Application for SINAUT ST7 Telecontrol with TIM4R-IE and TIM3V-IE in an Ethernet-based Environment

SINAUT ST7 Telecontrol– Configuration 8– Volume 1

Application Description • May 2009

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Preface

Objective of the application

The objective of this application is to familiarize beginners, as well as those changing over from classic SINAUT WAN connections, with the Ethernet communication via the TIM3V-IE, TIM4R-IE and EGPRS/ GPRS radio connection via the internet. An integrated demo plant enables you to follow the configuration and adapt it for your own specific requirements.

Main contents of this application

For clarity reasons the range of topics is divided between two documents.

- Volume 1 the central station is connected with the Ethernet via a TIM4R-IE, the two stations via a TIM3V-IE.
- Volume 2 is based on volume 1 and illustrates how the connections between the central station and the stations are realized via secured EPRS/ GPRS connections via the internet.

Note Volume 2 is available as an extra document on the HTML page.

Topics not covered by this application

The example project contains no technology-relevant program for control or coordinating the drives. It only serves for demonstrating the data exchange between station and central station. It is kept simple on purpose in order to illustrate the correlation between data in the CPUs and the central station.

Structure of this document

The documentation of this application is divided into the following main parts.

Components	Description
Application Description	This section provides a general overview of the contents. You will learn about the components used (standard hardware and software components and the specially created software).
Principles of Operation and Program structures	This part describes the detailed function processes of the involved hardware and software components, the solution structures and – where useful – the specific implementation of this application. You will need this section to get to know the interaction of the solution components, e.g. if you want to use them as basic elements for your own developments.
Setup, configuration and operation of the application	This part leads you step by step through the structure, important configuration steps, commissioning and operation of the application.
Appendix	This part of the documentation provides additional information such as bibliographic references, glossaries, etc.

Reference to the Automation and Drives Service & Support

This article is from the Internet application portal of the Automation and Drives Service & Support. The following link takes you directly to the download page of this document.

http://support.automation.siemens.com/WW/view/en/23810112

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Application Description

Content

Here you will be provided with a quick overview of the automation task as well as its solution. Furthermore, you will learn about the components used (standard hardware and software components).

1 Automation Task

1.1 Overview

Two waste water process stations can be controlled and monitored from the control centre. The figure below provides an overview of the automation task.

Figure 1-1

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1.2 Requirements

The SINAUT control centre and the stations are interconnected via a cable-based Ethernet network.

From the control centre the following is possible in each station:

- Three drives can be configured as technological standard typicals of the ST7cc package and can be operated via a WinCC image.

- An analogue value can be graphically displayed online and saved into an archive.
- The transferred data can be buffered in the local TIM.

Stations 02_Station and 03_Station can send process information to each other.

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2 Automation Solution

2.1 Overview of the overall solution

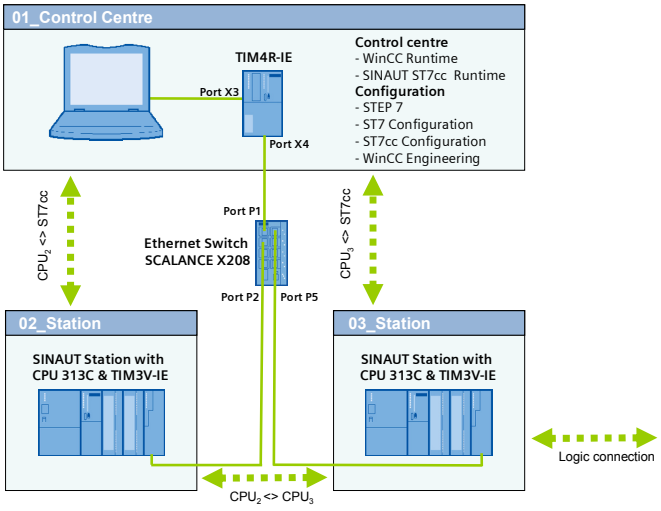
A control centre communicates with two stations via Ethernet.

- Control centre: PG/PC with SIMATIC NET PC Software, WinCC, SINAUT ST7cc and TIM4R-IE (TD7onTIM)
- Ethernet connection: central SCALANCE-X208 switch
- Distributed stations: CPU313C with TIM 3V-IE (TD7onTIM)

Schematic layout

The following figure shows the realized hardware and software setup of the solution:

Figure 2-1



Configuration

A PG or PC is used as the control centre. Via the integrated Ethernet interface the PC is connected with the TIM4R-IE. The TIM4R-IE is connected with port 1 of the SCALANCE X208 Switch via your second Ethernet port.
Each station consists of a compact CPU313C and a TIM3V-IE. The Ethernet interface of the TIM3V-IE in station 2 is connected with port 2 of the Switch. The TIM3V-IE in station 3 is connected with port 5 of the Switch.

Note

The PC in this example is configuration platform and control centre in one. Apart from STEP 7 and WinCC development environment, the WinCC and ST7cc Runtime environment runs simultaneously with the ST7 connection to the S7 station.

For separating these functions please follow the manuals for SIMATIC NET and WinCC.

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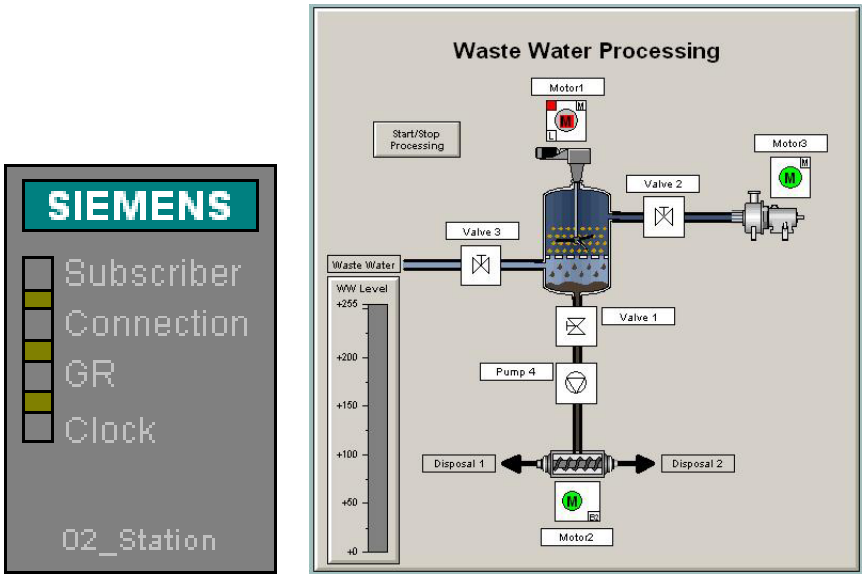
Note The power supply (DC 24 V) of the SIMATIC station is used in this test setup also for supplying the other modules (Switch and TIM).

2.2 Description of the core functionality

- Automation scenario: Configuring a simple process data transfer (same scenario for both stations)
  - Analog: analog measured value recording
  - Digital: operating 3 drives via control commands Start/Stop, feedback messages On/Off and error messages.
  - Digital: sending and receiving of status messages between the stations
- Visualization:
  - Using the standard SINAUT typicals (typical for the status of each station and for respective technological objects)

Figure 2-2



Advantage of this solution

- Integration of local automation and data transfer.
- Change-controlled process data transfer with the control centre and between the individual stations.
- Consistent data models – from field level to the archives of the control centre.

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- Supplying the archives in the control centre system using the provided time stamps.
- High data security through buffering the message frames in the local TIM.
- Networkwide clock synchronization (via the SINAUT networks)

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2.3 Required hardware and software components

Hardware components

Table 2-1

Component	Quantity	MLFB / order number	Note
TIM3V-IE	2	6NH7800-3BA00	
TIM4R-IE	1	6NH7800-4BA00	
SCALANCE X208	1	6GK5208-0BA00-2AA3	8 X RJ45
IE FC TP STANDARD CABLE	1	6XV1840-2AH10	Connecting line IE minimum ordering quantity 20 m
RJ45 plug-in connector	8	6GK1901-1BB10-2AA0	Easy to assemble
PG	1	6ES7712-	Configurator
PS307 5A	3	6ES7 307-1EA00-0AA0	Power supply
S7-CPU 313C	2	6ES7313-5BF03-0AB0	
Front connector for signal modules	2	6ES7392-1BM01-0AA0	
Micro Memory Card	2	6ES7 953-8LF11-0AA0	Min.64 kB

Standard software components

Table 2-2

Component	Qty.	MLFB / order number	Note
SINAUT ST7 Software package 2007	1	6NH7997-0CA15-0AA0	
SINAUT ST7cc V2.7	1	6NH7997-7CA15-0AA1	License for max. 6 SINAUT stations
STEP 7 V5.4 SP4		6ES7 810-4CC08-0YA5	or higher
SIMATIC NET PC SW Edition 2006	1	6GK1704-1LW64-3AA0	
SIMATIC WinCC V6.2 SP2	1	6AV6381-1BM06-2AX0	

Example files and projects

The following list contains all files and projects used in this example.

Table 2-3

Component	Note
23810112_SINAUT_LAN_DOKU_V20.pdf	This document
23810112_SINAUT_LAN_CODE_V20.zip	This ZIP file contains:
• STEP7_LAN.zip	STEP7 & SINAUT ST7 project
• WinCC_LAN.zip	WinCC & ST7cc project

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Principles of Operation and Program Structures

Content

This chapter discusses the background information on the topic of SINAUT Telecontrol and where appropriate the configurations leading to the example program.

You only need this part if you want to learn about the interaction of the solution components.

3 Telecontrol with SIMATIC

This chapter provides the beginner with a brief overview of the SINAUT Telecontrol system and its manifold possibilities.

3.1 SINAUT Telecontrol

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SINAUT ST7 Telecontrol (**Si**emens **N**etwork **Aut**omation) is based on SIMATIC S7-300, S7-400 and WinCC. It supplements this system with respective hardware and software, enabling the networking of individual components via WAN (Wide Area Network).

The fully automated monitoring and control of distributed process station, which via various WAN media exchange data between each other and with one or several control centres, is possible.

Under the topic WAN, the SINAUT system provides solutions for data transmission via classic WAN, such as dedicated copper lines, telephone networks, radio etc., but also via modern, Ethernet-technology-based WAN, such as broad-band systems or the internet.

SINAUT ST7cc (the PC control center) server as a control center, basec on WinCC. It is a control center system particularly designed for the event controlled and time-stamped data transmission of the SINAUT system.

The SINAUT software in the stations provides for a change-controlled process data transmission with the control center as well as between the individual CPUs. A particular feature of the TIM data transmission module, which is used in the SINAUT ST7 system, is the local storage of the data messages (including time stamp) during failure of the communication path, dailure of a partner or for cost optimization for dialup networks.

Any diagnostics and programming functions which SIMATIC and SINAUT provide for station automation and SINAUT communication, can be used across the SINAIT networks- even as the process data transmission is ni progress.

Modern remote technology increasingly builds on communication via Ethernet-based LAN and WAN connections. Today, any options outside the classic modem connections (dialup and dedicated line) can be used, from exitsting company LAN networks, Fibreoptic-Long-Distanve connection, to internet connections via DSL (high-speed) and EGPRS.

3.2 Communication module TIM

This application uses SINAUT ST7. Central component of the SINAUT ST7 hardware is the communication module TIM (**T**elecontrol **I**nterface **M**odule). They manage the data traffic for the S7-CPU or the control centre PC via WAN.

For SINAUT data communication, the SINAUT TD7 software can be used for the CPU (**TD7onCPU**) or the block library (**TD7onTIM**) integrated in the TIM 3V-IE(Advanced). TD7onTIM enables using the smallest S7-CPUs 312 and 312C, as ideally no CPU main memory is required any longer for SINAUT. The figure below summarizes the properties of the TIMs, which are used in this application.

Figure 3-1

	TIM 3V-IE	TIM 3V-IE Advanced	TIM4R-IE
General Properties	▪ for S7-300 ▪ easily ready ▪ Module exchange without PG (MMC of the CPU)		▪ For S7-300 and for stand-alone mode (without S7-300 CPU) with S7-400 and PC) ▪ Double width ▪ Module exchange without PG (MMC of the CPU or C-PLUG
SINAUT Library	TD7onCPU TD7onTIM	TD7onCPU TD7onTIM	TD7onCPU TD7onTIM
SINAUT Communication via ...	RS232 or RJ45	RS232 and RJ45	2 x RS232/RJ45 and 2 x RJ45
TIM can be used in ...	Station	Station Master Node station	Station Master Node station
Data Memory	16,000 message frames	32,000 message frames	56,000 message frames, battery buffered
S7 Connections via IP-based networks	8	20	62

Note This chapter does not replace the official documentation. For more information on SINAUT Telecontrol see /1/ and /2/ in the appendix.

The TIM4R-IE is in this application used as stand-alone TIM in the central station.

The application of a TIM 4R-IE as central TIM is in many cases the better solution since it offers the following advantages:

- For data transfer via an IP-based WAN the TIM generally provides better preconditions than with the Ethernet card of the PC. Compared

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with LAN, for example, the data transfer in IP-based WAN is often more prone to failure and the response times are partly longer. The TIM can be adjusted ideally to the respective network behavior via various parameters.

- For the PC of the control center the central TIM reduces the number of S7 connections, which the PC otherwise must store during direct connection with stations via an IP-based network, to only one connection.
- The TIM separates the local Ethernet from the IP-based networks to the stations. Only SINAUT and PG communication with the stations can pass. This prevents unnecessary traffic in the often non-broadband WAN.
- For a redundant control center the central TIM employed there provides for the reduction of the data volume in the WAN. This way the TIM reduces the costs for networks with volume tariffs, for example GPRS. If the stations were directly connected to the redundant control center (without central TIM), then it would send each message frame twice to supply both control center PCs with data. During application of a central TIM the stations send their telegrams only once. The message frames for supplying both PCs are then doubled by the central TIM.

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3.3 Standard SINAUT Typicals

To support the user in engineering his plant, he is provided with sample engineering templates for frequently used technical objects, e.g. motors, pumps, valves. These templates can be integrated into an HMI software and therefore represent an image of the real object.

For SINAUT an engineering template of a technological object consists of one or several image typicals, a faceplate and one or several ST7cc typicals.

The definitions for bits controlling or visualizing (information units) the templates are default.

Overview

For SINAUT the configuration of technical objects ranges across several levels.

- Automation level
- Communication level
- Control level

Figure 3-2

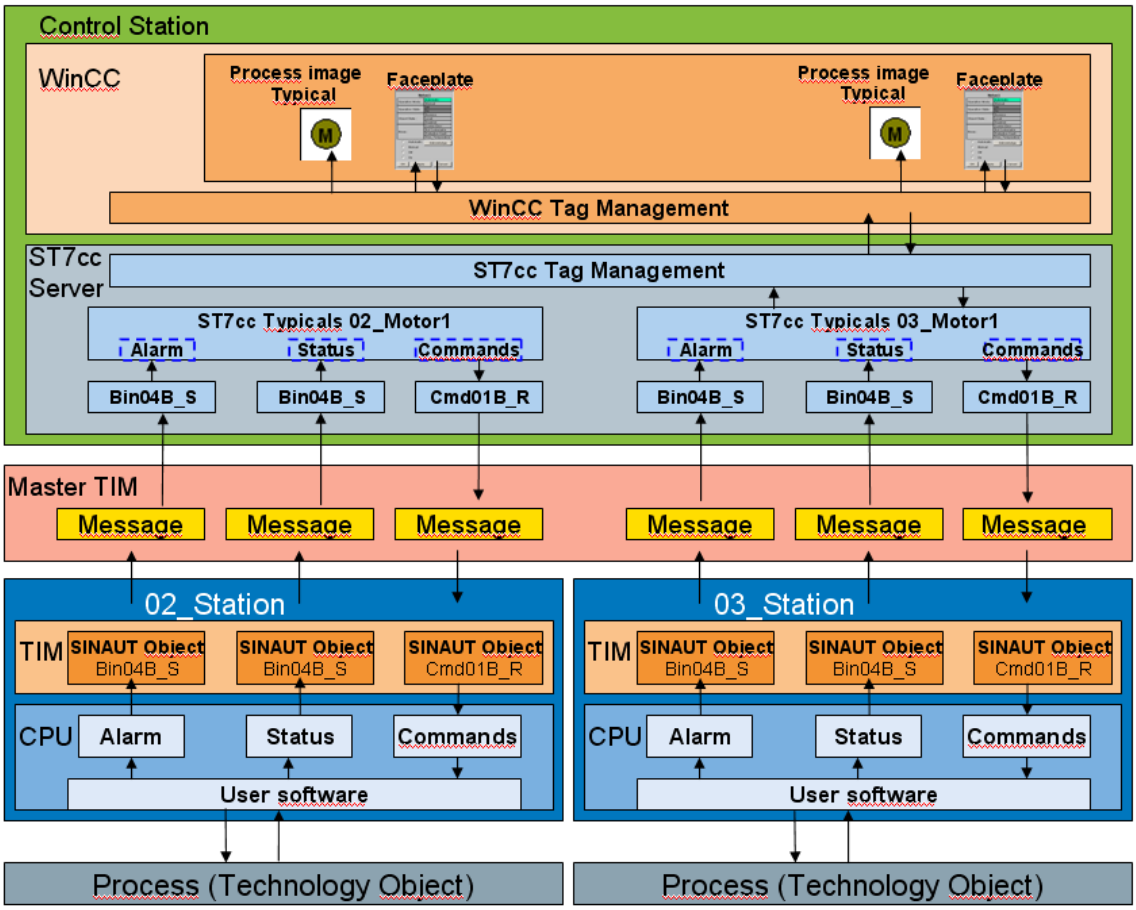

Table 3-1

Level	Description
Automation level	For the local CPU, the TIM with TD7onTIM sends and receives the process data using SINAUT objects. Data to be sent by TD7onTIM, are read from the CPU by the TIM via the backplane bus, received data are written to the CPU. (In the CPU no SINAUT blocks are required)
	The user program reads the data from the process, processes the data received by the TIM and controls the process. Furthermore, data are read from the process.
Control level	The SINAUT message frames are received by the central TIM station which forwards it to ST7cc. They are coded or decoded using the ST7cc typicals, and the data are mapped to the respective ST7cc variables. A ST7cc typical consists of several ST7cc variables.
	The ST7cc variables are mapped to WinCC variables which are the information carriers for the image typicals and faceplates.

Information unit

All states which a technical object can take on are divided into three information units

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- The information unit **Status** for input of all statuses of a technical object, which do not represent a failure, e.g. status ON, Off Automatic Operation
- The information unit **Alarm** for input of all statuses of a technical object which indicate a failure or an urgently to be transmitted status, for example the statuses Control Error, Over Temperature
- The information unit **Command** for output of commands to a technical object, e.g. ON, OFF

3.3.1 SINAUT Object

TIM modules, which are TD7onTIM capable take on any tasks for the local CPU using the SINAUT objects, in order to reduce the main memory of the CPU. SINAUT objects consist of

- System objects
- Data objects

System objects provide system-relevant information to the user program in the CPU. The following table shows the system objects.

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Table 3-2

System object	Description
WatchDog	Indicates to the CPU program whether the communication between CPU and TIM is still working
PartnerStatus	Indicates to the CPU program whether the communication with its partners (e.g. ST7cc control center or CPU) is working or failed.
OpInputMonitor	Indicates to the CPU program the status of operating inputs

Sending and receiving of process data is configured using standardized **data objects**. According to the two transmission directions they are divided into:

- Data objects for recording and sending of data (ending **S** for **Send**)
- Data objects for receiving and output of data (ending **R** for **Receive**)

SINAUT offers data objects with different data ranges. Each data object may contain one or several send or receive channels. Data object **Bin04B_S**, for example, contains four send channels for sending four bytes, the data object **Cmd01B_R** a channel for receiving one byte.

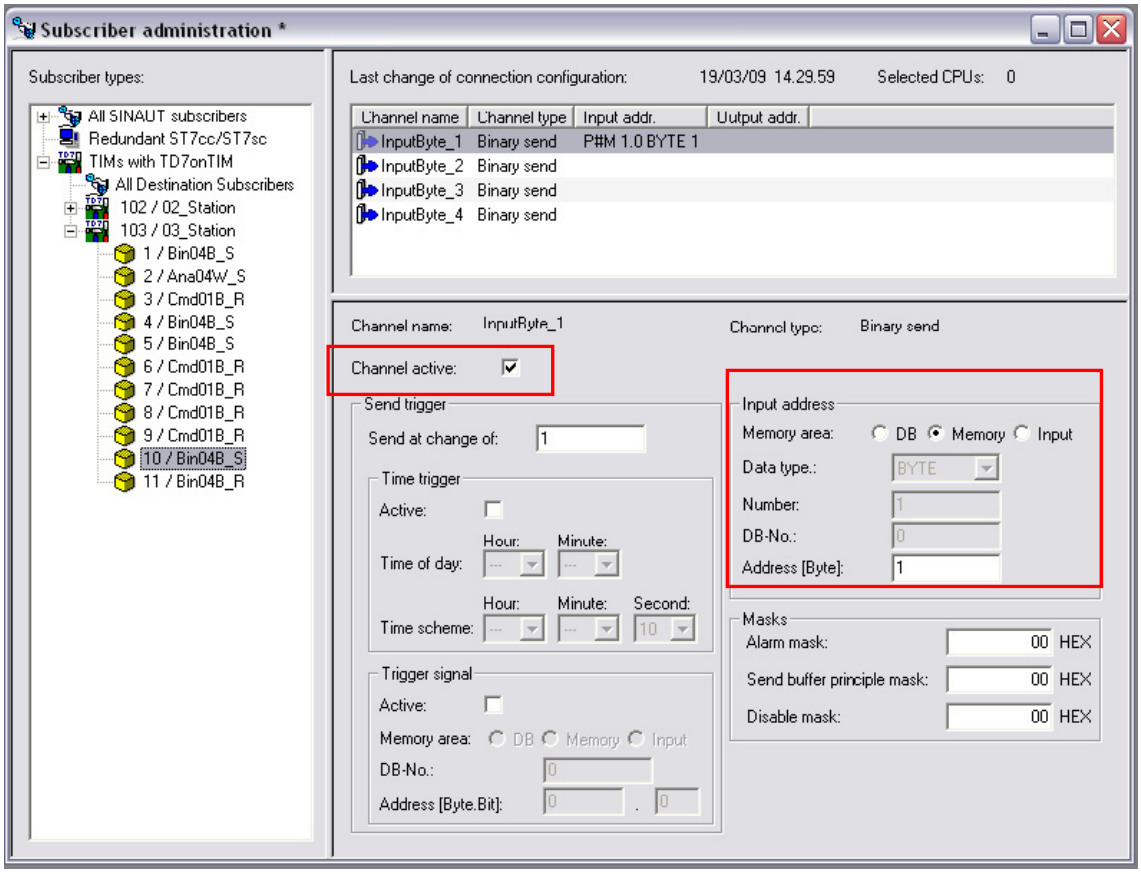
Management and configuration of data objects for the TIM occurs via the ST7 configuration tool. The data objects of the TIM can be added via a standard library. Configuring the data objects occurs in two parts:

- Establishing the base parameters of the data objects (e.g. partner, to which the data of the object is sent or from which it is received)

- Configuring the channel specific properties for the individual send and receive channels, e.g. memory area, byte address.

The following image shows the configuration of the data object **Bin04B_S**.

Figure 3-3



3.3.2 ST7cc Typicals

Using ST7cc Config, the data area of a data object is divided into different sections. A data section can be assigned with an information unit or with user-defined ST7cc variables. An information unit in return is mapped to fixed ST7cc variables. How to map an information unit to ST7cc variables is defined by an **ST7cc typical**. The following extract from ST7cc Config shows the division into data sections of one byte each, using the example of the data object **Bin04B_S**. The data object was preassigned with bytes 10-13. Each data section is assigned with an information unit for respectively one motor.

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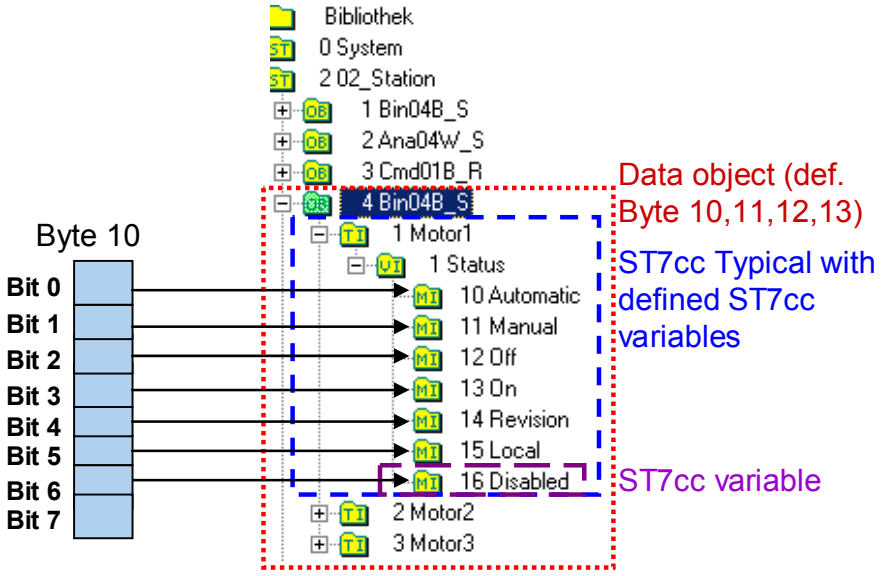
Figure 3-4



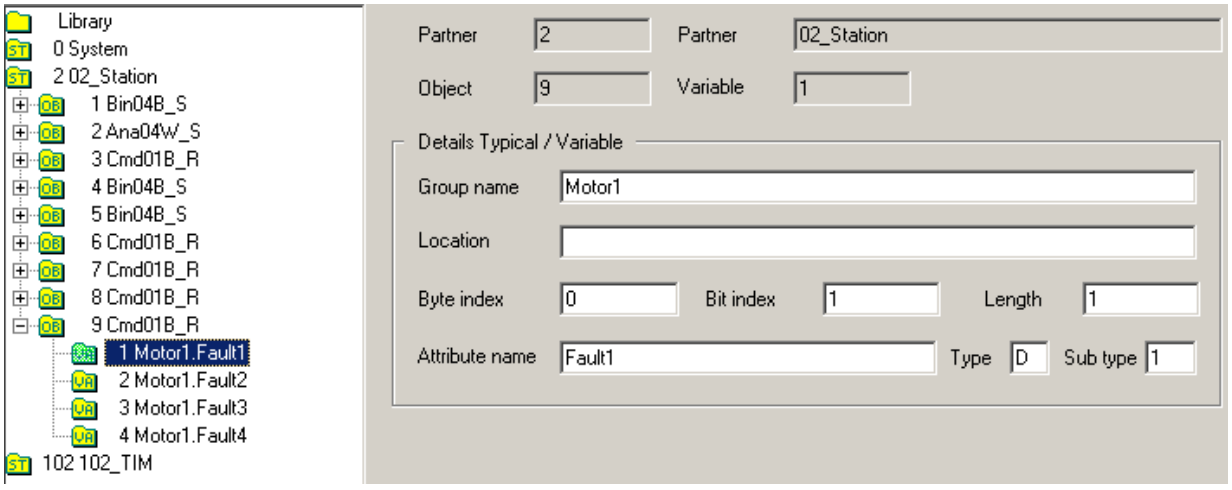
3.3.3 ST7cc Variable

A ST7cc variable can be a data section from the data range of a SINAUT object which is managed as independent unit in the ST7cc server, or a part of an information unit.

When paramaterizing the ST7cc variables, the following properties are defined:

- Group and attribute name
- Bit index
- Variable type, e.g. measured value, signal, count value, digital output

Figure 3-5



The ST7cc variable name is composed of its group name and attribute name. The group name is used for summarizing variables which belong

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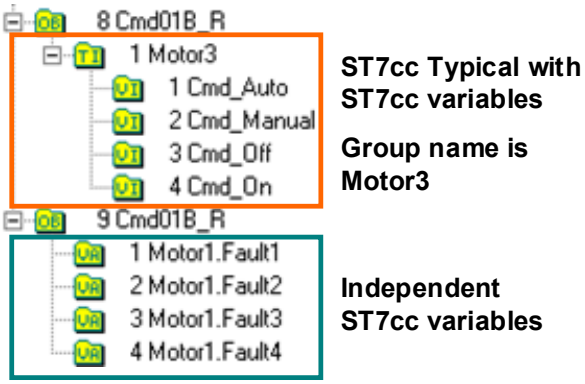
together and manage them in the WinCC Tag Management in a group. The attribute name serves for identification of the variables.

Figure 3-6

If the ST7cc variable is an independent data extract from the data area of a SINAUT object, the variable appears in the ST7cc tag management in two stages. For typical-related variables, the name of the Typical instance defines the group name. The two-staged naming only occurs when generating the WinCC variables.

Figure 3-7



3.3.4 WinCC Variable

WinCC variables are the information carriers for image typicals and faceplates. They are automatically generated from the ST7cc variables and filed in the WinCC Tag Management in folders according to group name.

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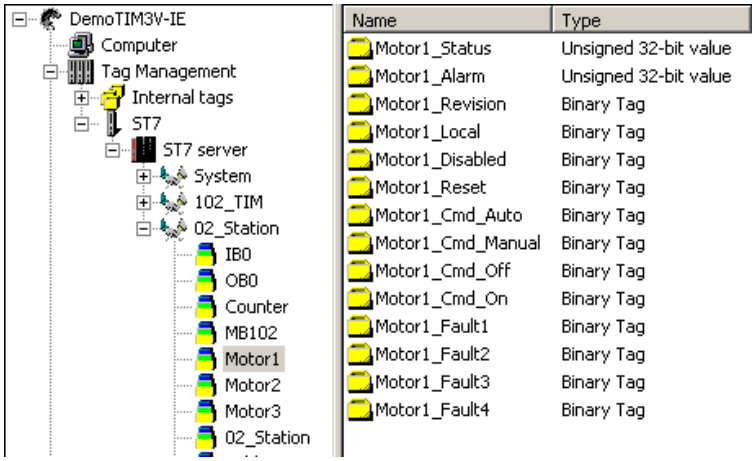
Figure 3-8



3.3.5 Image Typical

For each technology object, SINAUT offers an image typical which represent the respective object.

Table 3-3

Image Typical	Technology Object
	Pump
	Motor1
	Generator
	Valve
	Compressor
	Motor2 (Motor with 2 forward and 2 backward gears)
	Slider

The dynamization of an image typical requires the object name of the image typical corresponding to the group name of the typical instance which points to the technical object. The following graphic will illustrate this:

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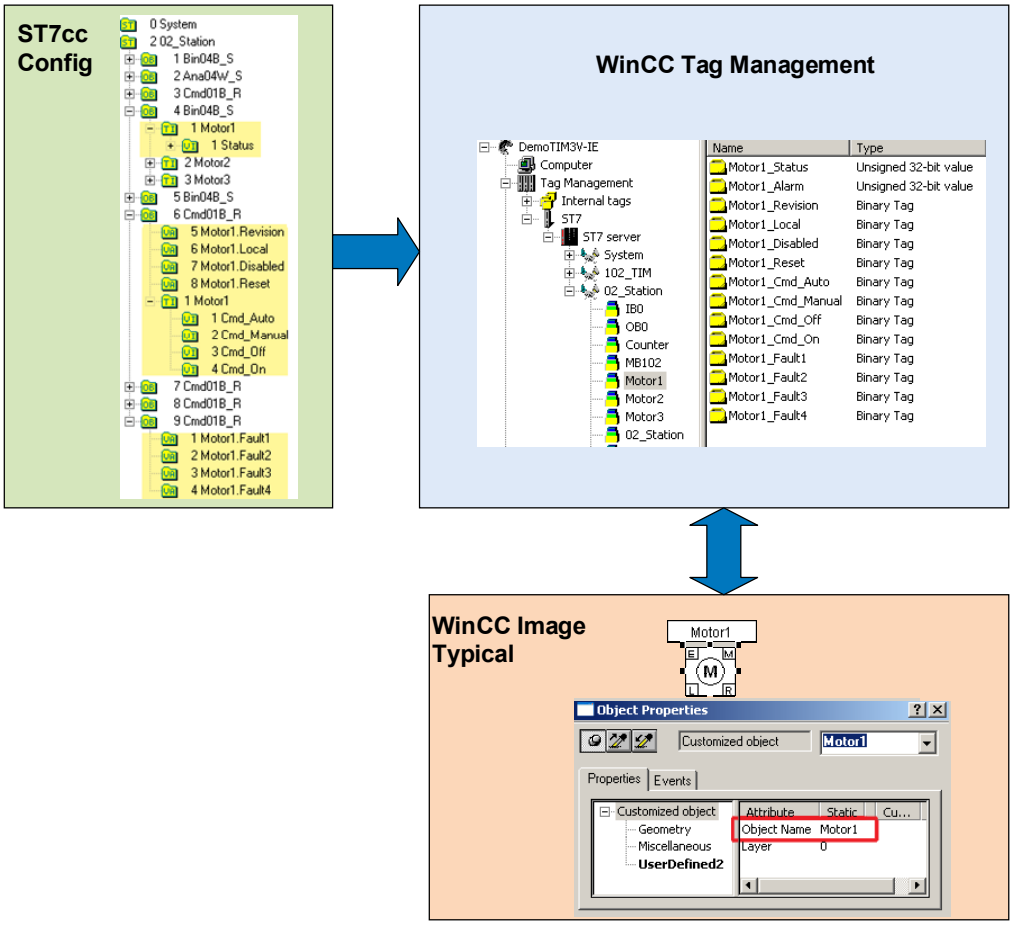
Figure 3-9



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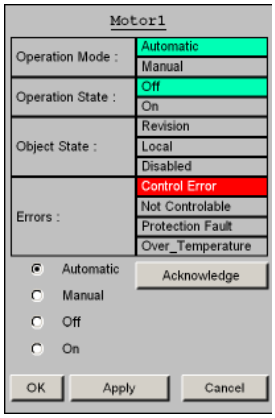
3.3.6 Faceplates

Each image typical has its own faceplate assigned to it which contains text displays for status information and enables operating the image typicals. The faceplate automatically takes on the object name of the respective image typical and is able to connect itself to the tag management.

Figure 3-10

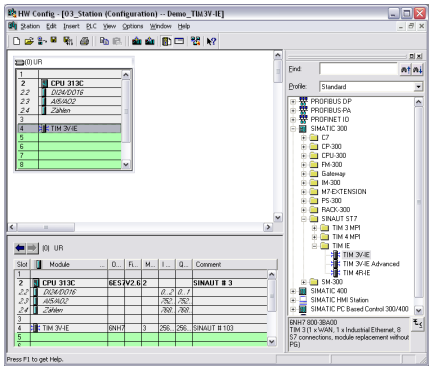
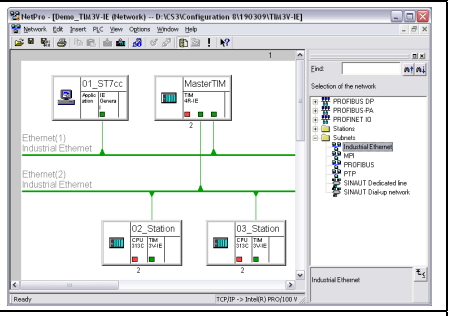


4 Explanations for the Example Program

This chapter discusses the important configurations which have lead to the provided program.

4.1 Hardware and network configuration

Table 4-1

No	Action	Remark/Figure
1.	In the **SIMATIC Manager** you create a new project via **`Project-> New`** and add a **SIMATIC 300** station.	
2.	Open the **HW config** via **Hardware**. Add the desired CPU and the TIM. The SINAUT module is available at **`SIMATIC 300 -> SINAUT ST7`**.	
3.	Open **NetPro**. Add a new Ethernet network and assign the desired IP address to the TIM module.	
4.	Repeat the process for all station. Then compile the project in **NetPro**.	

4.2 Configuration with the SINAUT ST7 configuration tool

4.2.1 Configuring the SINAUT connection

Table 4-2

No	Action	Remark/Figure
1.	Start the SINAUT ST7 configuration tool.	**`Start -> SIMATIC -> SINAUT ST7 -> Configuration`**

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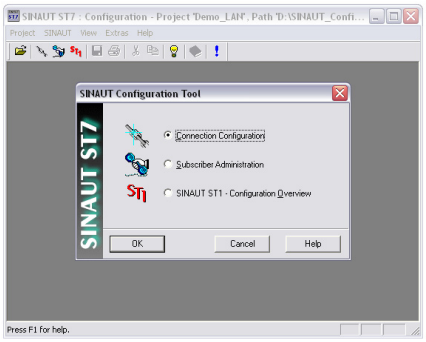
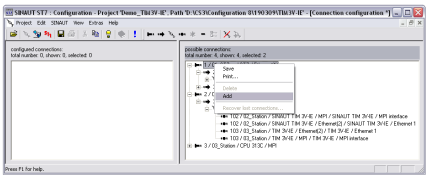
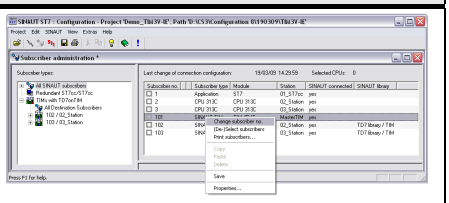
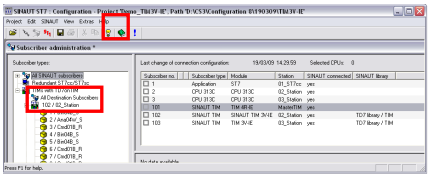
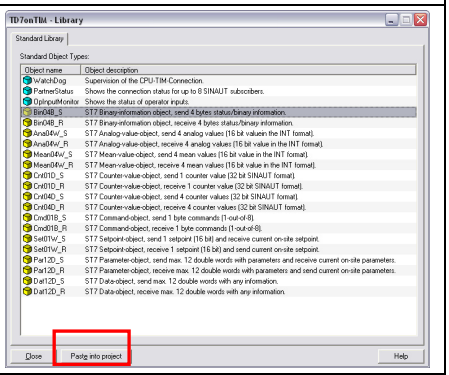
No	Action	Remark/Figure
2.	Select **Connection Configuration** and start with **OK**	
3.	The right-hand window pane displays the possible connections. Select the desired connection via **`Right mouse button -> Add`**. Save this configuration and change to **Subscriber Administration**.	

4.2.2 Configuring the TIMs with TD7onTIM

Table 4-3

No	Action	Remark/Figure
1.	All SINAUT stations (CPUs, TIMs, SINAUT ST7cc PC) are listed. They have the option of changing the SINAUT station number. Select the desired station. **`Right mouse button -> Change subscriber No.`** Subsequently you enter the new station number.	
2.	In **Subscriber Administration** the TD7onTIM stations are configured. Select the TIM you wish to configure from the left window pane. Then click on the TD7onTIM library symbol.	
3.	A window with the **TD7onTIM Library** opens. Select the object you wish to configure and click on **Paste into Project.** Close the library with the **Close** button.	

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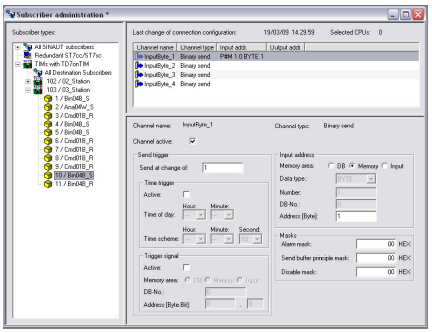
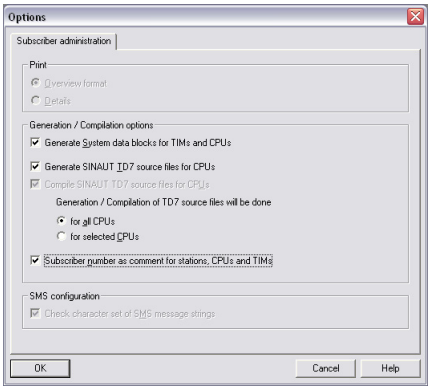
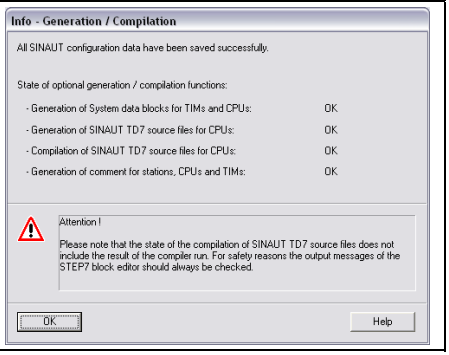
No	Action	Remark/Figure
4.	Configure the parameters for the objects. Then save and compile your project.	
5.	Acknowledge the security query with **OK**, let the options unchanged and continue with **OK**.	
6.	The SDBs are regenerated and saved in the STEP 7 project. If no errors have occurred, close the program again.	

4.3 ST7cc configuration

Table 4-4

No	Action	Remark/Figure
1.	Open the **SINAUT ST7cc Config** via **`Start -> SIMATIC -> SINAUT ST7cc Konfig`**	

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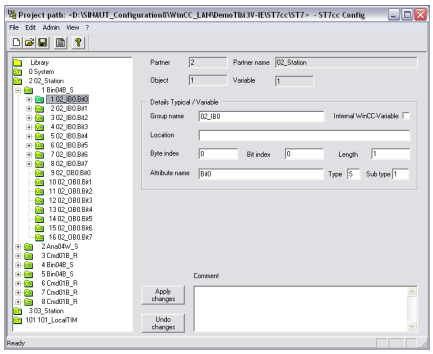
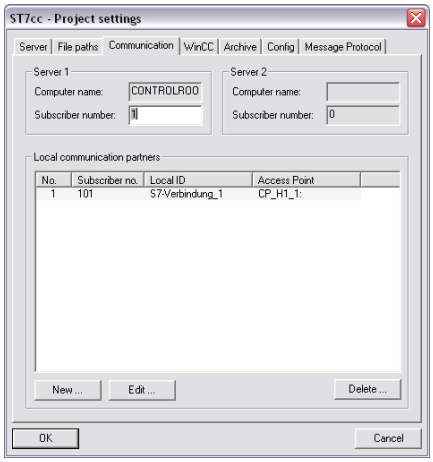
No	Action	Remark/Figure
2.	Add local TIM for the ST7cc PC via **`Edit -> New local TIM`** Enter the SINAUT station number of the TIM. Add the stations via **`Edit -> New Station`** Add the desired objects by copying them from the library. Configure the objects as desired.	
3.	Open the project settings mask via **`Edit -> Project Settings.`** Go to the **Communication** tab. Enter the station number of the ST7cc PC. Then click **New** and enter the station number of the local TIM and the local ID for the connection between TIM and ST7cc PC. Click on **OK** to confirm the settings.	 Note: The local ID is available in **NetPro**. Click the ST7cc station and then on Application. The ID is displayed in the bottom window.
4.	Save the ST7cc project.	

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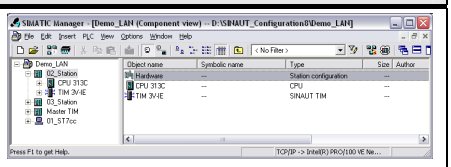
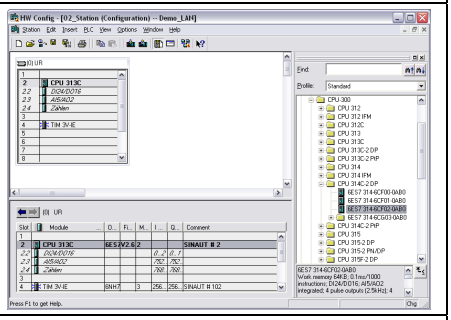
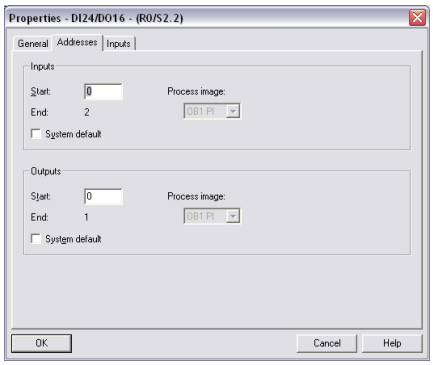
5 Modifications to the Example Program

The entire demo-project can be adjusted to your requirements. Performing all of the change options, however, is beyond the scope of this configuration. For further information please refer to the manuals.

5.1 S7-300 station exchange of the CPU 313C with a different type

Table 5-1

No	Action	Remark/Figure
1.	Open the SINAUT project in the **SIMATIC Manager**, select the SIMATIC 300 station **02_Station** and start the **HW-Config** via **Hardware**	
2.	Replace the CPU with the type you are using.	
3.	Change the start address for DI/DO to **0**	
4.	Accept the changes with **Save and Compile** and close HW-Config, if no failure messages appear.	
5.	Start the SINAUT ST7 configuration tool.	**`Start -> SIMATIC -> SINAUT ST7 -> Configuration`**
6.	Use the SINAUT ST7 Configuration Tool to open the ST7 project **Demo_LAN** in the directory **D:\SINAUT_Configuration8\ Demo_LAN**	Identical with the STEP 7 project path

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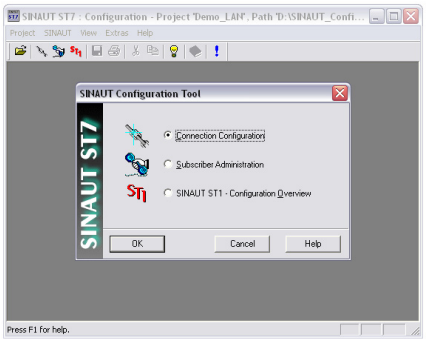
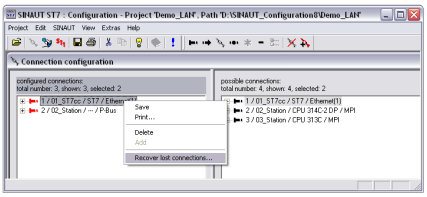
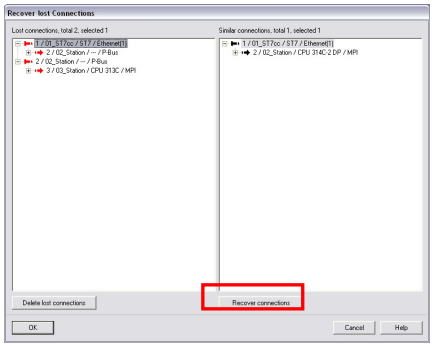
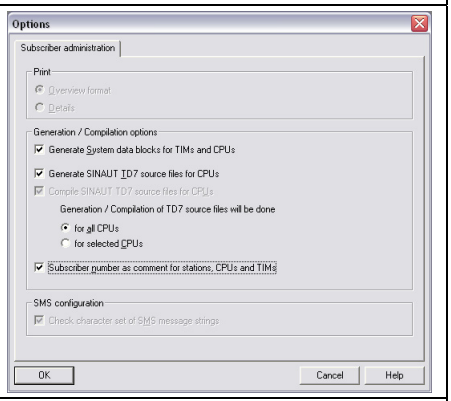
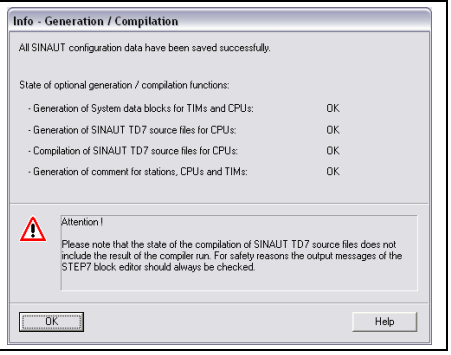
5.1 S7-300 station exchange of the CPU 313C with a different type

No	Action	Remark/Figure
7.	Select **Connection Configuration** and start with **OK**	
8.	If the connections on the left side are marked red, restore the connection with **`Right mouse-button -> Recover lost connections`**.	
9.	Select the connection which must be restored, clock on **Recover connections** and confirm with **OK**. Then you save the new connection table with the save icon or with **`SINAUT ->Save`**.	
10.	Acknowledge the security query with **OK**, let the options unchanged and continue with **OK**.	
11.	The SDBs are regenerated and saved in the STEP 7 project. If no errors have occurred, close the program again.	

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No	Action	Remark/Figure
12.	Then you transfer the changed SDBs into the CPU, as described in chapter 6.3.2 Loading station 2 and 3.	

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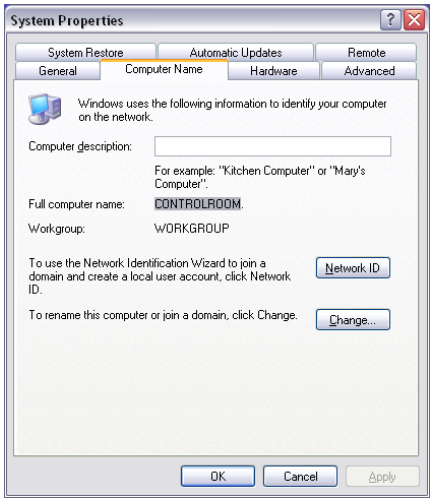
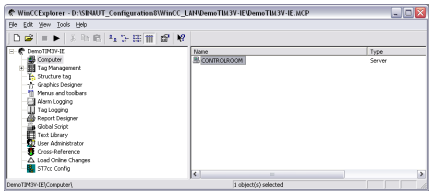
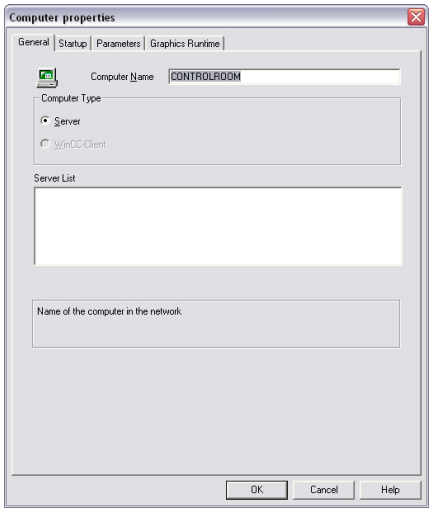
5.2 Central station - Changing the computer name in WinCC

Table 5-2

No	Action	Remark/Figure
1.	The computer name is available in **System Properties** under **`Start -> Settings -> Control Panel -> System`** in the tab **Computer Name**. You can enter or change the name via **Change…** .	
2.	If you cannot change the name of your PC, you have to adapt the server name under WinCC. Start the **WinCC Explorer**, open the project, select **Computer** and open the Properties dialog by double-clicking the **COMPUTERROOM** server.	
3.	Here you enter the name of your PC in the **Computer Name** field, acknowledge with **OK** and restart the WinCC Explorer when prompted.	
4.	Now you continue the regular IBS according to the instruction above.	Chapter 6.3.4

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Structure, Configuration and Operation of the Application

For startup we offer you a finished STEP 7 / SINAUT example project as a download. This software example supports you in the first steps and tests with this configuration. It enables a quick function test of hardware and software interfaces between the here described products.

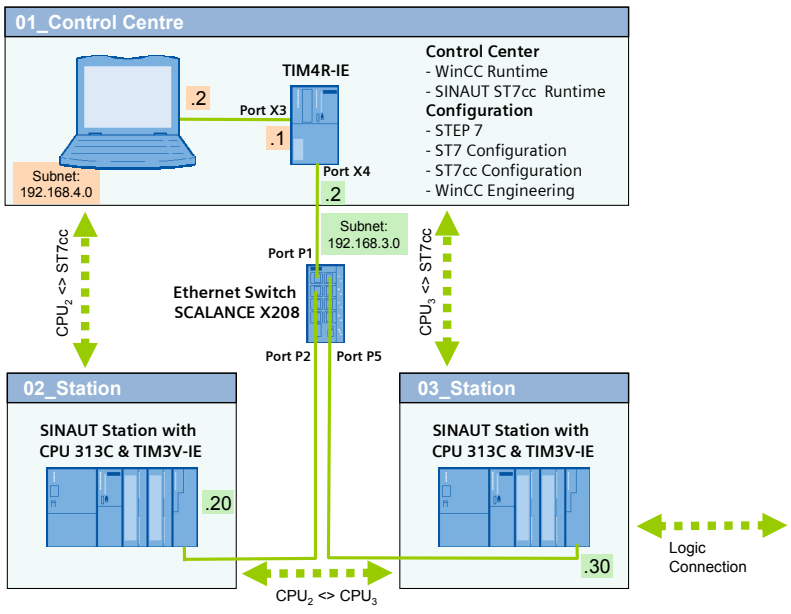
The software example is always assigned to the components used in this configuration and shows their principal interaction. However, it is not a real application in the sense of technological problem solving with definable properties.

6 Installation and Commissioning

6.1 Hardware and Software Installation

The following chapters take you step by step through the installation. Furthermore the commissioning of the example projects is described.

Figure 6-1



The following table includes the overview of all IP addresses used in this example. A fixed assignment of the IP addresses is assumed.

Table 6-1

Component	IP Address	Description
ST7cc computer	192.168.4.2	Central station
TIM4R-IE	192.168.4.1	Central TIM, Ethernet Port X3

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Component	IP Address	Description
TIM4R-IE	192.168.3.2	Central TIM, Ethernet Port X4
TIM3V-IE Station 2	192.168.3.20	TIM in Station 2
TIM3V-IE Station 3	192.168.3.30	TIM in Station 3

The subnet mask in all network components is 255.255.255.0.

Note If you use a PG with LAN and WLAN adapter, assign different IP addresses to the two interfaces. Disable the WLAN interface for the time being.

Installation of the hardware

For details on the hardware components, please see section 2.3. To set up the hardware, please follow the instructions in the below table:

Table 6-2

No	Action	Comment
1.	Preassembled PG or appropriately equipped PC with MS WINDOWS XP SP2 and Ethernet interface	Please follow the respective operating instructions and installation instructions
2.	Mount the voltage supply	The SIMATIC PS307 can here supply all required modules.
3.	Install TIM4V-IE	• Connect voltage supply • Connect computer with port X3 of the TIM4R-IE
4.	Installing CPU313C	• Adjust backplane bus adapter for TIM • Connect voltage supply • Plug the MMC • If I/O module required, supply with voltage, here DI16/DO16 L+ : 1, 21, 31 M : 20, 30, 40 • Manual CPU313C see /5/ in the Appendix
5.	Install TIM3V-IE	• Connect voltage supply
6.	Repeat step 4 and 5 for Station_03	
7.	Install SCALANCE X208	• Connect voltage supply • Connect port 1 with Port X4 of the TIM4R-IE • Connect port 2 with the TIM3V-IE of Station 2 • Connect port 5 with the

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No	Action	Comment
		TIM3V-IE of Station 3
8.	Switch on the system.	

Installing the software

During generating the application a computer was used as programming computer as well as central station. When using separate computers then the following software must be installed on the central station:

- SINAUT ST7cc V2.7
- SIMATIC WinCC Runtime V6.2 SP2
- SIMATIC NET PC Software Edition 2006

Table 6-3

No	Action	Comment
1.	Installation of STEP 7 V5.4 SP4	You can select the typical configuration
2.	Install the SIMATIC NET PC software Edition 2006	Install all suggested software packages. **The installation is only possible if STEP 7 has already been installed.** In „Service& Support news“ (see \1\ in the appendix) you find information on the released versions.
3.	Install the SINAUT ST7 standard software package 2007	SINAUT ST7 Configuration V4.1 SINAUT TD7 Library V2.2.1 **Installation is possible if STEP 7 has already been installed.**
4.	Prior to installing WinCC, some auxiliary programs must still be installed.	Please follow the installation notes for WinCC
5.	• Install SQL Server 2005 SP1	
6.	• Install MS Windows Hotfix XP SP2 KB319740	MS Tools CD
7.	• Activate the MS Message Queuing	Via **`Start -> Settings -> Control Panel ->Add or Remove Programs -> Add/Remove Windows Components`** you select **Message Queuing.** For more information click the **Details** button. Activate **Common** and start the installation with **OK.**
8.	Install WinCC V6.2 SP2	You can select the typical configuration. In Service& Support news \1\ you find information on the

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No	Action	Comment
		released versions.
9.	Install ST7cc	

Note It is also important to read the descriptions, manuals and any delivery information supplied with the products.

6.2 Installation of the example project

Table 6-4

No	Action	Comment
1.	Unzip the file 23810112_SINAUT_LAN_CODE_V20.zip	The directory **D:\SINAUT_Configuration 8** is used below as project directory.
2.	Unzip the file WinCC_ LAN.zip	The WinCC project is now filed at **D:\SINAUT_Configuration 8\ WinCC_LAN \Demo_TIM3V-IE.MCP**
3.	Start STEP 7 and retrieve STEP7_ LAN.zip to **D:\SINAUT_Configuration8**	The STEP 7 project is now filed at **D:\SINAUT_Configuration 8\Demo_LAN**

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6.3 Commission the example project

Commissioning of the example project can only occur in the following steps:

1. First startup of the PC station (chapter 6.3.1)
2. Downloading the TIM in the central station (chapter 6.3.2)
3. Downloading station 2 and 3 (chapter 6.3.3)
4. Activating the ST7cc and starting ST7cc & WinCC Runtime (chapter 7.3.4)

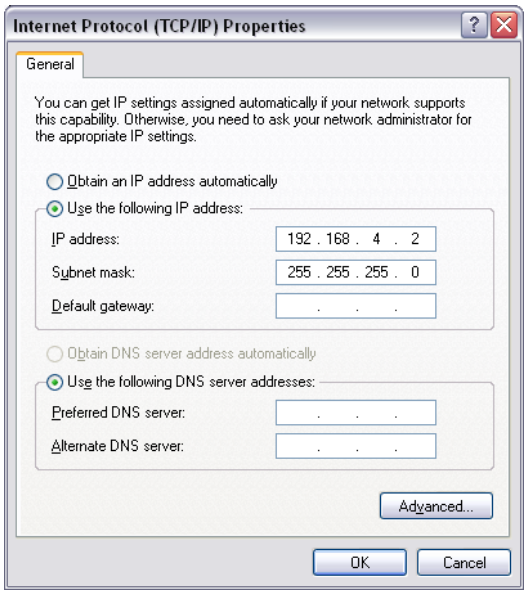
6.3.1 First commissioning of the PC station

A “PC station” is a PC with communication modules and software components within an automation solution with SIMATIC.

The hardware configuration of a PC station in SIMATIC is comparable with that of an S7 station. Components of a PC station such as modules or software interfaces are assigned to a virtual slot and parameterized in the same way.

Assigning IP address of the PG

Table 6-5

No	Action	Remark/Figure
1.	Open the **Internet Protocol (TCP/IP)-Properties** via **`Start -> Settings -> Network Connection ->Local Connections`**. Select the options field **Use following IP-address** and fill in the field according to the screenshot on the right. Close the dialog boxes with “OK”.	
2.	If you PG has an IWLAN interface, switch this off.	Of course you can work via the IWLAN, if all the IWLAN components are configured.

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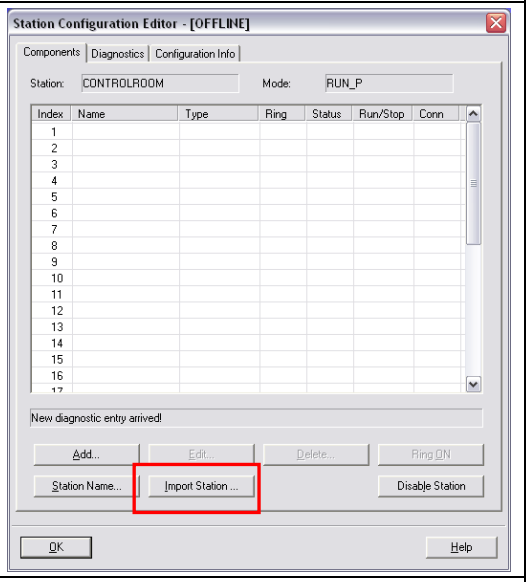
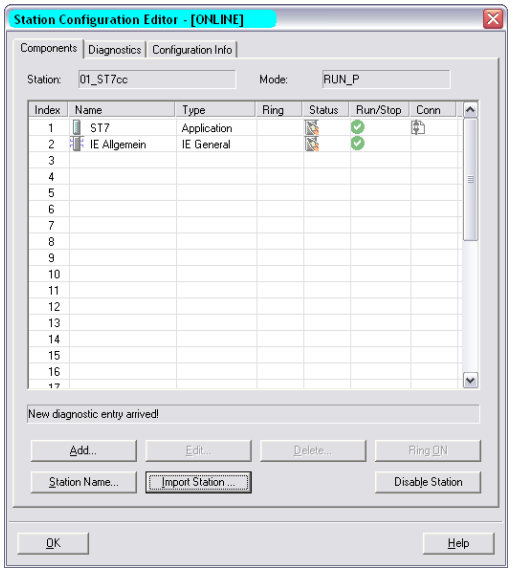
Import PC station

Table 6-6

No	Action	Remark/Figure
1.	Open the Component Configurator. **`Start -> Station Configurator`** or by double-clicking the icon in Windows SYSTRAY The empty configuration list appears initially.	
2.	Import the XDB file **D:\SINAUT_Configuration8\ Demo_LAN\XDBs\pcst_1.xdb** via the **Import Station…** button.	
3.	**Note** The import is only possible if the imported configuration corresponds with the locally existing configuration.	For unsuitable components, the faulty component is selected. Chapter HW-Config discusses how you can adjust the setup of the PC station and generate a new XDB file.
4.	Execute the import with **OK**. The components are restarted. **Note** Should the components not be started immediately without error, please perform a RESTART of the PC.	
5.	After the configuration of the PC station, the access point of the ST7cc-PC in the network is now defined.	

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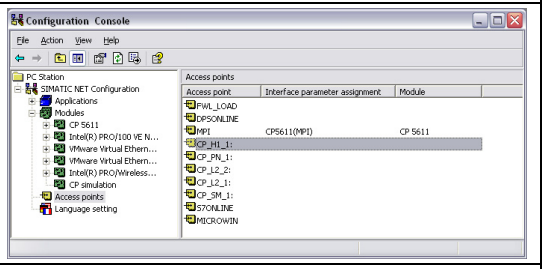
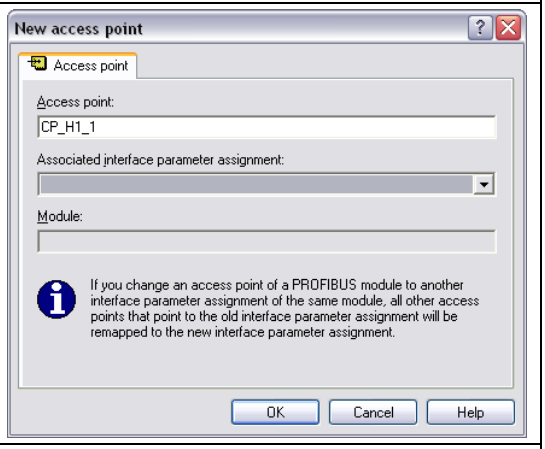
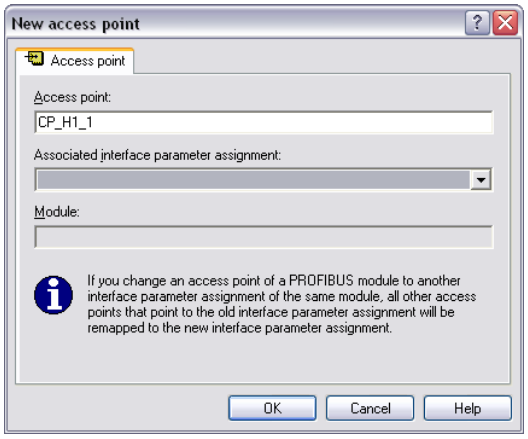
Specifying access points

Table 6-7

No	Action	Remark/Figure
1.	Open the SIMATIC NET configuration console. **`Start -> SIMATIC -> SIMATIC NET -> Configuration Console`**	The **Configuration Console** window opens.
2.	Click **Access Points** in the directory tree of the **PC-Station**. The available access points are displayed in the right-hand window pane.	
3.	If no access point of the name **CP_H1_1** exists, then you generate it by opening the context menu **`New -> New access Point`** in the **Access Points** directory and entering **CP_H1_1.** Confirm with **OK**.	
4.	With the right mouse-button you select the access point CP_H1_1, click on the context menu **Properties** and select the **TCP/IP-> XXX** setting from the **Associated interface parameter assignment** drop-down list, whereas XXX corresponds to the CP designation. Click **Apply** and **OK**. The dialog is closed	
5.	Set the access point **S7ONLINE** also to **TCP/IP-> XXX.** Click **Apply** and **OK**. The dialog is closed	For certain applications (e.g. routing) it may be necessary to set this access point to **PC internal** later on.
6.	Close the **Configuration Console**.	
7.	The initial commissioning of the PC station is now complete.	

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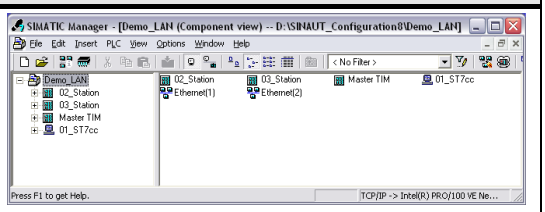
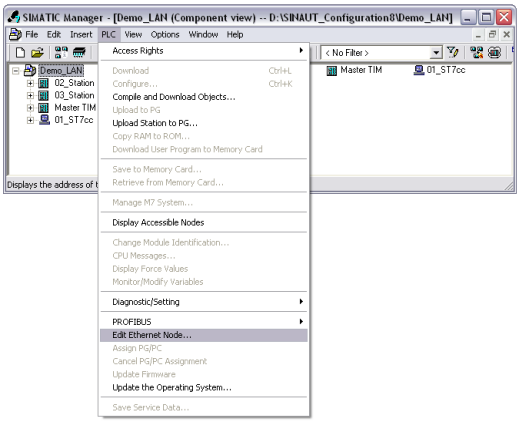
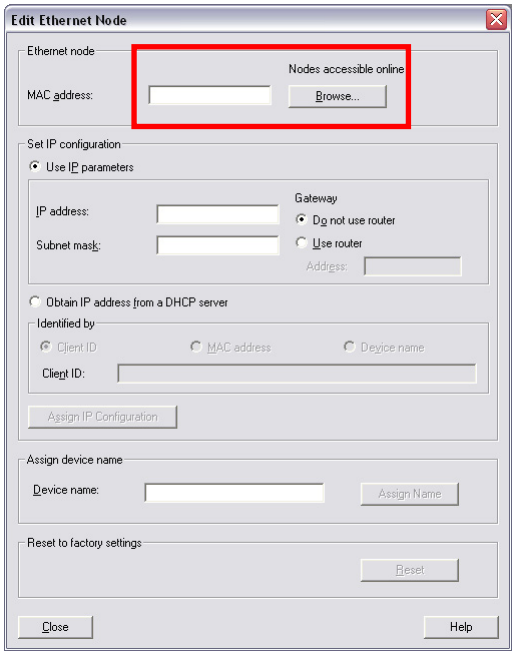
6.3.2 Downloading the TIM in the central station

Table 6-8

No	Action	Remark/Figure
1.	Open the STEP 7 project **Demo_ LAN** in the directory **D:\SINAUT_Configuration8\ Demo_LAN** After retrieving, the project opens automatically.	
2.	In the **PLC** menu you select the **Edit Ethernet Node…** option.	
3.	Click the **Browse…** button.	

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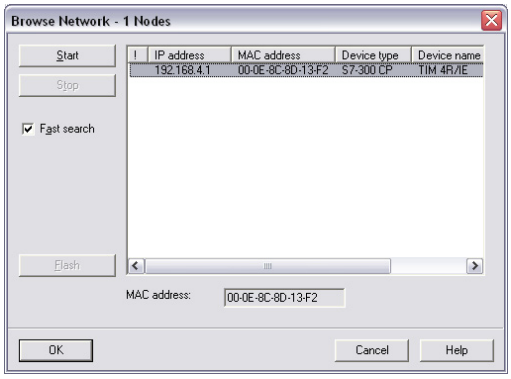
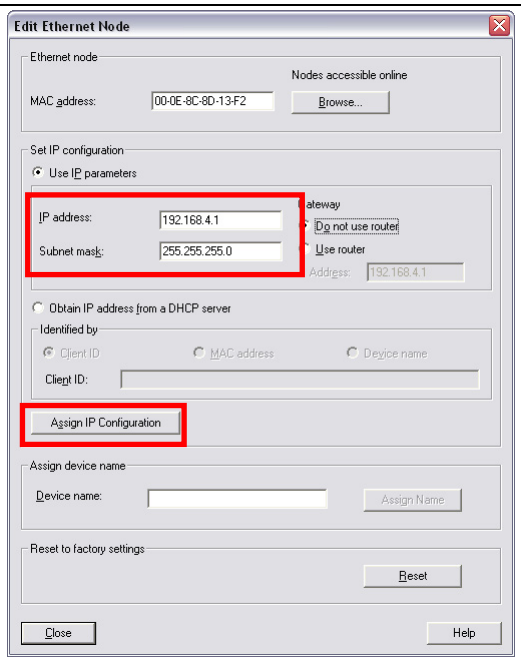
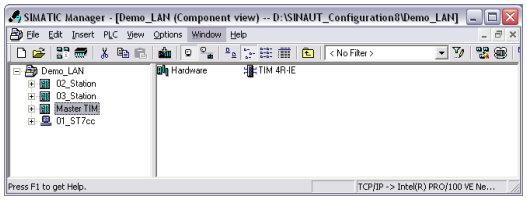
No	Action	Remark/Figure
4.	Select the TIM4R-IE module and acknowledge the selection with the **OK** button.	
5.	In the **Set IP configurations** window which appears you enter the following data: IP address:**192.168.4.1.** Subnet Mask: **255.255.255.0** Click the **Assign IP Configuration** button. Close the dialog with the **Close** button.	
6.	Now the program is downloaded into the TIM as follows.	
7.	Mark the station **MasterTIM** in the SIMATIC Manager. In the **PLC** menu you select the **Download** option. Now the project settings are loaded to the TIM4R-IE. Before the next step you wait until the TIM module has restarted.	
8.	The station is now ready for operation.	LEDs: TIM: RUN and X3 or X4 are On, KBus blinking

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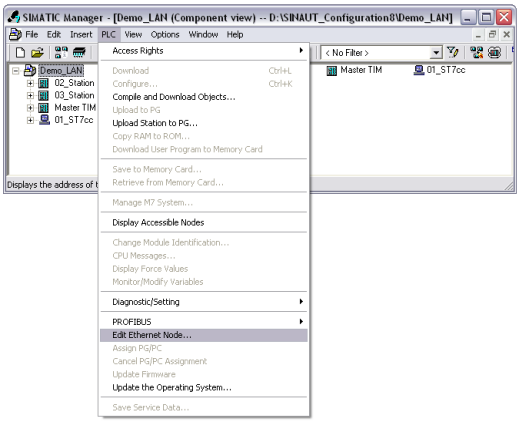
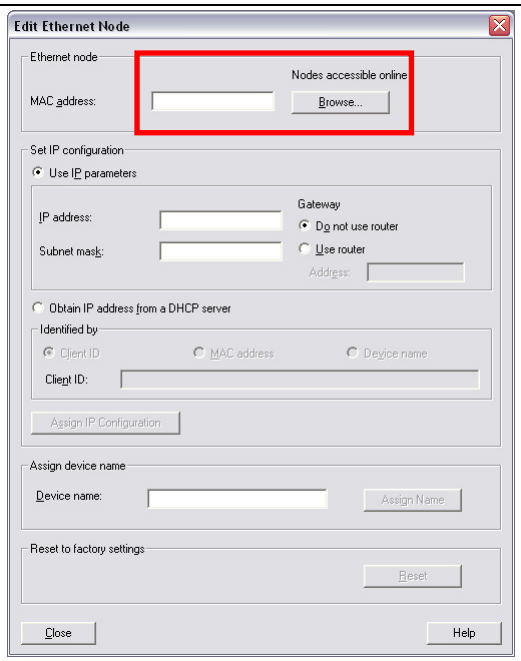
6.3.3 Download station 2 and 3

Table 6-9

No	Action	Remark/Figure
1.	To download the S7 stations connect your PC to the SCALANCE X208 Switch.	
2.	Open the **Internet Protocol (TCP/IP)-Properties** via **`Start -> Settings -> Network Connection ->Local Connections`**. Select the options field **Use following IP-address** and enter the following address: IP Address: **192.168.3.100** Subnet Mask: **255.255.255.0** Close the dialog boxes with “OK”.	
3.	In the **PLC** menu you select the **Edit Ethernet Node…** option.	
4.	Click the **Browse…** button.	

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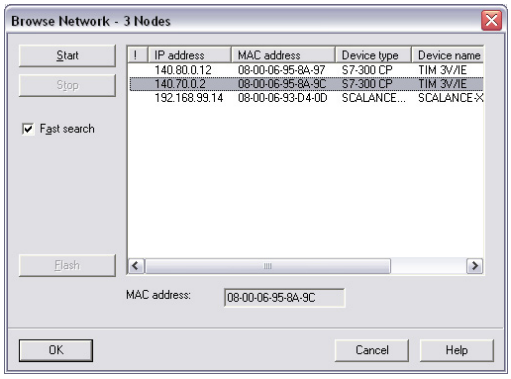
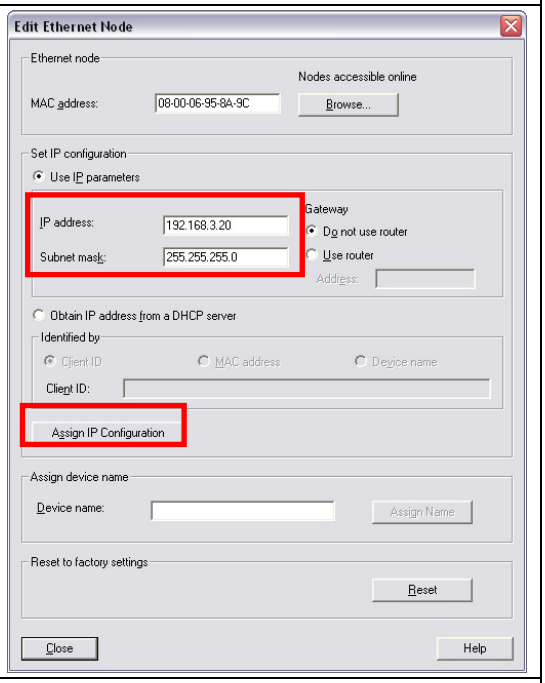
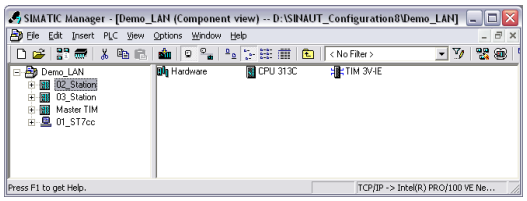
No	Action	Remark/Figure
5.	The two **TIM 3V-IE** are displayed. Using the displayed MAC address and the MAC address displaced on the TIM module you first select **TIM 3V-IE** in **Station 2**. Confirm the selection with the **OK** button.	
6.	In the **Set IP configurations** window which appears you enter the following data: IP Address:**192.168.0.30** Subnet Mask: **255.255.255.0** Click the **Assign IP Configuration** button. Close the dialog with the **Close** button.	
7.	Mark the station **02_Station** in the SIMATIC Manager. In the **PLC** menu you select the **Download** option. Now the project settings are loaded to the CPU 313 and the TIM 3V-IE. Before the next step you wait until the TIM module and the CPU has restarted.	
8.	The station is now ready for operation.	LEDs: CPU: is in RUN DO 0.1: flashing slowly TIM: RUN and LINK are ON, KBus flashing
9.	Repeat steps 3-8 for **Station 3**. Use the assigned IP address **192.168.3.30**. To download station 3 mark station **03_Station** in step 7.	

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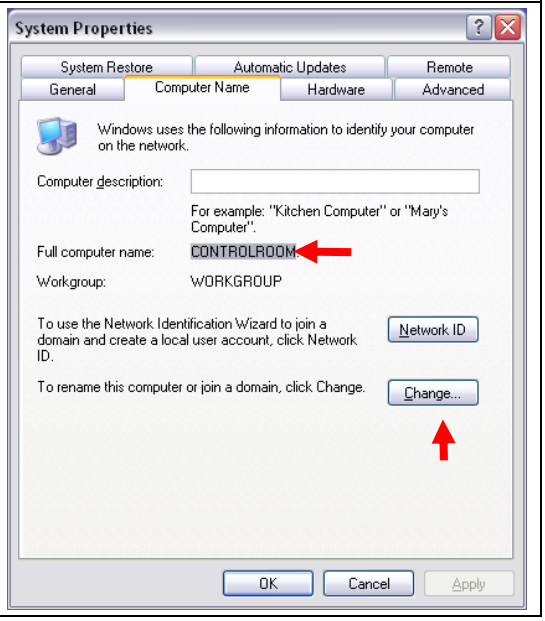
No	Action	Remark/Figure
10.	Reconnect the PC to the TIM4R-IE and set the IP address of the PC as in table 6-5.	

6.3.4 Activating the ST7cc and starting ST7cc & WinCC Runtime

Assign computer name

Table 6-10

No	Action	Remark/Figure
1.	The computer name (server name) **CONTROLROOM** was configured in the WinCC project. The setting of the computer name in WinCC and in Windows be identical. For this reason the computer name in the System Properties of the computer must also be adjusted. There is also the option to adjust the server name in WinCC. For information, refer to chapter 5.2.	
2.	Open the System Properties via **`Start -> Settings -> Control Panel -> System`**. Go to the **Computer Name** tag You can enter or change the name via **Change...** .	

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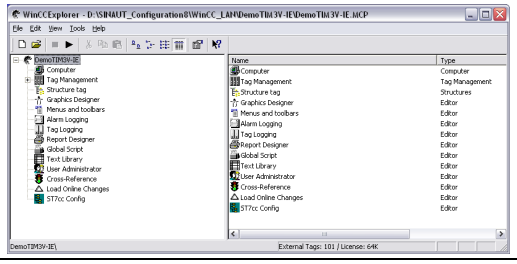
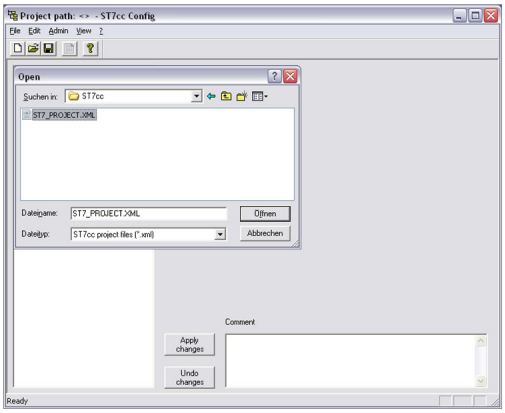
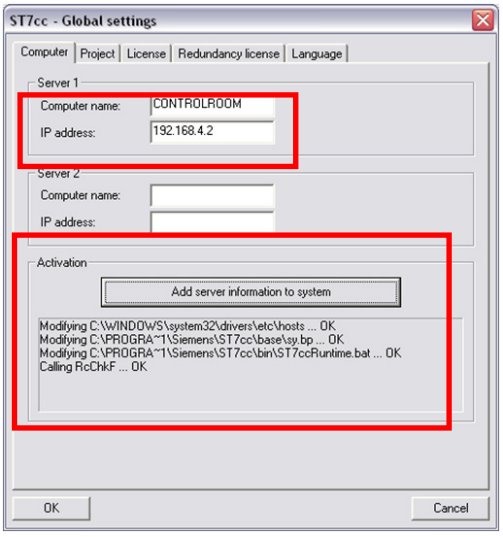
Open WinCC project and ST7cc Config settings

Table 6-11

No	Action	Remark/Figure
1.	Start WinCC and open the project **D:\SINAUT_Configuration8\WinCC_LAN\DemoTIM3V-IE\Demo_TIM3V-IE.MCP**	
2.	Start S7T Config via **`Start -> SIMATIC -> ST7cc -> ST7cc Config`** and open the project **D:\SINAUT_Configuration8\WinCC_LAN\ DemoTIM3V-IE\ ST7cc\ ST7_Project.XML**	
3.	Open the **Global settings** via **Edit** In the **Computer** tab you enter **Computer name CONTROLROOM** and the **IP address: 192.168.4.2** in the section **Server 1**. Activate the entry by clicking on **Add server information to system**.	

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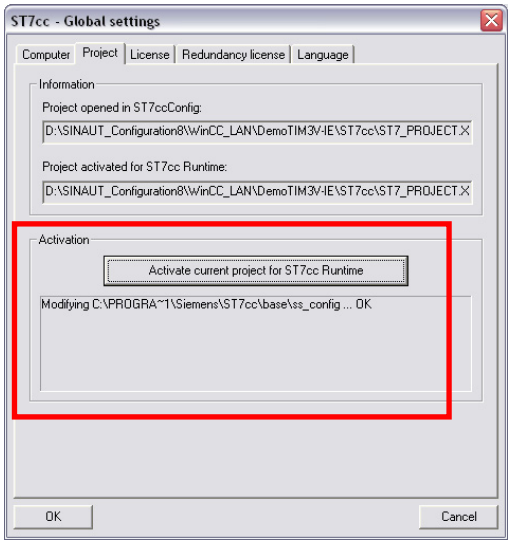
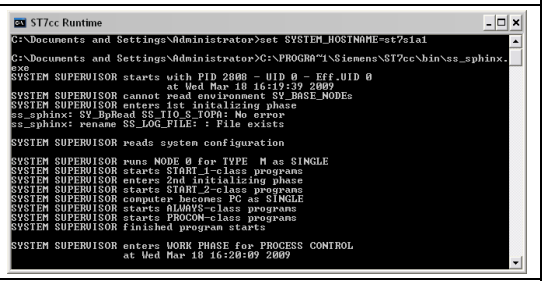
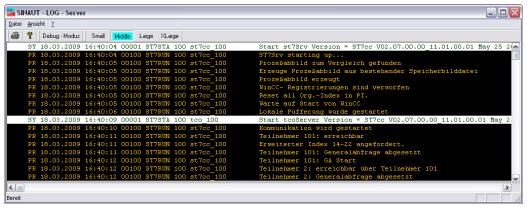
No	Action	Remark/Figure
4.	In the **Project** tab you press the button **Activate current project for ST7cc Runtime**. Press **OK** to quit the dialog. Save the settings now or when exiting ST7cc Config at the latest.	

Start WinCC runtime and ST7cc

Table 6-12

No	Action	Remark/Figure
1.	Start the ST7cc Runtime	**`Start -> SIMATIC -> ST7cc -> ST7cc Runtime`**
2.	The DOS output window opens and displays information on which programs are successively started by ST7cc	
3.	The Log window of the SINAUT server opens. It also shows the connection with the SINAUT stations and that the general queries for these stations, which are automatically started during system start, were terminated without error.	
4.	Wait until the ST7CC server is running. If this is the case the right hand window will appear.	

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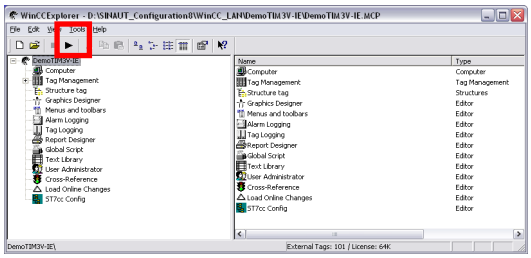
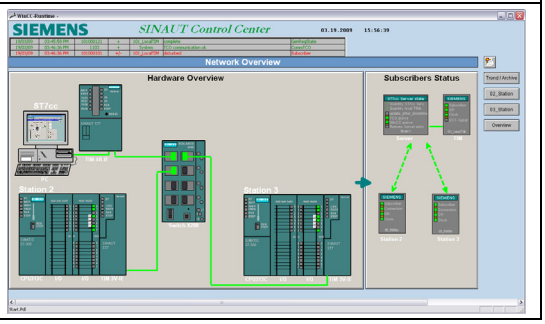
No	Action	Remark/Figure
5.	Now start WinCC Runtime in the WinCC Explorer	
6.	Your SINAUT Demo plant is now ready for operation.	

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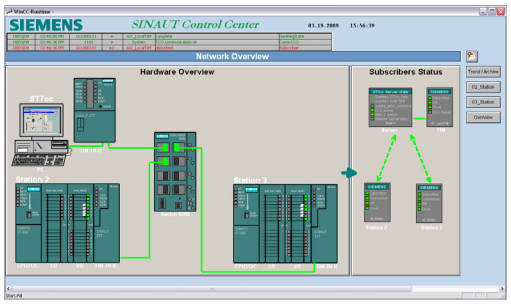
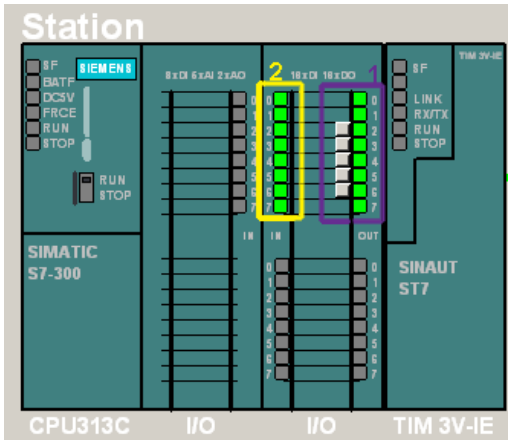
7 Operation of the Application

Introduction

In the following chapters we will introduce the operation of the demo-project as well as the test and diagnostic functions provided by the used components:

7.1 Operating the SINAUT ST7cc project

Table 7-1

No	Action	Remark/Figure
1.	After ST7cc and WinCC Runtime have been started the SINAUT Demo project is active.	
2.	If a connection between the CPU and your local TIM exists, then this is signalled by the watchdog object at the flashing output bit 0.1. The PartnerStatus object monitors the control center status and the other station. The status of the control center is displayed at Bit 0.0 and that of the other station at bit 0.2. If bit 0.0 has not been set, for example, the partner (control center) has failed, if bit 0.0 has been set, the partner is OK. You can switch them over using the function keys at outputs 0.3 to 0.6.**(1)** When physically connecting the inputs 0.0 to 0.7 at the module, you can see the feedback as well. **(2)** The required SINAUT objects have already been configured. All other inputs and outputs were not parameterized for this demo-project.	

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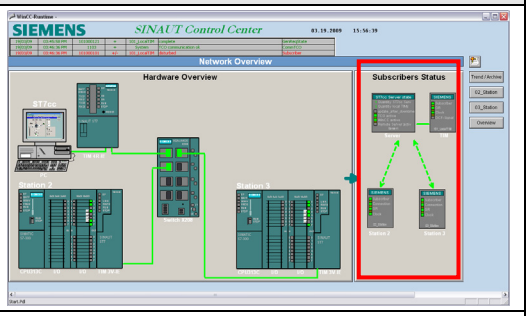
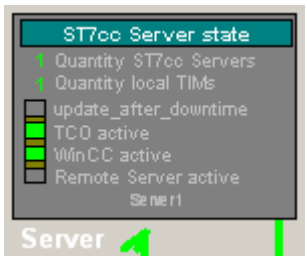
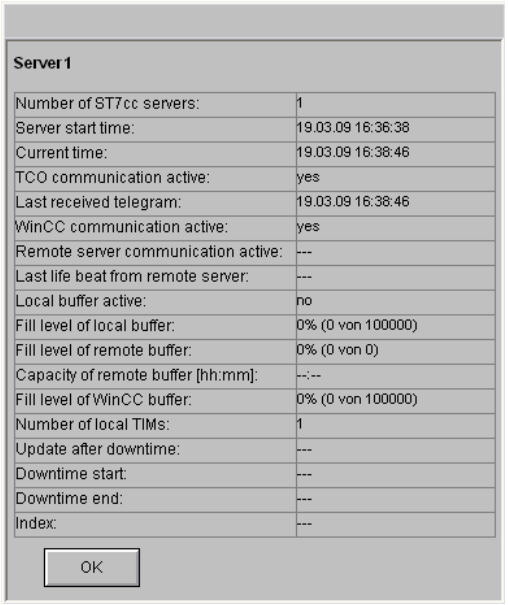
7.2 Subscribers Status

Table 7-2

No	Action	Remark/Figure
1.	On the right side, you can read the status of control center, local TIM and both stations. You can open a details list by moving the left mouse-button over the respective image. These faceplates are generated by SINAUT depending on the configuration and can be easily included into a project.	
2.	Control center: Apart from the number of existing ST7cc servers and directly connected TIMs the status of the TCO (communication module of the ST7cc software) is also displayed. Further information is available in the manual ST7cc (see /3/ in the appendix).	 

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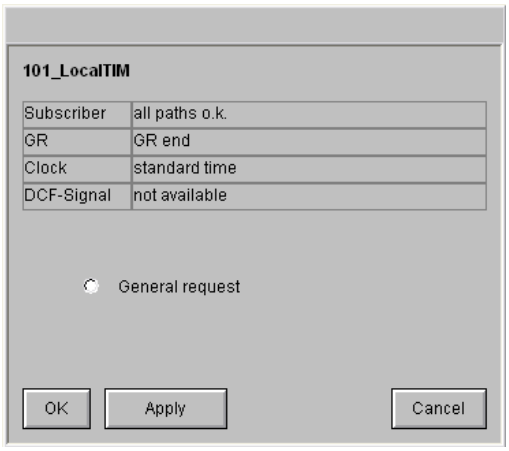
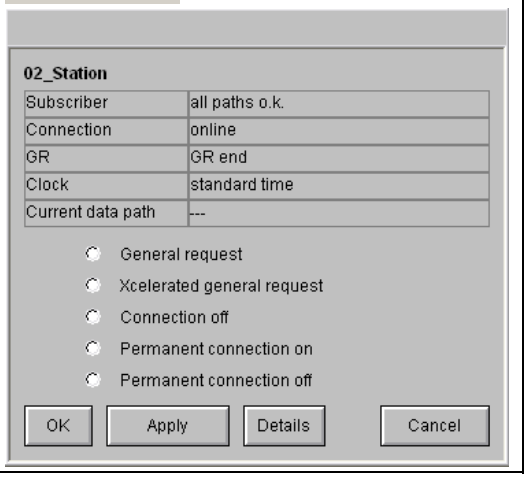
No	Action	Remark/Figure
3.	Local TIM: The image typical indicates whether the TIM is available (Subscriber), that the last general request to the TIM was completed without error (GR) and that the clock time on the TIM is ok (Clock). In the details view you can trigger a general request to the TIM manually (General request) which will then transfer your latest accountancy information. Processing of the general request can be followed at the GR-LED as well as in the text field GR in the faceplate.	 
4.	Station: The image typical indicates whether the station CPU is available (Subscriber), that the last general request to the station was completed without error (GR) and that the clock time on the station is ok (Clock). In the details view, a general request can also be triggered (General request). From the TIM in the station all data message frames possibly stored there can be transmitted as well as a current process image. Both further command options (Permanent connection on / off) are only relevant for one station, which is connected via a dialup network or landline.	 

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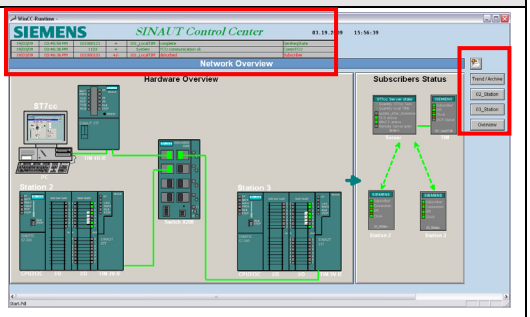
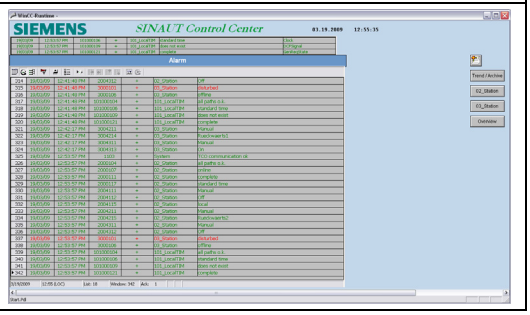
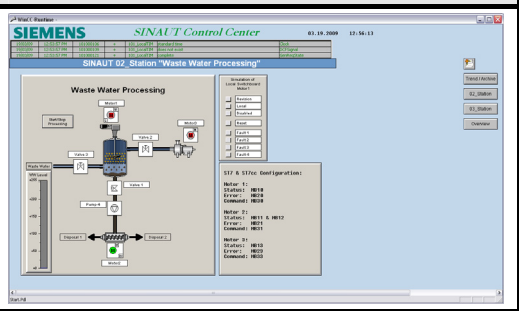
7.3 Error message list

Table 7-3

No	Action	Remark/Figure
1.	In the upper part of the WinCC window, you see the last three error and operating messages. The message archive opens with the function key next to it on the right. Below this function key you find the buttons for three other images • Trend/Archiv • 02_Station • 03_Station • Overview Overview takes you back to the start screen.	
2.	Setup and operation of the message archive is typical for WinCC. For further information please refer back to the WinCC Documentation /5/. Messages are generated by SINAUT depending on the configuration, further messages can be additionally configured.	

7.4 Operation 02_Station / 03_Station

Table 7-4

No	Action	Remark/Figure
1.	Open the overview screen for station 2 or station 3 with function key **02_Station** or **03_Station** . Apart from the process image some signals for motor 1 are simulated in a “Local Switchboard“.	

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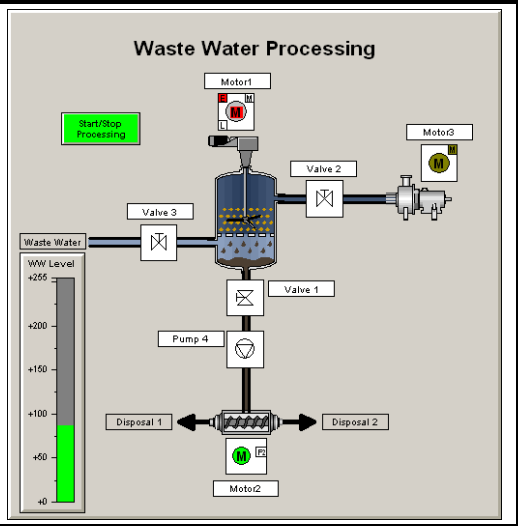
No	Action	Remark/Figure
2.	Only the signals for motor 1, 2 and 3 have been configured. Valves and pump are not interconnected. With the **Start/Stop Processing** button you operate a counter in the CPU, which is output via the Waste Water Level column. The value is secured in the archive and can be output via **Trend/Archive**. This example is technically not realistic and is only meant to illustrate the possibilities with SINAUT.	

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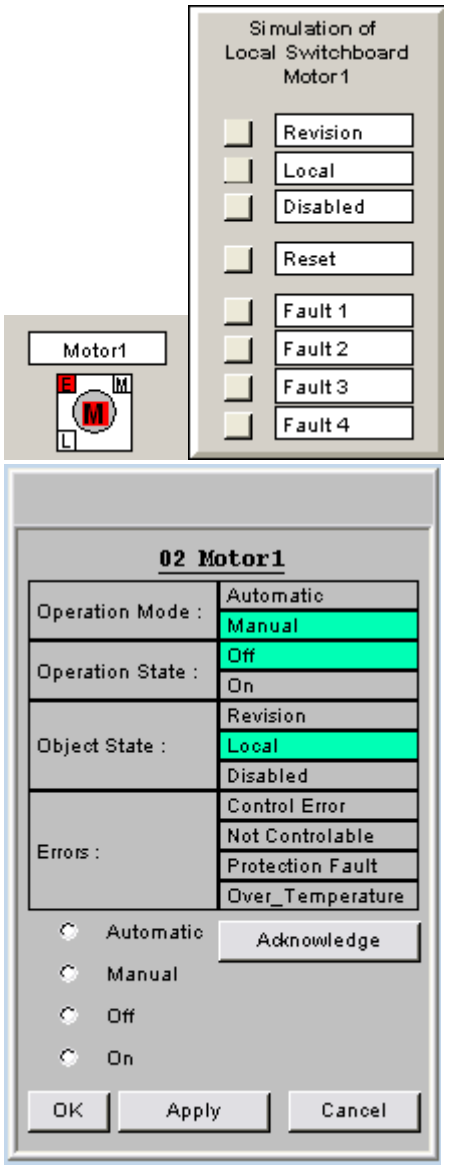
No	Action	Remark/Figure
3.	Click **Motor1** with the left mouse button to open its faceplate with detailed information and control options. You can select the modes **Automatic** and **Manual** and switch the motor **On** and back **Off**. The respective status is displayed in the symbol and in the face plate. The “Local Switchboard” enables selecting the modes **Revision**, **Local**, and **Disabled**. Additionally, the **4 standard Faults** can be set. **Reset** is used to reset these signals. **Acknowledge** must be pressed to confirm the **Control Error** status.	

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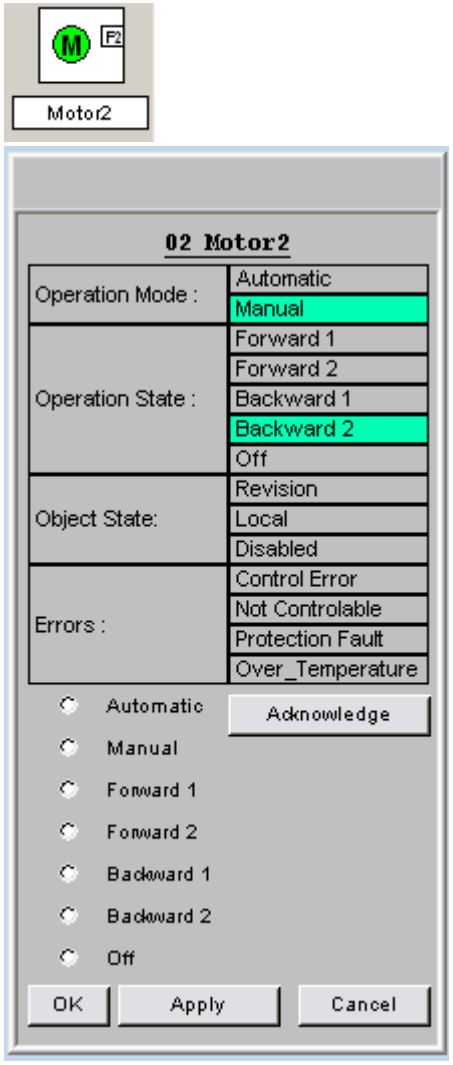
No	Action	Remark/Figure
4.	Apart from the simple motor displayed above, with one rotation direction and one speed, SINAUT also provides a typical for a motor with two rotation directions and two speeds.	

ATTENTION

Programming for the drives in this demo project has not been completed and the states are not-interlocked, the appropriate program parts can not be used for a real plant.

These functions have been described in detail in the ST7cc Manual (see /3/ in the Appendix).

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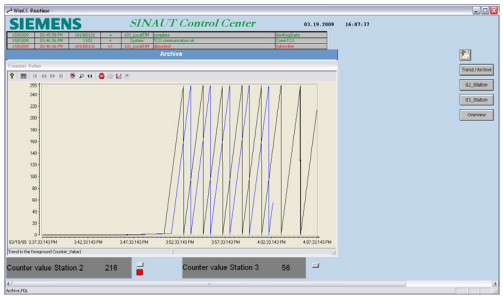
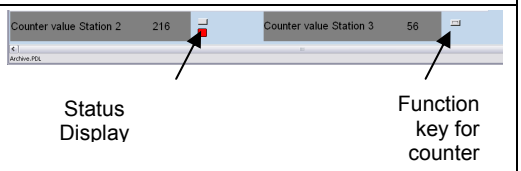
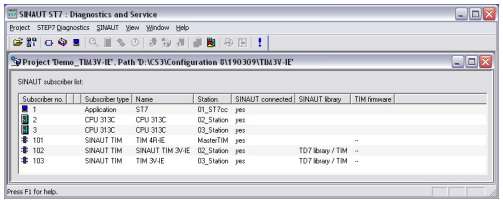
7.5 Archive

Table 7-5

No	Action	Remark/Figure
1.	After you have activated the counter "WW Level" as described above, you can view the archived values. Open the display of the archive values with the **Trend/Archive** button. The WinCC Online Trend Control was used for the output of the archive values. You can adjust the output to your requirements. All WinCC functions are available: • Online/Offline • Scroll • Zoom • Read pointer • Statistic Area	 The trend for 02_Station is indicated with **black** color. The trend for 03 is indicated with **blue** color.
2.	The current count value is once more output in the bottom part of the screen. Using the function key, you can stop the counter or start it here. The status field next to the button shows the status of the ON/Off counter.	
3.	Using this archive output, you can easily test the storage function of the TIM, for example, by interrupting the connection control center – TIM while counter is activated and reconnecting it after some time.	The data generated in the CPU are entered into the archive with precise time stamp. There are no gaps in the archive.

7.6 SINAUT Diagnostics and Service

Table 7-6

No	Action	Remark/Figure
1.	The ST7 Configuration Diagnostics and Service Tool provides many diagnostics options in concentrated form. Apart from module information known from STEP 7, you will also find SINAUT specific diagnostics information. For a description refer to ST7 Manual see /2/ in the Appendix.	

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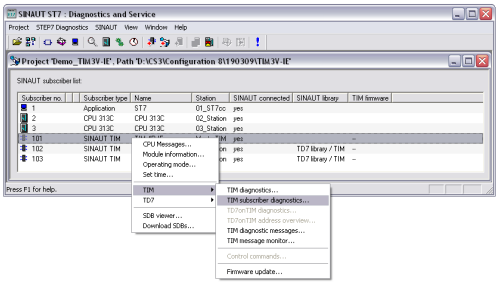
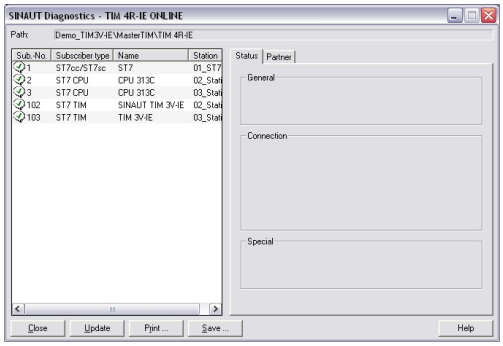
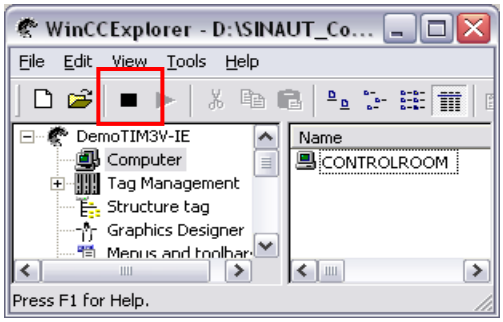
No	Action	Remark/Figure
2.	A diagnostic option for the TIM is to check the connection with other stations. Click on the central TIM. Subsequently you select **`TIM -> Subscriber Diagnostics`** via the right mouse button.	
3.	The window with the SINAUT Diagnostics for the TIM opens. If the connection with a CPU, TIM or ST7cc computer has been established this is indicated with a green checkmark. If there is no connection it is indicated with a red cross. The right window pane contains additional information for the connection.	

7.7 Terminate WinCC and ST7cc Runtime

Table 7-7

No	Action	Remark/Figure
4.	Stop the WinCC Runtime via the WinCC Explorer, even if the user interface has been terminated beforehand.	
5.	Stop the SINAUT ST7cc Server. The LOG console and the commando input window are then also terminated automatically.	

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7.8 Cross-communication between station 2 and station 3

Table 7-8

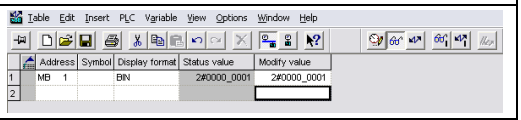
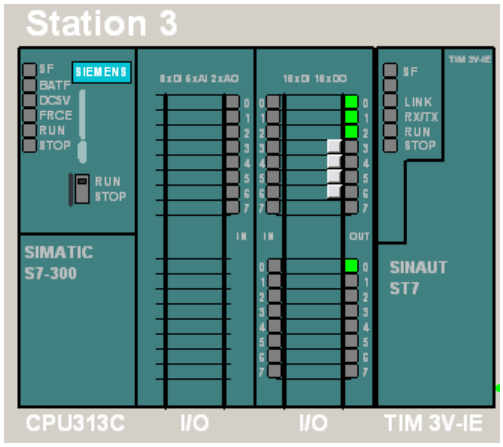
No	Action	Remark/Figure
1.	To test the communication between the stations object **Bin04B_S** and a **Bin04B_R** are programmed in each station. Memory byte 1 (MB1) is used for sending. For receiving the output byte (AB1) is used.	Using block **Bin04B_S** it is possible to send up to 4 bytes. In this application only the first byte is programmed. In the receive object this byte is displayed on the first output byte (see figure 7-1)
2.	In 02_Station (send CPU) you set one or several bits of memory byte 1 (MB1) via the variable table saved in the program.	
3.	Monitor output byte 1(AB1) in 03_Station (receive CPU). You can repeat the same process for 03_Station as send CPU.	

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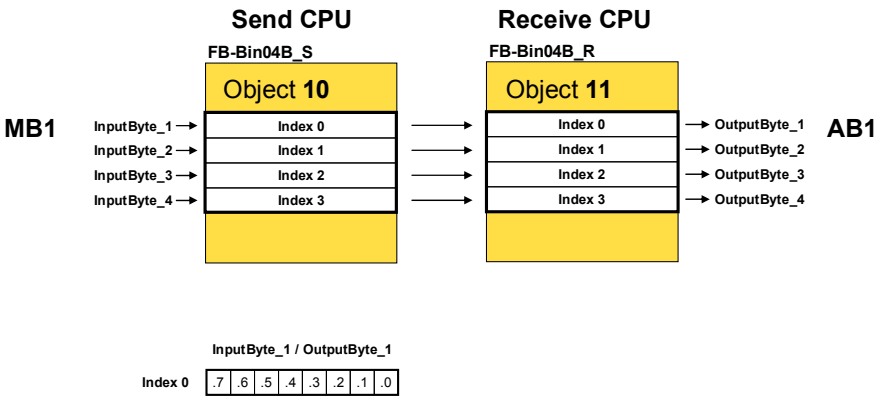
Figure 7-1



Appendix and List of Further Literature

8 Glossary

DSL

Digital Subscriber Line, digital node connection line; households and company can send and received data with high transmission rate. DSL uses the already installed two to four copper lines of the telephone network, the "node connection line".

GPRS

General Packet Radio Service, general package oriented radio service. An expansion of the GSM mobile radio standard by *package-oriented* data transmission.

GSM

Global System for Mobile Communications is a fully digital mobile radio network standard.

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LAN, WAN

LAN : Local Area Network
Such a network has only one restricted geographical reach.
As opposed to public networks, it is under the legal control of the user and restricted to an office building or company premises.

WAN: Wide Area Network,
Wide area networks have been designed for language or data transmission over long distances. The concepts of such networks is mainly shaped by the service provider's offers.

SINAUT ST7, ST7cc

SINAUT® ST7 is a SIMATIC® S7-based system for fully automatic monitoring and control of process stations, which exchange data with one or several control centers via WAN (Wide Area Network) or Ethernet (TCP/IP).
SINAUT ST7cc (the PC control center) server as a control center, based on WinCC. It is a control center system particularly designed for the event controlled and time-stamped data transmission of the SINAUT system.
The SINAUT software in the stations provides for a change-controlled process data transmission with the control center as well as between the individual CPUs. A particular feature of the TIM data transmission module, which is used in the SINAUT ST7 system, is the local storage of the data messages (including time stamp) during failure of the communication path, failure of a partner or for cost optimization for dialup networks.

TIM

Telecontrol Interface Module

The core piece of the SINAUT Telecontrol Hardware is the communication module TIM (Telecontrol Interface Module). It manages data traffic via the WAN.
Using the TIM 3V-IE(Advanced), a SIMATIC S7-300 or a C7 complete device can exchange data with other SINAUT ST7 or ST1 partners via any SINAUT WAN network. Furthermore, this module extends the SINAUT communication to the Ethernet, i.e. to TCP/IP based networks. The most important SINAUT property, data storage including time stamp on the TIM at connection failure or failure of the partner, is hereby also provided for Ethernet connections. Important events, alarms etc. are not lost, and archives in the control center system are always filled continuously.
SINAUT TD7 software so far available for the CPU (TD7onCPU) is integrated in the TIM 3V-IE (TD7onTIM). This enables using the smallest S7-CPUs 312 and 312C, as ideally no CPU main memory is required any longer for SINAUT.

The TIM4R-IE has the properties of the TIM3V-IE(Advanced). Additionally it can be connected with a S7-400 or with an ST7cc/ST7sc computer.

VPN tunnel

Virtual Private Network
A computer network using a public network (e.g. the Internet) for transporting private data. Stations of VPN can exchange data like in an internal LAN. The connection via the public network is usually encoded. The term “tunnel“ refers to transmitting the data of a network protocol, embedded into a different network protocol.

WinCC

PC-based operating and monitoring system for visualizing and operating of processes, production processes, machines and plants in all branches with simple application up to distributed multi-terminal systems with redundant servers and location independent solutions with web clients. WinCC is the information pool for company wide, vertical integration.

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9 Bibliography

9.1 Bibliographic References

This list is by no means complete and only provides a selection of appropriate sources.

Table 9-1

	Topic	Title
/1/	SINAUT ST7 Hardware	SINAUT ST7 System Manual Volume 1: System and Hardware http://support.automation.siemens.com/WW/view/en/24621696
/2/	SINAUT ST7 Software	SINAUT ST7 System Manual Volume 2: Software http://support.automation.siemens.com/WW/view/en/24619519
/3/	SINAUT ST7cc	SINAUT ST7cc Control Center Manual (6NH7998-7AA11) http://support.automation.siemens.com/WW/view/en/17188997
/4/	MD741-1	EGPRS Router SINAUT MD741-1 System Manual http://support.automation.siemens.com/WW/view/en/31385703
/5/	CPU 31xC	CPU 31xC and CPU 31x, Technical Data Device Manual (6ES7398-8FA10-8AA0) http://support.automation.siemens.com/WW/view/en/12996906
/6/	WinCC	SIMATIC HMI WinCC V6 Basic Documentation (6AV6392-1XA06-0AA0) http://support.automation.siemens.com/WW/view/en/15342782

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9.2 Internet Links

This list is by no means complete and only provides a selection of appropriate sources.

Table 9-2

	Topic	Title
\1\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

10 History

Table 10-1 History

Version	Date	Modification
V1.0	27.02.2007	First issue
V2.0	18.05.2009	Configuration with 2 stations and cross communication

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