → Administrative Tools → Internet Information Services. In Windows 2000, the Management Panel is opened using Start → Control Panel → Administrative Tools → Internet Services Manager. In Windows 2003, you open the Management Panel using Start → Control Panel → Administrative Tools → Internet Information Services Manager.		
2	In the Management Pa folder has been created	nel of Internet Information Services, a new virtual d for the WinCC OPX XML server under Standard	
	Web site. The Propertie WinCC OPC XML.	es dialog opens using ${}^{\checkmark}\mathbb{O} \mathbb{R}  woheadrightarrow \mathbb{P}$ roperties on item	
	Default Web Site     Site	Explore Open Browse New All Tasks View Delete Refresh Export List Properties Help	

	B: Setting of Authentication
3	Using the Directory Security tab register, you may edit the control for Anonymous Access and authentication. The current example activates anonymous access, and user name and password are not modified. Finish the dialog with OK.
	Anonymous access should not be used for security reasons. However, in our case it represents the simplest option for authentication.
	WinCC-OPC-XML Properties
	Virtual Directory Documents Directory Security HTTP Headers Custom Errors
	Anony Authentication Methods
	No user name/password required to access this resource.
	IP add       User name:       IUSR_WCC6-XP-ENU-01       Browse         Password:       ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●
	Secur Secur For the following authentication methods, user name and password are required when - anonymous access is disabled, or - access is restricted using NTFS access control lists Digest authentication for Windows domain servers Basic authentication (password is sent in clear text)
	Default <u>d</u> omain: Select
	<u>R</u> ealm: <u>Select</u>
	□ Integrated Windows authentication □
	OK Cancel <u>H</u> elp

## 3.10.3 Creating WinCC Project WinCC\_OPC\_XML\_SERVER

The following description shows in detail the necessary configuration steps for creating and successful commissioning of WinCC project WinCC\_OPC\_XML\_SERVER.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project WinCC\_OPC\_XML\_SERVER.

- A: Creating WinCC project
- B: Creating internal tags
- C: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project	
1	Creating a new WinCC project in WinCC Explorer.	
	This is started using Start $\rightarrow$ SIMATIC $\rightarrow$ WinCC $\rightarrow$ Windows Control Center.	
	WINLLExplorer	
2	WinCC Explorer is opened.	
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.	
	The following example project creates a single-user project.	
	Finish the dialog with OK.	
	WinCC Explorer	
	Create a New Project	
	Single-User Project	
	BASS ⊂ Multi-User Project	
	C Client Project	
	C Open an Existing Project	
	Cancel	

	A: Creating WinCC project		
3	The Create a New Project dia	log opens.	
	Enter a project name for the n this manual begin with a chara contain a description of comm type used. The current examp WinCC_OPC_XML_SERVER	new project. WinCC projects c acter sequence of WinCC, and nunication partners, as well as ole has the name	reated as part of d furthermore communication
	Furthermore, in the Project Pa project must be set.	ath field, the storage location of	of the new
	The Create a New Project dia	log is closed by clicking the C	reate button.
	Create a new project		? 🔀
	Project Name: WinCC_OPC_Server New Subfolder: WinCC_OPC_Server You can use this dialog box to create a new WinCC project.	Project Path c:\\wincc\winccprojects Eolder: [] Dri <u>v</u> e:	<u>Create</u> <u>C</u> ancel <u>H</u> elp

## **B: Creating internal tags**

	B: Creating internal tags
1	Creating internal tags required for example.
	This is done in Tag Management using $GR$ on the entry for Internal Tags and New Tag. Tag Management Tag Management Mew Group
	New Tag Find
	Cut Copy Paste
2	The property dialog of the tag opens. The example uses S16i_OPCServer_01 as the name for the first tag. The tag is of data type Signed 16-Bit Value.
	Tag properties
	General Limits/Reporting
	Name: S16i OPCServer_01
	DataType : Signed 16-bit value
	Length: 2
	Address:
	Adapt <u>format</u>
	Project-wide update     C Computer-local update
	🗖 Linear scaling
	Process Value Range Tag Value Range
	Value1 Value1
	Value2 Value2
	OK Cancel Help

	B: Creating internal tags	S	
3	Creating the remaining required tags.		
	The procedure is analogous to Steps 1 to 3 as described. Names, data types and addresses of tags used in this example may be obtained from the following display.		
	Name	Type Parameters	
	🔁 @ConnectedRTClie	Unsigned 16-bit v	
	🔁 @CurrentUser	Text tag 8-bit cha	
	🔁 @DeltaLoaded	Unsigned 32-bit v	
	🔁 @LocalMachineName	Text tag 8-bit cha	
	🔁 @RedundantServe	Unsigned 16-bit v	
	S16i_OPCServer_01	Signed 16-bit value	
	S16i_OPCServer_02	Signed 16-bit value	
	S16i_OPCServer_03	Signed 16-bit value	
	S16i_OPCServer_04	Signed 16-bit value	

#### C: Creating WinCC picture



	C: Creating WinCC picture		
3	After placement of the I/O field on the picture, its configuration dialog opens.		
	In the Tag field, the tag S16i_OPCServer_01 is set using the button shown in the following.		
	Tag updates are set to Upon Change. The addi retain their default values. Finish the dialog with	tional set options should OK.	
	I/O-Field Configuration		
	Tag: S16i_OPCServer_0		
	Update 2 s		
	C Output C Input C Both		
	- Format		
	Font Size 12		
	Font Name Arial		
	Cancel		

	C: Creating WinCC picture
4	Changes of output format for I/O field.
	Open its property dialog. This is done by clicking OR on the I/O field and Properties.
5	Cut Ctrl+X     Copy Ctrl+C     Duplicate     Paste Ctrl+V     Delete Del     Customized object     Group object     Linking     Configuration Dialog Properties  The Object Properties dialog opens
5	On the Properties tab register, select the Output/Input entry in the left window. Using $\textcircled{D}D$ on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is capable to display signed values with a maximum of 5 digits.
	🗖 Object Properties 📀 🔀
	Properties Events
	Image: Description of the state in the
6	Creating an additional three I/O fields to display the remaining tags.
-	The procedure is analogous to Steps 2 to 5 as described.

	C: Creating WinCC picture			
7	Creating a simple tag simulation.			
	The sum of tags S16i_OPCServer_01 and S16i_OPCServer_02 is supposed to be stored in tag S16i_OPCServer_03.			
	The value of tag S16i_OPCServer_04 is supposed to be incremented every 250ms.			
	The requirements posed are satisfied by two C actions. Each is generat using Properties $\rightarrow$ Geometry $\rightarrow$ Position X of the I/O field displaying the respective tag.			
	A detailed description of the C action is found following this section.			
8	The picture must be saved.			
	In the example project, it was saved under the name OPC_XML_Server_01.pdl. The picture may be switched directly from Graphics Designer into Runtime by using the button displayed in the following.			
	Buntime			
	These may also be changed by input of values into the individual I/O fields.			
	WinCC-Runtime -			
	Communication			
	OPC WinCC Server Station			
	+5 Inc: +155			
	+ ****			
	+28			

#### C action to generate sum

```
#include "apdefap.h"
long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
//get tag values
int iValue_01 = GetTagSDWord("S16i_OPCServer_01");
int iValue_02 = GetTagSDWord("S16i_OPCServer_02");
//calculate sum and set tag value
SetTagSDWord("S16i_OPCServer_03",(iValue_01 + iValue_02));
//return constant property value
return GetLeft(lpszPictureName,lpszObjectName);
}
```

- The above described C action is configured for the I/O Field3 object using Properties Geometry Position X. The C action is triggered upon changes of tags S16i\_OPCServer\_01 and S16i\_OPCServer\_02.
- The values of both tags S16i\_OPCServer\_01 and S16i\_OPCServer\_02 are read. Their sum is formed and written to tag S16i\_OPCServer\_03.
- The C action is configured for an object property which serves to provide a trigger. The current value of the property is returned to it.

#### C action for incrementing

```
#include "apdefap.h"
long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
//get tag value
int iValue = GetTagSDWord("S16i_OPCServer_04");
if (iValue < 10000)
{
    //increment and set tag value
    SetTagSDWord("S16i_OPCServer_04", ++iValue);
}
else
{
    //reset tag value
    SetTagSDWord("S16i_OPCServer_04", 0);
}
//return constant property value
return GetLeft(lpszPictureName, lpszObjectName);
}</pre>
```

- The above described C action is configured for the I/O Field4 object using Properties Geometry Position X. The C action is triggered at 250ms.
- The value of tag S16i\_OPCServer\_04 is read. If this has not yet reached 10000, it is incremented and rewritten into the tag. Otherwise the tag value is set to zero.
- The C action is configured for an object property which serves to provide a trigger. The current value of the property is returned to it.

## 3.10.4 Creating WinCC Project WinCC\_OPC\_XML\_CLIENT

The following description shows in detail the necessary configuration steps for creating and successful commissioning of WinCC project WinCC\_OPC\_XML\_CLIENT.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project WinCC\_OPC\_XML\_CLIENT.

- A: Creating WinCC project
- B: Establishing connection
- C: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project			
1	Creating a new WinCC project in WinCC Explorer.			
	WinCC Explorer is started using Start → SIMATIC → WinCC − Windows Control Center.			
	WinCCExplorer			
2	WinCC Explorer is opened.			
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.			
	The following example project creates a single-user project.			
	Finish the dialog with OK.			
	WinCC Explorer			
	Create a New Project			
	Single-User Project			
	■ C Multi-User Project			
	C Client Project			
	C Open an Existing Project			
	Cancel			

	A: Creating WinCC project					
3	<ul> <li>The Create a New Project dialog opens.</li> <li>Enter a project name for the new project. WinCC projects created as part of this manual begin with a character sequence of WinCC, and furthermore contain a description of communication partners, as well as communication type used. The current example has the name WinCC_OPC_XML_CLIENT.</li> <li>Furthermore, in the Project Path field, the storage location of the new project must be set.</li> </ul>					
	Create a new project  Project Name: WinCC_OPC_XML_Client New Subfolder: WinCC_OPC_XML_Client	Project Path c:\\wincc\winccprojects <u>F</u> older: []	Create			
	You can use this dialog box to create a new WinCC project.	Drive:				

## **B: Establishing connection**

	B: Establishing connection		
1	The new project is displayed in WinCC Explorer.		
	Installing of required communication driver. This is done by clicking $\textcircled{R}$ on the Tag Management item and Add New Driver. Tag Management Tag Management Add New Driver Find Properties		
2	The Add New Driver Dialog opens. It offers a selection of all communication drivers available for installation. In the current example, the OPC communication driver is required. It must be selected in the dialog. Close the dialog with Open.		
	Add new driver       Image: Construction of the second secon		
3	The newly added OPC communication driver is displayed as a subitem of Tag Management. Establishing a connection to a certain OPC server, as well as selection of items required from this server, may be facilitated using the OPC Item Manager. This is started using BR on the entry for OPC Groups (OPCHN Unit #1) channel unit and System Parameters. OPC Properties Properties		

_					
	B: Establishing connection				
4	The OPC Item Manager opens.				
	Here the desired OPC server may be selected. It may be local computer or on another computer accessible through a connection.	ated on the network			
	Using the OPC Web Server button, a connection may be established to the WinCC OPC XML server.				
	🗇 OPC Item Manager				
	Eile View Options Help				
	Image: Image	Computer			
		<u>E</u> xit			
	Finished				
5	The Add OPC Web Server dialog opens. Here, the URL of the WinCC OPC XML server must be specified. Enter the URL as follows: "http://xxx/wincc-opc-xml/dawebservice.asmx". Replace xxx with either the IP address or the computer name where OPC XML Web Service runs. Close the dialog by clicking the OK button				
	Add OPC web server	X			
	http://192.168.0.82/wincc-opc-xml/dawebservice.asmx				
	Authentication				
	C Use <u>W</u> indows authentication				
	C Default authentication				
	User name:	_			
	Password:				
	Canc	el			
	B: Establishing connection				
---	--	--	--	--	--
6	The OPC Web Server is now visible in OPC Item Manager.	The OPC Web Server is now visible in OPC Item Manager.			
	The just added OPC Web Server must now be selected. Using the Browse Server button, you may obtain a summary of all items made available by this WinCC-OPC XML server. However, this is only the case if the WinCC project was opened from the server station.				
7	The Filter Criteria dialog opens.				
	This allows you more detailed specification of the type of desired ite you wish a display of available items, no settings need to be made here the dialog may be concluded with Continue $\rightarrow$ .	ms. If nere.			
	Filter Criteria				
	Filter: Type: All Types				
	Access Authorization         Read access         Write access         <- Back				

	B: Establishing connection
8	A dialog for the selection of desired items is opened.
	The four internal tags created previously in the server project are offered for selection as WinCC OPC XML server items. However, this is only the case if the WinCC project on the server station is in Runtime.
	These four items must be selected in the right window. Using the Add Items button, these may be inserted into the WinCC project.
	If you do not have any items available for selection in this dialog, use Error Diagnostics to check your network connections.
	http://192.168.0.82/wincc-opc-xml/dawebservice.asmx - ( <xml>)</xml>
	Image: Provide the service of the s
	C Back      C Back      Item Properties
9	If no connection has been configured yet, a new connection may now be established. The OPCTags dialog must be closed with Yes.
	OPCTags
	The current project does not contain a logical connection, to which the selected tags could be added! Do you want to create a suitable connection?
	<u>Yes</u> <u>N</u> o

	B: Establishing connection
10	The New Connection dialog opens. Only the name of the new connection needs to be specified. The current example uses the name WinCC-OPC-XML-Connection-01. Close the dialog with OK.
	New Connection
	Please enter a name for the new connection:
	WinCC-OPC-XML-Connection-01
	Cancel
11	The Add Tag dialog opens.
	Here you specify which connection the tags should be added to. In the current example, they are supposed to be added to the previously created connection WinCC-OPC-XML-Connection-01. This must be selected in the lower Add Here field.
	The tag names used by OPC Item Manager may have optionally added a prefix and a suffix. In the current example, the tag name should be preceded by the prefix OPC_Server.
	The WinCC tags are created using the Finish button.
	The OPC Item Manager is closed using the Finish button.
	Add Tags
	Tags to be added:
	Tag names should be completed as follows: Prefix Name Suffix
	OPC_Server ExampleTag
	Example: OPC_ServerExampleTag
	Add here:
	E- C test2.MCP
	WINLU-UPU-XML-Lonnection-UI
	<- Back

	B: Establishing connection			
12	The following display lists WinCo Manager.	C tags generated by	the OPC Ite	em
	♥ WinCCExplorer - C:\PROGRAM FILES\SIEMENS         Ele       Edit       Yiew       Iools       Help         □       □       □       ►         X       □       <		2\test2.MCP	
		Name OPC_Server516i_OPCServer_01 OPC_Server516i_OPCServer_02 OPC_Server516i_OPCServer_03 OPC_Server516i_OPCServer_04	Type Signed 16-bit value Signed 16-bit value Signed 16-bit value Signed 16-bit value 20 / License: 128	Parameters *516i_OPCServer *516i_OPCServer *516i_OPCServer *516i_OPCServer

#### **C: Creating WinCC picture**



	C: Creating WinCC picture					
3	After placement of the I/O field on the picture, its configuration dialog opens.					
	In the Tag field, the tag OPC_ServerS16i_OPCServer_01 is set using the button shown in the following.					
	Tag updates are left at 2s. The additional set options should retain their default values. Finish the dialog with OK.					
	I/O-Field Configuration					
	Tag: OPC_ServerS16i_O					
	Update 2 s 💌					
	C Output C Input C Both					
	Format					
	Font Size 12					
	Font Name Arial					
	OK Cancel					

	C: Creating WinCC picture			
4	Changes of output format for I/O field.			
	Open its property dialog. This is done by clicking $\sqrt[3]{UR}$ on the I/O field and Properties.			
	0.000			
	• KCut Ctrl+X			
	Copy Ctrl+C			
	Duplicate			
	🔁 <u>P</u> aste Ctrl+V			
	D <u>e</u> lete Del			
	Customized object			
	Group object			
	Linking			
	Configuration Dialog			
	P <u>r</u> operties			
5	The Object Properties dialog opens.			
	On the Properties tab register, select the Output/Input entry in the left			
	window. Using UD on the set output value will make the display field			
	capable to display signed values with a maximum of 5 digits.			
	Object Properties			
	2 2 1/0 Field IOField1			
	Properties   Events			
	□ I/O Field Attribute Static Dynamic Cu I			
	Colors Output Valu: 0.00000 OPC_ServerS16i_OPCSe 2 s			
	Flashing Apply on Full No			
	Miscellaneous Apply on Exit No 💆 🗌			
	Limits Clear on New Yes X			
6	Creating an additional three I/O fields to display the remaining tags.			
	The procedure is analogous to Steps 2 to 5 as described.			

	C: Creating WinCC picture
7	The picture must be saved. In the example project, it was saved under the name OPC_XML_XLIENT_01.pdl. The picture may be switched directly from Graphics Designer into Runtime by using the button displayed in the following. Purtime Once the picture is in Runtime and the network connection has been established, the current tag values of the server project are displayed. These may also be changed by input of values into the individual I/O fields. Of course, the server project must also be in Runtime.
	VinCC-Runtime - Communication OPC WinCC Client Station +548 Inc: +73 + 999 +1547
	If no connection exists, the I/O fields are shown in gray tones. In this case, some error must exist in some part of the communication link.

# 3.10.5 Diagnostics of Communication Link Using OPC XML

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_OPC\_SERVER and the WinCC project WinCC\_OPC\_CLIENT.

Depending on transport protocol used (such as TCP/IP), time-outs of up to 6 minutes may occur. Therefore, under certain circumstances, corrections after connection disruptions may take effect after several minutes only.

#### A: WinCC Explorer

	A: WinCC Explorer			
1	Diagnostics of communication link in WinCC Explorer.			
	Switch the WinCC_OPC_CLIENT project into Runtime. This is done in WinCC Explorer using the toolbar button displayed in the following. The WinCC_OPC_SERVER project must also be in Runtime.			
2	In WinCC Explorer, using the menu item Tools → Connection Status, a dialog may be opened to monitor all configured connections. However, this menu item is only active if the project is in Runtime.			
	Language			
	Status of <u>D</u> river Connections			
	Status of Server Connections			
	Status of <u>C</u> lient Connections			

	<b>A</b> :	WinC	C Explorer					
3	Th	e Stat	tus - Logical C	onnection	s dialog is	opened.		
	Th coi	is dial nnecti	og lists all con on WinCC_OF	figured co PC_01 exi	nnections	s. In the cu	rrent exam	ple, only the
	Th wa up	e disp is ope date r	played values o ned. By select nay also be ac	correspond ing the co chieved.	d to the st rrespond	atus at the ng checkb	moment th ox, a cyclic	ne dialog : display
	St	atus -	Logical Connecti	ons				×
		Tag ID	Name		Status	Tag read	Read requ	Tag written
		3	WinCC-OPC-XML-C	onnection-01	ОК	0	0	0
		<						>
		Update Cyc	clic update (	4 <u>→</u> × 2	250 ms )	<u>U</u> pdate	<u>H</u> elp	Close

	A: WinCC Explorer
4	Another option to obtain information on the connection status in general but also on the connection status of individual tags is provided by Tag Management.
	The status of a configured connection may be obtained as a tooltip by simply moving the mouse over it.
	Name Parameters
	WinCC-OPC-XML-Connection_01 http://192.1
	The current process value of a certain tag, as well as its status, may be obtained as a tooltip by simply moving the mouse over it. This procedure allows determination of errors of a single tag only, not of errors concerning the entire connection.
	Name Type
	OPC_ServerS16i_OPCServer_01 Signed 16-bit value
	OPC_Server_02Signed 16-bit value
	OPC_S - Start value
	Last Change:2/3/2005 11:46:56 AM

## **B: Channel Diagnosis**

	B: Channel Diagnosis		
1	Diagnostics of communication lir program.	nk using the WinCC C	Channel Diagnosis
	This is started using Start $\rightarrow$ : Channel Diagnosis.	SIMATIC → WinC	C → Tools →
	Channel Diagnosis		
2	The WinCC Channel Diagnosis	program is opened.	
	The Channels/Connections tab r status of each configured conne- one second. The update cycle m	egister displays exac ction. The default valu hay be changed in the	t information on the ue for display update is a lower input field.
	🍓 WinCC Channel Diagnosis	2	? 🛛
	Channels/Connections Configuration		Always on top
	B OPC	Counters	Value
	√ WinCC_OPC_01	Requested Tags Data Change Notifications Data Change Notification Tags Synchronous Reads Synchronous Writes Synchronous Writes Synchronous Write Tags AddItem failures DPC Groups Items added Server uses DataAccess Server Status Last Error Last Error Name Last Error In Call	16 212 215 0 0 0 0 0 1 4 V2.0 RUNNING 0x80040154 REGDB_E_CLASSNOT CoCreateInstanceEx ➤
	Cyclic Update		

# 3.10.6 Error Diagnostics (OPC XML)

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_OPC\_XML\_SERVER and the WinCC project WinCC\_OPC\_XML\_CLIENT.

#### Problem: The WinCC\_OPC\_XML\_Server is not available

	Procedure
1	Try to ping the server.
	Open the command prompt using Start → Programs → Accessories → Command prompt. Enter the following command: ping xxx.xxx.xxx
	Replace xxx with the IP address of the server. If you receive a reply, check the entered web address once again.
	ightarrow The WinCC OPC XML server is available, but the website is not

#### Problem: The WinCC OPC XML server is available, but the website is not

	Procedure		
1	Check whether or not IIS is active and select the item Standard Wel activated, activate it and again at OPC XML Client.	ited. Open the Manage o site. If the standard W tempt to establish opera	ment Panel of IIS /eb site is not ation of the WinCC
	🝓 Internet Information Services		
	File Action View Help		
	← → 🗈 🖬 💣 🕃 😫		
	🝓 Internet Information Services	Name	Path 🔨
	🗐 🗐 WCC6-XP-ENU-01 (local computer)	🛞 IISHelp	c:\windows\he
	<ul> <li>→ → → → → → → → → → → → → → → → → → →</li></ul>	tsweb	C:\WINDOWS
		🔁_vti_bin	C:\Program Fi
		Printers	C:\WINDOWS
		SWINCC-OPC-XML	C:\Program Fi
		aspnet_client	
		images	
		📄 vti cnf	M
2	Check the physical network conn different website.	ections of your compute	er. Try to access a
	If the WebNavigator Server is still Administrator	not available, check w	ith your System

# 3.11 Communication Using WinCC Web Navigator

Projects and files to be generated in this chapter may also be loaded onto your hard disk directly from the Online Support (link "Info" on http://support.automation.siemens.com/WW/view/en/21320307).

There is the option of copying the following components to hard disk:



The Server WinCC project to be generated.

This chapter describes in detail the implementation of a communication link between two WinCC stations using WinCC WebNavigator.

The WinCC WebNavigator Server is installed on the computer serving as server which provides the data of a WinCC project to the entire connected network environment as well as the internet.

#### Summary on Example Design



The WinCC WebNavigator Server must be installed from the WinCC WebNavigator CD on the computer serving as server.

Both WinCC stations may be connected using any network connection or the internet.

#### **Summary of Configuration Steps**

The following summary lists all configuration segments necessary for establishing the communication link.

- Configuring WinCC Stations
- Establishing communication link
- Commissioning of WinCC stations
- Generation of WinCC project WinCC\_Web\_Server
- Error diagnostics

#### **Required software**

Name	Description
IIS	Internet Information Server.
WinCC	WinCC with WinCC WebNavigator Server as well as WebNavigator Client.

#### Required hardware on computer

Name	Description
Network connection	Any network connection to establish link to the internet.

# 3.11.1 Configuring WinCC Stations for Web Navigator

The following description contains notes to be taken into consideration during configuration of WinCC stations.

- A: Installing software component Server
- B: Installing software component Client

## A: Installing software component - Server

	A: Installing software component - Server
1	For WinCC WebNavigator, Internet Information Services are required.
	Open Control Panel. In the Control Panel, select the Add or Remove programs item. In the Add or Remove programs dialog, select Add or Remove Windows Components. The Windows Components Wizard opens. In this dialog, select and install IIS.
2	Installing WinCC WebNavigator Server. Insert the WinCC WebNavigator CD. The setup for WinCC WebNavigator starts. Execute all steps of the installation wizard.

## B: Installing software component - Client

	B: Installing software component - Client	
1	Installing WebNavigator Client.	
2	Select the option Complete and finish the setup for WebNavigator Client.	
	🔀 SIMATIC WinCC/Webnavigator Client V6.1 - InstallShield Wizard 🛛 🔀	
	Setup Type       Choose the setup type that best suits your needs.	
	Please select a setup type.	
	Choose which program features you want installed and where they will be installed. Recommended for advanced users.	
	InstallShield	

# 3.11.2 Creating WinCC Project WinCC\_Web\_Server

The following description shows in detail the necessary configuration steps for creating and successful commissioning of WinCC project WinCC\_Web\_Server.

#### **Summary of Configuration Steps**

The following summary lists all necessary configuration steps to create the WinCC project WinCC\_Web\_Server.

- A: Creating WinCC project
- B: Creating internal tags
- C: Creating WinCC picture

## A: Creating WinCC project

	A: Creating WinCC project
1	Creating a new WinCC project in WinCC Explorer. This is started using Start → SIMATIC → WinCC → Windows
	Control Center.
	WinCCExplorer
2	WinCC Explorer is opened.
	Using menu item File $\rightarrow$ New, the dialog to specify the properties of a new WinCC project opens.
	The following example project creates a single-user project.
	Finish the dialog with OK.
	WinCC Explorer
	Create a New Project
	Single-User Project
	In the set of the set
	🕵 🔿 Client Project
	🖉 Open an Existing Project
	Cancel

	A: Creating WinCC project		
3	The Create a New Project dia	alog opens.	
	Enter a project name for the of this manual begin with a cl contain a description of comr type used. The current exam	new project. WinCC projects haracter sequence of WinCC munication partners, as well a sple has the name WinCC_W	created as part , and furthermore as communication eb_Server.
	Furthermore, in the Project P project must be set.	ath field, the storage location	n of the new
	The Create a New Project dia	alog is closed by clicking the	Create button.
	Create a new project		? 🔀
	Project Name: WinCC_Web_Server New Subfolder: WinCC_Web_Server You can use this dialog box to create a new WinCC project.	Project Path c:\\winco\wincoprojects <u>Folder:</u> [] Drive: C:	Cr <u>e</u> ate Cancel <u>H</u> elp

## **B: Creating iinternal tags**

	B: Creating internal tags
1	Creating internal tags required for example.
	This is done in Tag Management using CR on the entry for Internal Tags and New Tag. Tag Management Tag Management New Group New Tag Find Cut Copy Paste
2	The property dialog of the tag opens. The example uses S16i_Web_01 as the name for the first tag. The tag is of data type Signed 16-Bit Value. Tag properties General Limits/Reporting Properties of Tags Name: S16i_Web_01 Data_ype : Signed 16-bit value
	Length: 2   Address: Select   Adapt format : Image: Computer-local update   Project-wide update Computer-local update   Linear scaling Tag Value Range   Value1 Value1   Value2 Value2
	OK Cancel Help

	B: Creating internal	tags
3	Creating the remaining required tags.	
	The procedure is anal types, and addresses the following display.	logous to Steps 1 to 3 as described. Names, data of tags used in this example may be obtained from
	Name	Type Parame
	🔁 S16i_Web_01	Signed 16-bit value
	🔁 S16i_Web_02	Signed 16-bit value
	🔁 S16i_Web_03	Signed 16-bit value
	<mark>ြ</mark> S16iWeb04	Signed 16-bit value

#### **C: Creating WinCC picture**



	C: Creating WinCC picture	
3	After placement of the I/O field on the picture, its configuration dialog opens.	
	In the Tag field, the tag S16i_Web_01 is set usi following.	ng the button shown in the
	Tag updates are set to Upon Change. The addi retain their default values. Finish the dialog with	tional set options should OK.
	I/O-Field Configuration	
	Tag: Web_EAKonfig.gif	
	Update 2 s	
	Type C Output C Input ☉ Both	
	- Format	
	Font Size 12	
	Font Name Arial	
	Cancel	

	C: Creating WinCC picture	
4	Changes of output format for I/O field.	
	Open its property dialog. This is done by clicking $\mathcal{O}R$ on the I/O field Properties.	
	Image: Book of the second	
5	The Object Properties dialog opens. On the Properties tab register, select the Output/Input entry in the left window. Using D on the set output value will make the display field editable. Enter the new format s99999. Using this format, the I/O field is capable to display signed values with a maximum of 5 digits.	
	Object Properties     Image: Constraint of the second	
	ID Field       Attribute       Static       Dynamic       Cu       I         Geometry       Geometry       Field Type       I/O Field       Image: Colors	
6	Creating an additional three I/O fields to display the remaining tags. The procedure is analogous to Steps 2 to 5 as described.	

	C: Creating WinCC picture		
7	Creating a simple tag simulation.		
	The sum of tags S16i_Web_01 and S16i_Web_02 is supposed to be stored in tag S16i_Web_03.		
	The value of tag S16i_Web_04 is supposed to be incremented every 250ms.		
	The requirements posed are satisfied by two C actions. Each is generated using Properties $\rightarrow$ Geometry $\rightarrow$ Position X of the I/O field displaying the respective tag.		
	A detailed description of the C action is found following this section.		
8	The picture must be saved.		
	In the example project, it was saved under the name Web_Server_01.pdl. The picture may be switched directly from Graphics Designer into Runtime by using the button displayed in the following.		
	Runtime		
	These may also be changed by input of values into the individual I/O fields.		
	WinCC-Runtime -		
	Communikation WinCC Web Navigator		
	+5 Inc: +155		
	+ + + + 23		
	+28		

#### C action to generate sum

```
#include "apdefap.h"
    long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
    //get tag values
    int iValue_01 = GetTagSDWord("S16i_Web_01");
    int iValue_02 = GetTagSDWord("S16i_Web_02");
    //calculate sum and set tag value
    SetTagSDWord("S16i_Web_03",(iValue_01 + iValue_02));
    //return constant property value
    return GetLeft(lpszPictureName,lpszObjectName);
}
```

- The above described C action is configured for the I/O Field3 object using Properties --> Geometry --> Position X. The C action is triggered upon changes of tags S16i\_Web\_01 and S16i\_Web\_02.
- The values of both tags S16i\_Web\_01 and S16i\_Web\_02 are read. Their sum is formed and written to tag S16i\_Web\_03.
- The C action is configured for an object property which serves to provide a trigger. The current value of the property is returned to it.

#### C action for incrementing

```
#include "apdefap.h"
long _main(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName)
{
//get tag value
int iValue = GetTagSDWord("S16i_Web_04");
if (iValue < 10000)
{
    //increment and set tag value
    SetTagSDWord("S16i_Web_04", ++iValue);
}
else
{
    //reset tag value
    SetTagSDWord("S16i_Web_04", 0);
}
//return constant property value
return GetLeft(lpszPictureName,lpszObjectName);
}</pre>
```

- The above described C action is configured for the I/O Field4 object using Properties Geometry Position X. The C action is triggered at 250ms.
- The value of tag S16i\_Web\_04 is read. If this has not yet reached 10000, it is
  incremented and rewritten into the tag. Otherwise the tag value is set to zero.
- The C action is configured for an object property which serves to provide a trigger. The current value of the property is returned to it.

# 3.11.3 Configuring WinCC Web Navigator Server

The following chapter shows in detail the required configuration steps in WinCC project WinCC\_Web\_Server in order to configure the WinCC WebNavigator Server.

- A: Establishing a user
- B: Configuring WebNavigator
- C: Publishing WinCC pictures

## A: Establishing a user

	A: Establishing a user		
1	Opening User Administrator. This is done in WinCC Explorer using ${}^{\circ} term R$ on the User Administrator item.		
2	Establishing a new group in User Administrator. By pressing the button, a new user group is added. For example, the name WebUser is entered as a group name.		
3	Establishing a new user. This is done using the 🚨 button. In the example, the user is issued the user name WebClientUser with password 123456.		
4	Activating the WebNavigator option for the just created users. This is done by activating the WebNavigator checkbox. The picture Web_Server_01 is entered as the start-up picture. User Administrator may be closed.		
	Web Navigator         Web options         Start       Web_Server_01.PD_         Language       German (Germany)		

## **B: Configuring WebNavigator**

	B: Configuring WebNavigator		
1	Starting Web Configurator. This is done in WinCC Explorer using $\mathcal{D}R$ on the items WebNavigator and Web Configurator.		
	Properties		
2	Start the WinCC Web Configurator Wizard which will guide you through the WinCC Web Navigator Server configuration. Push the Continue button.		

	B: Configuring WebNavigator		
3	On the next page of the Wizard, you may select if the WinCC WebNavigator Server is supposed to be created as the new Standard Web site or to be added to another existing website. In this example, the WinCC WebNavigator Server is added to an already existing virtual folder. Using the Search button, you may search for an existing web site.		
	🖶 WinCC Web Configurator		
	Here, you can create a new standard Web site or add a virtual folder to an existing activated Web site:		
	C Create a new standard Web site (stand-alone)     Add to an existing Web site (virtual folder)		
	Active Web Site:		
	Cancel < Back Next > Finish		
4	If you have successfully installed IIS, a standard Web site already exists. Select the existing standard Web site and close the dialog by clicking OK.		
	WinCC Web Configurator		
	Here, you can select one of your active Web sites and add a virtual folder to it.		
	Active Web Site:		
	Default Web Site		
	Selection of an active Web site:		
	Cancel < Back Next> OK		

	B: Configuring WebNavigator			
5	5 The just selected standard Web site is now recorded in the dialog. the Continue button, you may switch to the next page in the Wizard			
	🖶 WinCC Web Configurator 🛛 🛛 🔀			
		Here, you can create a new standard Web site or add a virtual folder to an existing activated Web site:		
		<ul> <li>Create a new standard Web site (stand-alone)</li> <li>Add to an existing Web site (virtual folder)</li> </ul>		
		Active Web Site:		
		Cancel < Back Next> Finish		
6	age are left at the default values in this example. n, the configuration of WinCC WebNavigator Server			
	🖶 WinCC Web Configurator			
		Here, you can change the name, IP address and TCP connection (default: 80) of your Web site:		
		Name of the Web site: WebNavigator Port: IP Address:		
		80 (All not assigned)		
		MainControl.asp Reconnect Interval 10 s		
		✓ Start the web-site after being configured.		
		Cancel < Back Next > Finish		

## C: Publishing WinCC pictures

	C: Publishing WinCC pictures	
1	Starting Web View Publisher. This is done in WinCC Explorer using OR on the items WebNavigator and Web View Publisher. Web Navigator Web View Publisher Web Configurator Load Balancing Properties	
2	2 The WinCC Web Publishing Wizard is started. By pushing the Continu- button, you get to the next page of the WinCC Web Publishing Wizard.	
	WinCC Web Publishing Wizard - Introduction         Welcome to the Web Publishing Wizard         The WinCC Web Publishing Wizard will help you publish your WinCC Pictures to a Web Server by preparing and copying the selected files from your WinCC Project to the Picture Publishing Folder of your WinCC Web Server.         Server.         Skip this screen in the future.	

	C: Publishing WinCC pictures			
3	On the next page of the Wizard, the path to pictures and WebServer is specified. In this example, no server prefix is issued. The first path to be specified must point to the directory GraCs of your WinCC project.			
	The second directory to be specified must point to the installation dir of WinCC-WebNavigator-Server\Server\Web\Pictures. The Wizard p may be closed with Continue.			
	WinCC Web Publishing Wiza	ard - Select directories		
		Select the folder containing the GraCS folder with your WinCC pictures and the folder of the WinCC Web Server to which you will publish your pictures.		
		Path to WinCC project folder:		
		C:\PROGRAM FILES\SIEMENS\WINCC\WINCCPROJECT		
		Publishing folder of the WinCC Web: C;\PROGRAM FILES\SIEMENS\WINCC\WINCCPROJECT		
		ancel < <u>B</u> ack <u>Next</u> Einish		




## 3.11.4 Commissioning of WinCC Web Client

This chapter describes access to WinCC WebNavigator Server using WinCC WebNavigator Client.

#### A: Starting WinCC WebNavigator Client

	A: Starting WinCC We	bNavigator Client	
1	Open Internet Explorer. In the address line, enter http://xxx.xxx.xxx/WebNavigator. Replace xxx with the IP address of the WinCC WebNavigator Server. Confirm the		
2	entered address with the Return key. During the initial use of WebNavigator Client, you must confirm the security warning with Yes.		
	Security Warning	Do you want to install and run "http://localhost/webnavigator/Install/WebClientInstall.dll " signed on 6/29/2004 6:53 AM and distributed by: <u>Siemens AG</u> Publisher authenticity verified by VeriSign Class 3 Code Signing 2001 CA	
		Caution: Siemens AG asserts that this content is safe. You should only install/view this content if you trust Siemens AG to make that assertion. Always trust content from Siemens AG Yes No More Info	

	A: Starting WinCC	WebNavigator Client	
3	Register at Server. Enter user name and password of user WebClientUser, as previously created in UserAdministration.		
	Connect to localho	st 🥐 🔀	
	localhost		
	<u>U</u> ser name:	🕵 WebClientUser 💌	
	Password:	•••••	
		Remember my password	
		OK Cancel	
_			
4	Upon successful logon at the WinCC WebNavigator Server, the start-up picture set for this user is loaded.		
	WinCC Web Navigator - Microsoft Internet Explorer		
	Image: Second Secon		
	Address  http://locahost/webNavigator/  VinCC  Communikation		
	WinCE/Web Navigator	*5 Inc: +155	
	Change Server Recent Servers	+ *23	
	localhost 🛞	+28	
	Reporting Tools ▼ Analysis Tools ▼ Diagnose ▼		
	Additional Tools ▼ Download Area ▼ Settings		
	WebClient properties News		
	Simatic HMI Website Simatic WinCC Website		
	Eanguage (*) Deutsch English		
	Français     Italiano     Español	 ▼	
1	🕘 Done	Second intranet	

## 3.11.5 Error Diagnostics (WinCC Web Navigator)

The following description shows options available for diagnostics of the communication link between the WinCC project WinCC\_Web\_Server and WinCC WebNavigator Client.

#### Problem: WinCC WebNavigator server is not available

	Procedure
1	Try to ping the server.
	Open the command prompt using Start → Programs → Accessories → Command prompt. Enter the following command: ping xxx.xxx.xxx
Replace xxx with the IP address of the server. If you receive a repl the entered web address once again.	
	ightarrow The WinCC WebNavigator server is available, but the website is not
2 WinCC WebNavigator server is not available using ping	
	Try to open the WebNavigator Client on the WebNavigator Server. To do so, open Internet Explorer and, instead of the IP address of the server, enter localhost.
	WinCC WebNavigator Server is running but cannot be reached through the internet
3	WebNavigator server is not available on the server computer using localhost.
	ightarrow The WinCC WebNavigator server is available, but the website is not

#### Problem: The WinCC WebNavigator server is available, but the website is not

	Procedure		
1	Check whether or not IIS is active and select the item Standard We activated, activate it and again at WinCC WebNavigator Client.	ated. Open the Manag b site. If the standard tempt to establish ope	gement Panel of IIS Web site is not eration of the
	🝓 Internet Information Services		
	Eile Action Yiew Help		
	← → 🖻 🖬 😭 🛱 😫	₽   ► "	
	<ul> <li>Internet Information Services</li> <li>→ → → → → → → → → → → → → → → → → → →</li></ul>	Name	Path 🔥
		🛞 IISHelp	c:\windows\he
		atsweb	C:\WINDOWS
		🔁_vti_bin	C:\Program Fi
		Printers	C:\WINDOWS
		WinCC-OPC-XML	C:\Program Fi
		aspnet_client	
		images	
			~
			>
2	If the WebNavigator Server is stil Administrator	l not available, check	with your System

# Problem: WinCC WebNavigator Server is running but cannot be reached through the internet

	Procedure
1	Check the physical network connections of your computer. Try to access a different website.

# Index

## Α

Access	27, 110
Access Methods	9, 20
Industrial Ethernet	27
MPI	20
Access Point	86
Industrial Ethernet	86, 110
Actuator-Sensor Level	16
Acyclic Reading	53
Addressing	110
Alarm Logging Runtime	44
AUI	29

## В

Bridge	13
Bus	5

## С

Cell Level	16
Central Module	136
COM Port	63
COM PROFIBUS	69, 70
Communication	131, 292
Communication Driver	63, 74
Industrial Ethernet	74
PROFIBUS	67
Serial Communication	63
Communication Partners	63, 65, 69,
	70, 72, 74
Industrial Ethernet	74
MPI	65
PROFIBUS	67
PROFIBUS DP	69
PROFIBUS FDL	72
PROFIBUS FMS	70
Serial Communication	63
Communication Processor	64, 86,
05 4040	176, 290
CP 1612	131, 176
CP 1613	
CP 3013 Industrial Ethernat	290, 292
Industrial Ethernet	73
	04 66
Postart	00
NESIGII	00

Configuration	110
Connection	110, 201, 324
Connection Parameters	
Industrial Ethernet	110
PROFIBUS	324
TCP/IP	201
CSMA/CD	9
Cycle	44, 52
Cyclic Reading	53, 110

#### D

Data Type	44
Space Requirement	44
Diagnosis	
SlotPLC	433
Web Navigator	533
Diagnostics	
Hard Net	125
Industrial Ethernet	125, 170
OPC	467
OPC XML	501, 505
Redundancy	396
S7 PROFIBUS	340
S7-OPC	287
Soft Net	170
TCP/IP	217
DP	24, 69

#### Ε

Ethernet Address 86

# F

FDL	24, 72
Field Level	16
FMS	24, 70, 344

## G

Gateway	13
Global Script Runtime	44
Graphics Runtime	44

## Η

Hard Net	64, 84
Diagnostics	125
Industrial Ethernet	73, 84
PROFIBUS	64

### I

I/O	110
Industrial Ethernet	18, 27, 28,
	29, 73, 74
Access Methods	27
Communication Partners	74
Diagnostics	125, 170
Electrical Network	29
Optical Network	29
Protocol Profiles	28
Standardization	27
Transfer Medium	29
Transport Protocols	28
IP181	
ISO	28
ISO-on-TCP	28
ITP	29

## L

LAN	8
Line	5

## Μ

MAC Address	86
MAN	8
Management Level	16
MAP	28
Master Slave	9
MPI	18, 20, 64
Access Methods	20
Number of Participants	20
Transfer Medium	20

#### 0

OLM	25
OLP	25
OPC	32, 263, 435
Client	455
Diagnostics	467
Group	263
Item	263
OPC Scout	263
Server	445
OPC Item Manager	271
OPC XML	471, 473, 474
Diagnostics	501, 505
OPC XML Client	488
OPC XML server	478
Organization of Data	55

#### Ρ

PA	24
PDU	44
Point to Point	5
Power Supply Unit	136
PROFIBUS	18 22 24 25 66
	67 69 70 344
Communication Partn	or 67
Electrical Network	CI 07
Number of Derticinent	20
	S 22
Optical Network	25
PROFIBUS DP	24, 69
PROFIBUS FDL	24
PROFIBUS FMS	24, 70, 344
PROFIBUS PA	24
Protocol Architecture	24
S7 Functions	24
Standard	22
Transfer Medium	25
Protocol	24, 28, 86, 131, 176
Industrial Ethernet	28
Installing	131 176
PROFIBUS	24
	<b>4</b> 7

### R

Rack	136
Redundancy	344
Diagnostics	396
Repeater	13, 25
Ring	5
Router	13
Runtime	110

# S

S7 Functions	28
Industrial Ethernet	28
PROFIBUS	24
S7 PROFIBUS	24
Diagnostics	340
S7-OPC	221
Diagnostics	287
SEND/RECEIVE	24, 28, 76
Industrial Ethernet	28, 76
PROFIBUS	24
Serial Communication	63
Setting PG/PC Interface	86
SIMATIC Manager	136
SIMATIC NET	82
SIMATIC Redundancy	344
SIMATIC S5	72, 76, 344
ETHERNET LAYER 4	76
ETHERNET TF	76
PMC Ethernet	76
PROFIBUS FDL	(2
PROFIBUS FMS	344
Single-User	110
SIOTPLC	399
	433
	401
Solt Net	64, 129
Diagnostics	72 120
	73, 129
Stor	5
Subpot	J 191
Sub-Not	101
Svetom	130
Oyatem	110

## Т

Tag	44
Space Requirement	44
Tag Logging Runtime	44
TCP/IP	174
Diagnostics	217
Telegram	44, 55
Number of Telegrams	44
Optimization	55
TF	28
Token	23
Token Passing	9
Topology	5, 8
Transfer Medium	8, 20, 29
Industrial Ethernet	29
MPI	20
PROFIBUS	25
Tree	5
Type Conversion	44

## U

28
10
52
44

#### W

WAN	8
Web Navigator	507
Configuring	509
Diagnosis	533
Web Navigator client	531
Web Navigator server	512, 522
WinAC	401
WinCC Explorer	110
WinCC OPC	435
WinCC OPC Server	435
WinCC OPC XML	474
WinCC SlotPLC	399
WinCC Web Navigator	507

Index