WinCC – Examples of integrated engineering with STEP 7

WinCC

Application Description • April 2009

Service & Support

Answers for industry.

SIEMENS

Warranty, Liability and Support

Note The Application Examples are not binding and do not claim to be complete regarding the configuration, equipping and any eventuality. The Application Examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for ensuring that the described products are used correctly. These Application Examples do not relieve you of the responsibility of safely and professionally using, installing, operating and servicing equipment. When using these Application Examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these Application Examples at any time without prior notice. If there are any deviations between the recommendations provided in these Application Examples and other Siemens publications – e.g. Catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document.

Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data etc., described in this Application Example shall be excluded. Such an exclusion shall not apply in the case of mandatory liability, e.g. under the German Product Liability Act (“Produkthaftungsgesetz”), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract (“wesentliche Vertragspflichten”). The damages for a breach of a substantial contractual obligation are, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change of the burden of proof to your detriment.

It is not permissible to transfer or copy these Application Examples or excerpts of them without first having prior authorization from Siemens Industry Sector in writing.

If you have any questions concerning this document please e-mail us to the following address:

online-support.automation@siemens.com

Copyright © Siemens AG Copyright 2009 All rights reserved

Preface

Objective of the application

This application is designed for users ...

- who gained initial experiences with WinCC already.
  It conveys knowledge about the interaction of the individual SIMATIC configuration tools and shows how their configuration can be made easier.

Main contents of this application

The following main points are discussed in this application:

- TIA
- Prerequisites
- Creating a Project
- Tags transfer
- Alarms
- System diagnostics
- Process diagnostics
- Trends
- User archives
- Time synchronization
- Basic Process Control

Copyright © Siemens AG Copyright 2009 All rights reserved

Topics not covered by this application

This application does not contain a description ...

- of the engineering tools used (STEP 7, WinCC).
- of the installation of STEP 7 or any required communication drivers.

Previous knowledge in these fields is assumed.

Validity

The examples were created with WinCC V7.0 and STEP 7 V5.4.

Industry Automation and Drives Technologies Service & Support Portal

This entry is taken from the Internet Service Portal of Siemens AG, Industry Automation and Drives Technologies. The following link takes you directly to the download page of this document.

http://support.automation.siemens.com/WW/view/en/34995306

Table of Contents

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

1 TIA

1.1 What is TIA?

TIA stands for "Totally Integrated Automation" and it is an automation technology strategy which has been designed and developed by Siemens since 1996.

This strategy defines the interaction of extensive single components, tools (SW) and the related services (spare parts service etc.).

The consistency of TIA offers the involved companies simplification and cost savings for their value chain (OEM, system integrators, planners and end customers). The complete product and system range offers solutions for the continuous (process / engineering technology) and discrete manufacture / automation.

Copyright © Siemens AG Copyright 2009 All rights reserved

1.2 Core statement

Totally Integrated Automation can be described with a reduced formula:

- TIA is
  - an extensive product / system offer combined with services.

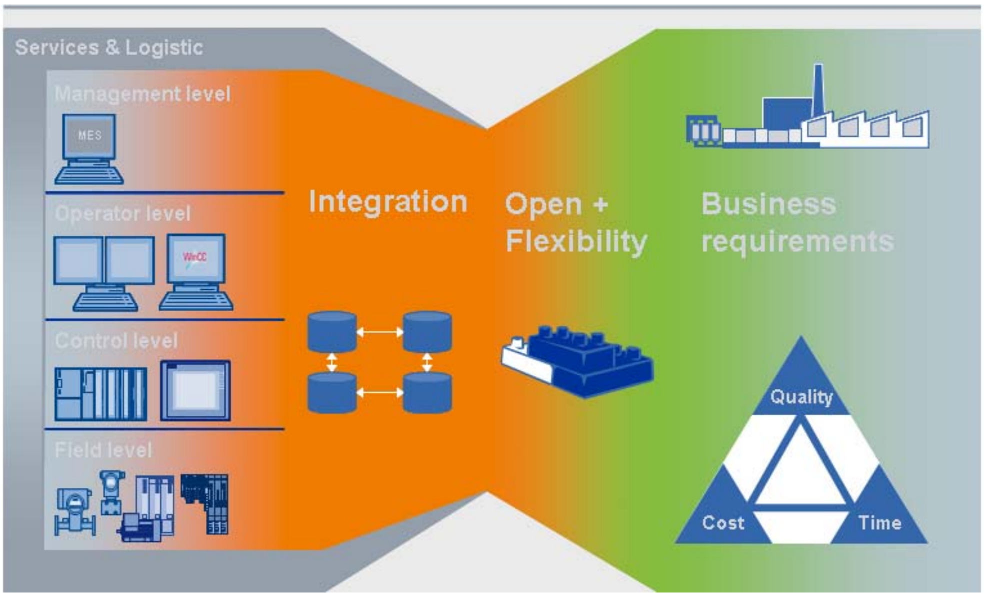
    plus
  - consistency which improves the interaction of the components forming a system.

    plus
  - openness and flexibility for any automation job.

This offer facilitates and entails the benefit of meeting the economic requirements of any customer better, faster and at an improved quality level, i.e. more efficiently.

1.3 Details

Figure 1-1

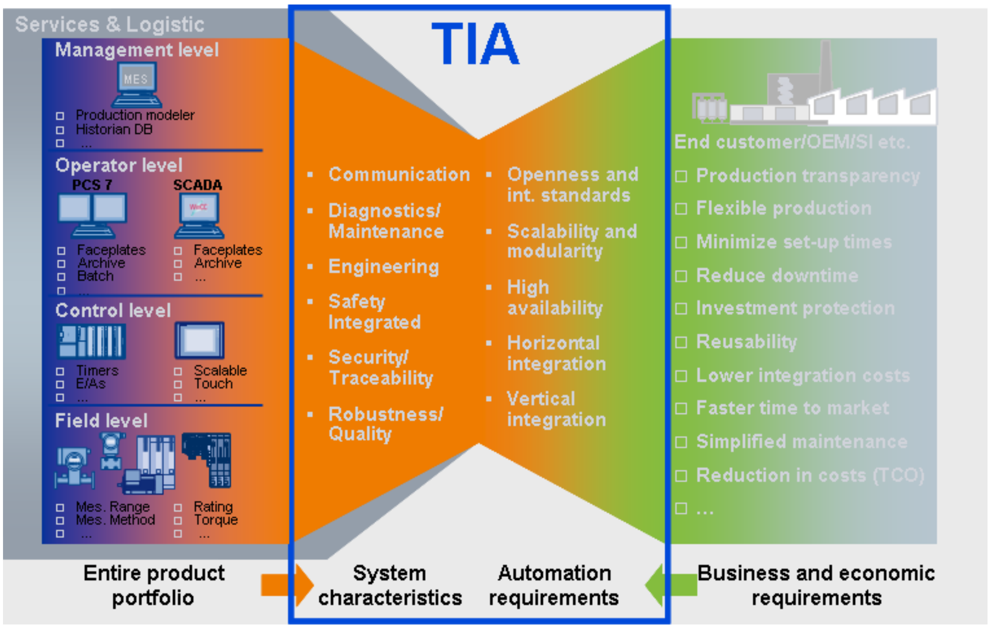


- The interaction is ensured with a consistency existing across the four automation levels:
  - management level
  - operator level
  - control level
  - field level
- In particular, the services frequently determine the economic benefit of the involved companies (EPC, OEM, plant engineers, control cabinet builders, system integrator and final customer) when an automation system is to be realized.

Copyright © Siemens AG Copyright 2009 All rights reserved

1.4 Efficiency

Figure 1-2

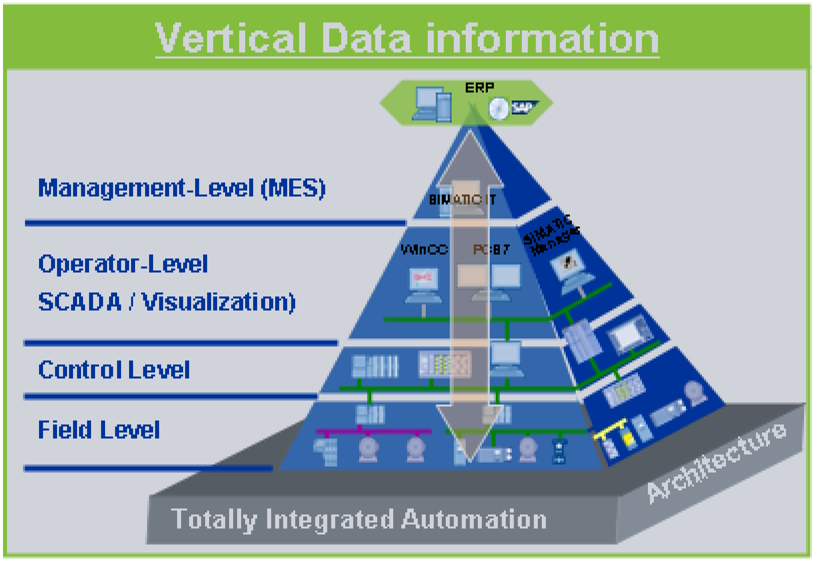


- The extensive I°IA/DT product range offers six system properties. The customer also specifies general requirements for automation based on his economic requirements. These requirements are not only supported by the Siemens automation strategy / TIA architecture but added values will be achieved based on the TIA system properties which an inhomogeneous automation will not offer.
- On the left side you can see the product range which comprises the 136,000 products offered by I°IA/DT. In addition to its specific product properties every single product contains six consistent system properties within one application interacting in reaching a solution.
- On the right side you will find the customer's driving forces or economic requirements which our customers and, in particular, their management have to deal with every day. In addition to these requirements our customers also have general requirements for their individual automation, e.g. "openness, support of international standards" and "scalability / modularity" to achieve investment protection or flexibility of their automation.
- Moreover the "horizontal" and "vertical" integration gains increasing and more elementary importance. These two requirements have played a rather secondary role to the customers so far.

Copyright © Siemens AG Copyright 2009 All rights reserved

1.5 Vertical integration

Figure 1-3



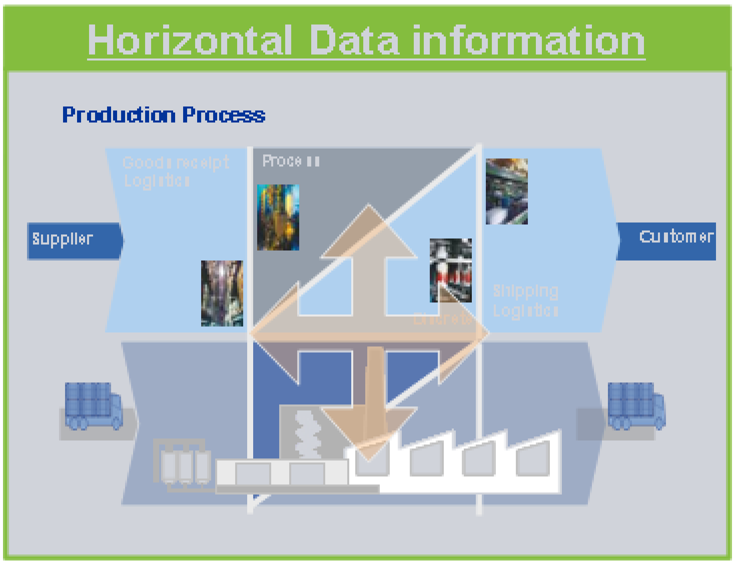
The Siemens products offer consistency across all 4 levels within automation and drive solutions which saves on costs and efforts.

- The field level contains the biggest number of components.
  From the simple asynchronous motor via actuators, sensors or process instruments, process analyzers to products which permit distributed automation designs (I/O modules with ET 200).
- The control level contains the products which, on the one hand, control the automation (controllers) and, on the other hand, permit the operator to operate and monitor the automated process via operator panels (HMI).
- The operator level provides the customer with an overview over the entire automated system from one point in the case of complex automation systems. Control systems (DCS) or a SCADA system (WinCC) provide the plant manager with the desired, relevant and condensed information in any form.
- The management level represents the interaction between the automation system and the customer's ERP system. The connection between the economic data and the automation data (field level) are very important for medium-scale and large-scale production lines for providing the plant managers with the relevant information for their decisions.

Copyright © Siemens AG Copyright 2009 All rights reserved

1.6 Horizontal integration

Figure 1-4



Horizontal integration or consistency means the advantage of acquiring information from the entire production process starting with incoming goods (discrete) via the main process (process engineering, continuous and/or discrete) to goods output (discrete) and reverse.

The horizontal consistency provides transparency of the entire process to avoid failures and save costs.

In addition the customer can reduce the following automation-related expenses:

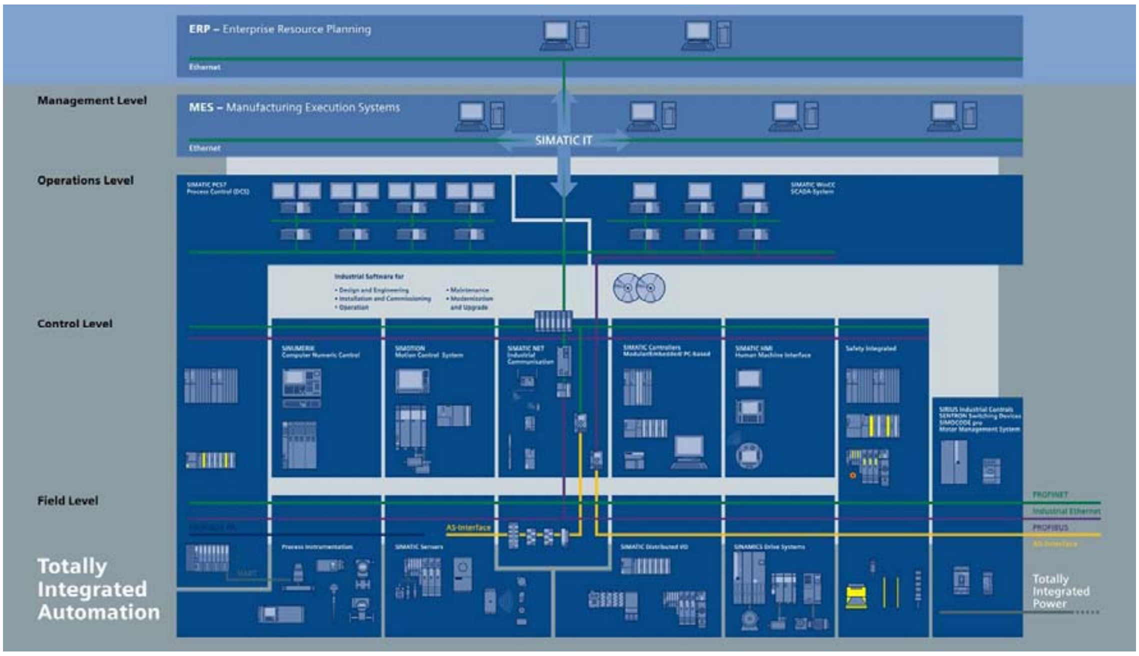
- expenses for spare parts and costs.
- same operation of the tools (e.g. engineering SW) in each of the three horizontal phases.
- optimization of the personnel expenses as the number of software and hardware used can be reduced to a necessary minimum.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

1.7 Added value

Figure 1-5


ERP – Enterprise Resource Planning
Ethernet
Management Level
MES – Manufacturing Execution Systems
SIMATIC IT
Ethernet
Operations Level
SIMATIC PCS7 Process Control (DCS)
SIMATIC WinCC SCADA-System
Industrial Software for
• Design and Engineering
• Installation and Commissioning
• Operation
• Maintenance
• Modernization and Upgrade
Control Level
SINUMERIK Computer Numeric Control
SIMOTION Motion Control System
SIMATIC NET Industrial Communication
SIMATIC Controllers Modular/Embedded/ PC-based
SIMATIC HMI Human Machine Interface
Safety Integrated
SIRIUS Industrial Controls
SENTRON Switching Devices
SIMOCODE pro
Motor Management System
Field Level
PROFIBUS PA
HART
AS-Interface
Process Instrumentation
SIMATIC Sensors
SIMATIC Distributed I/O
SINAMICS Drive Systems
PROFINET
Industrial Ethernet
PROFIBUS
AS-Interface
Totally Integrated Automation
Totally Integrated Power

The portfolio for different production requirements is too big for dealing in one workshop with all added values which the integration of WinCC provides.

- Uniform representation of all automation devices and networks in the editors and project browsers (SIMATIC Manager, NETPRO Editor, topology editor).
- Start of the configuration and programming tools with a double-click in SIMATIC Manager (HMI configuration: WinCC or WinCC flexible).
- Consistent access to the process data from the management level down to the field level.
- Direct access to STEP7 icons from out of WinCC / WinCC flexible.
- Central loading of all projects from out of the SIMATIC Manager.
- Disturbances are consistently displayed with all information from the control to the operator level.
- Automation view (system diagnostics): Diagnosable modules signal errors through the reporting of system error, without extensive configuration.
- Process view (process diagnostics): Production monitoring with S7-PDIAG and ProAgent, chronological reporting from control to HMI.
- Process data analysis with DowntimeMonitor (DTM), ProcessMonitor (PCM), PM-Analyze or PM-Quality.

- Remote diagnostics with WebNavigator, DataMonitor, AlarmControlCenter (for passing on the alarms).
- Vertical integration through distributed systems (server-server communication, CAS, etc.).
- Central user administration via SIMATIC Logon.
- Time synchronization between the levels.
- Uniform licence management (Automation Licence Manager is the central tool for handling SIMATIC WinCC, STEP 7, etc.).
- Worldwide support and service of the entire plant is provided by one company (http://support.automation.siemens.com).

1.8 Further reading

This list is not complete and only represents a selection of relevant literature.

Table 1-1

	Topic	Title
\1\	Further Information	https://www.automation.siemens.com/_de/tia/index.htm
\2\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

Copyright © Siemens AG Copyright 2009 All rights reserved

2 Prerequisites

2.1 Hardware requirements

The following list contains all components used in the example:

Table 2-1

Number	Module	Ordering number
1	UR1	6ES7 400-1TA00-0AA0
1	PS 407 4A	6ES7 407-0DA01-0AA0
1	CPU 414-3 PN/DP	6ES7 414-3EM05-0AB0
1	IM151-3PNHFV50	6ES7 151-3BA22-0AB0
1	PM-E DC24V	6ES7 138-4CA01-0AA0
1	4DI DC24V HF	6ES7 131-4BD01-0AB0
2	2DO DC24V/0.5A HF	6ES7 132-4BB01-0AB0
1	2AI I 2/4WIRE HF	6ES7 134-4MB02-0AB0
1	2AO I HF	6ES7 135-4MB02-0AB0
1	PC with Ethernet interface	---

Note You can also execute some of the topics dealt with (e.g. ALARM_S) with a 300-series CPU. If you want to practice all topics discussed in this document (e.g. Alarm_8) you will need a CPU of the 400 series.

Copyright © Siemens AG Copyright 2009 All rights reserved

2.2 Software requirements

The following list contains all programs used in the example:

Table 2-2

Component	Note
SIMATIC WinCC V7.0	Program is used for visualization of the process.
SIMATIC STEP 7 V5.4+SP3	Program is used for program generation for control of the process.
SIMATIC NET V7.0	Program contains the communication drivers.

2.3 Installing the software

This chapter describes the software components to be installed. It is also important to read the descriptions, manuals and any delivery information supplied with the products.

Installation order

To integrate WinCC in STEP 7 you have to install WinCC and also STEP 7. For a new installation the following installation order is recommended:

1. Installation of STEP 7
2. User-defined installation of WinCC

Procedure for WinCC

1. In the start menu of the operating system open "Settings > Control Panel > Software".

2. Select "SIMATIC WinCC V7.0" and click "Change/Delete". The WinCC setup program opens.

3. Select whether single components or options are to be installed. Components which have already been installed will be displayed.

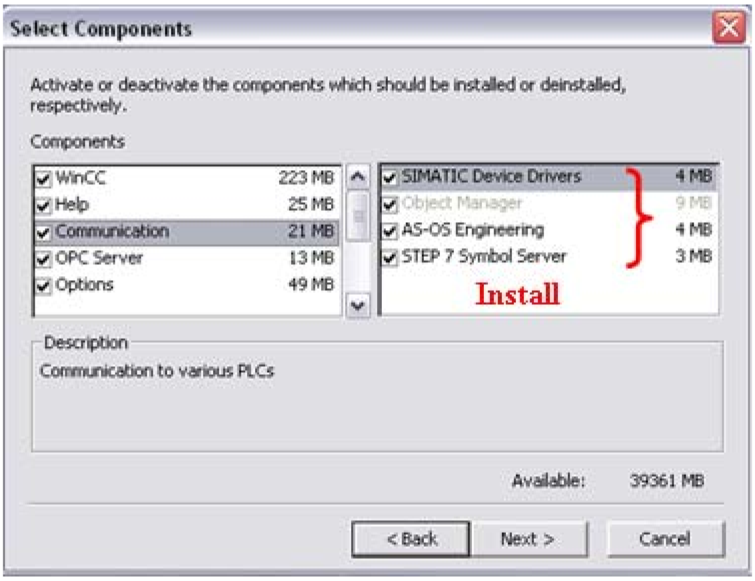
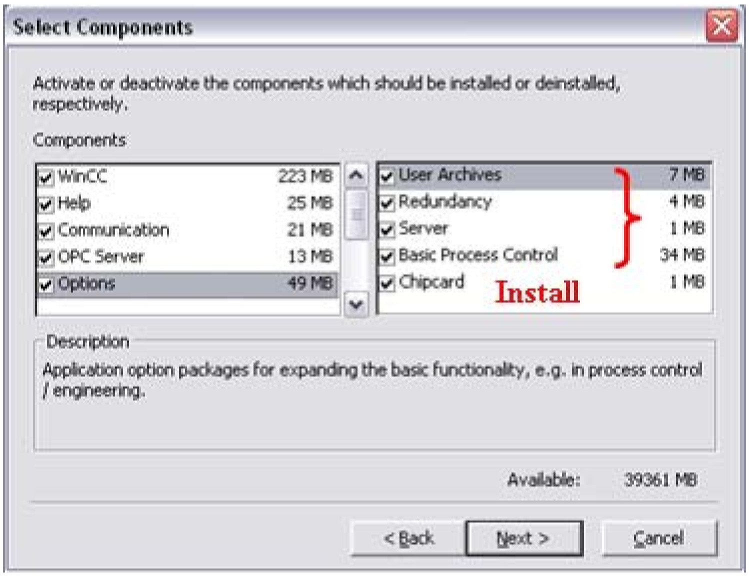
4. Put the WinCC product DVD in the DVD drive when prompted. When the start page of the DVD is opened via the autorun function, close the window with "Finish".

5. Follow the on-screen instructions.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Table 2-3

	Action	Screenshot
1.	Select the following communication extensions during the installation:	 Select Components Activate or deactivate the components which should be installed or deinstalled, respectively. Components ☑ WinCC 223 MB ☑ Help 25 MB ☑ Communication 21 MB ☑ OPC Server 13 MB ☑ Options 49 MB ☑ SIMATIC Device Drivers 4 MB ☑ Object Manager 9 MB ☑ AS-OS Engineering 4 MB ☑ STEP 7 Symbol Server 3 MB Description Communication to various PLCs Available: 39361 MB
2.	Select the following options during the installation:	 Select Components Activate or deactivate the components which should be installed or deinstalled, respectively. Components ☑ WinCC 223 MB ☑ Help 25 MB ☑ Communication 21 MB ☑ OPC Server 13 MB ☑ Options 49 MB ☑ User Archives 7 MB ☑ Redundancy 4 MB ☑ Server 1 MB ☑ Basic Process Control 34 MB ☑ Chipcard 1 MB Description Application option packages for expanding the basic functionality, e.g. in process control / engineering. Available: 39361 MB

2.4 Further instructions for installation

You can install the required WinCC components at the same time when you follow the described steps. However, STEP 7 can also be installed at any time later. Single WinCC components might have to be post-installed then.

2.5 Language settings

This documentation only contains pictures in English. It might be easier for you to follow the examples when you select English for your configuration tools.

- In SIMATIC Manager you select the language via "Options > Settings... > Language".
- In WinCC you select the language via "Options > Language...".

2.6 Further reading

Bibliographic references

This list is not complete and only represents a selection of relevant literature.

Table 2-4

	Topic	Title
/1/	STEP7 V5.4 Documentation Basic Knowledge	6ES7810-4CA08-8AW0
/2/	Documentation of WinCC V7.0	http://support.automation.siemens.com/WW/view/en/29489481

Internet links

This list is not complete and only represents a selection of relevant literature.

Table 2-5

	Topic	Title
\1\	Requirements for the installation of STEP 7 V 5.4	http://support.automation.siemens.com/WW/view/en/24059047
\2\	Installation of WinCC V7.0 on an MUI operating system if the language set in Windows is not English	http://support.automation.siemens.com/WW/view/en/32817147
\3\	Integrating an existing WinCC project into a STEP 7 project	http://support.automation.siemens.com/WW/view/en/11841504
\4\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

Copyright © Siemens AG Copyright 2009 All rights reserved

3 Creating a Project

3.1 Introduction

Here you get an overview over the steps which are required for the creation of an integrated WinCC project.

The instruction describes the creation of the PLC station, PC station and networking of these components.

Copyright © Siemens AG Copyright 2009 All rights reserved

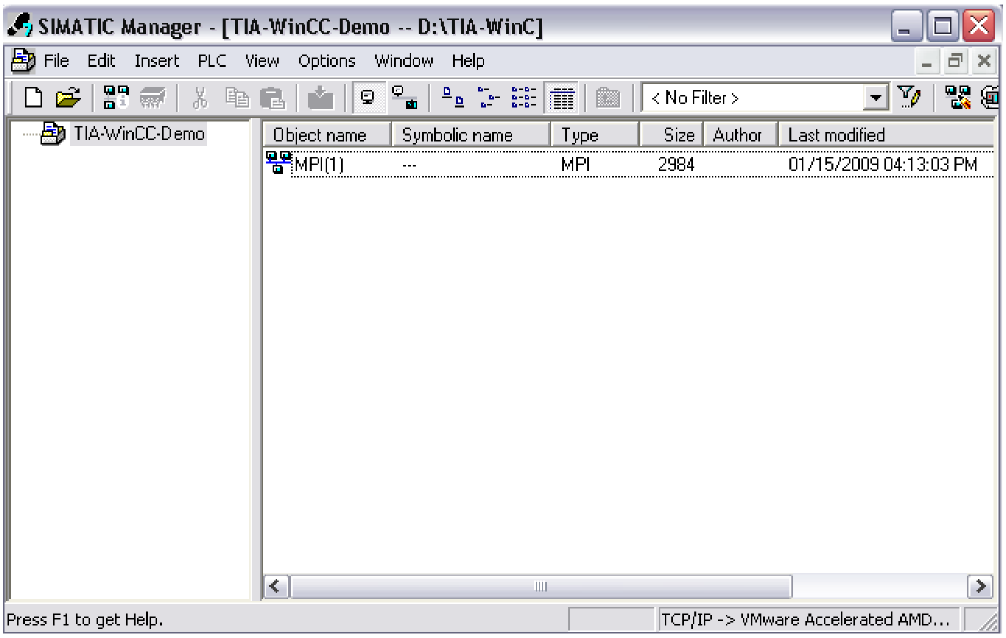
Copyright © Siemens AG Copyright 2009 All rights reserved

3.2 STEP 7 configuration

3.2.1 Inserting the PLC

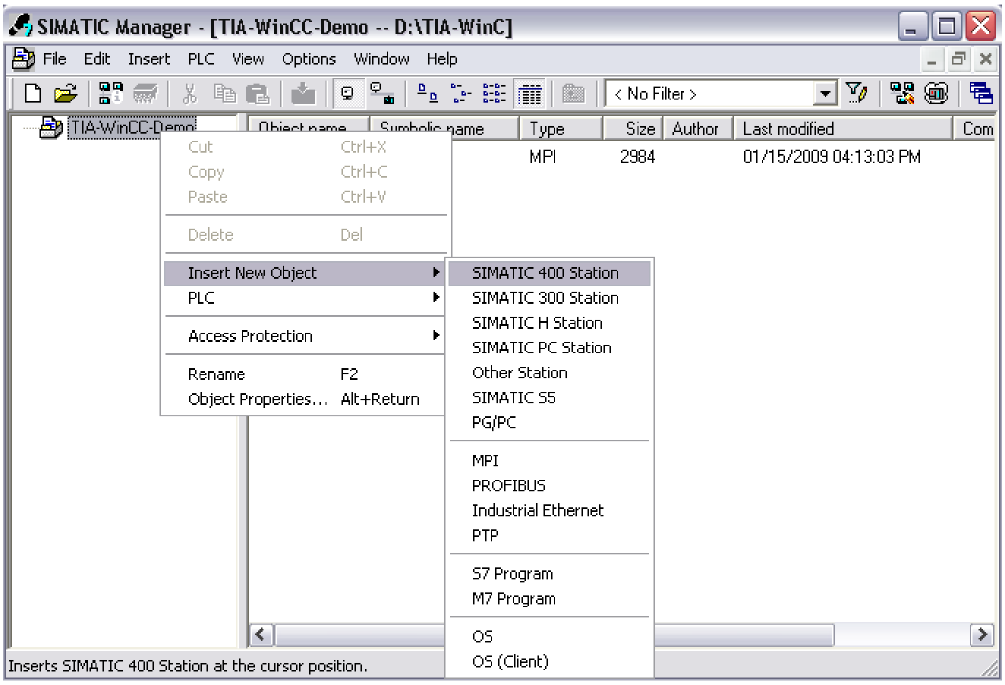
Table 3-1

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>Start the Simatic Manager and create a new project (File > New).



<table>
<tr><th>Object name</th><th>Symbolic name</th><th>Type</th><th>Size</th><th>Author</th><th>Last modified</th></tr>
<tr><td>MPI(1)</td><td>---</td><td>MPI</td><td>2984</td><td></td><td>01/15/2009 04:13:03 PM</td></tr>
</table>

Press F1 to get Help. TCP/IP -> VMware Accelerated AMD...</td></tr>
<tr><td>2.</td><td>Insert a new SIMATIC 400 station (Insert > Insert New Object > SIMATIC 400 Station).

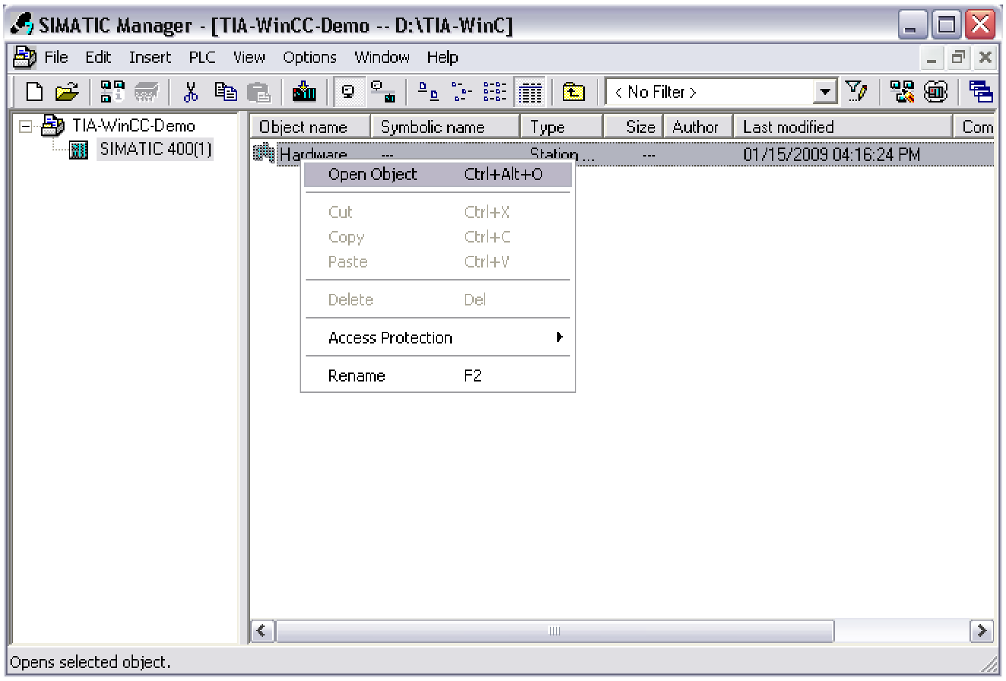


<table>
<tr><th>Object name</th><th>Symbolic name</th><th>Type</th><th>Size</th><th>Author</th><th>Last modified</th><th>Com</th></tr>
<tr><td></td><td></td><td>MPI</td><td>2984</td><td></td><td>01/15/2009 04:13:03 PM</td><td></td></tr>
</table>

Inserts SIMATIC 400 Station at the cursor position.</td></tr>
</table>

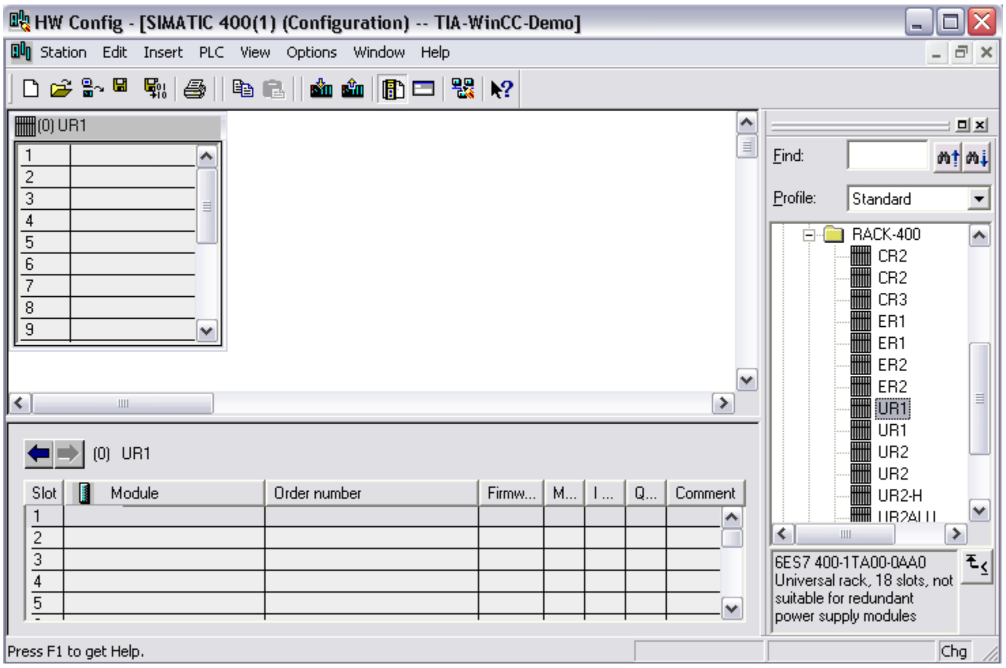
Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3.</td><td>Open HW Config (Edit > Open Object) to configure your modules.



SIMATIC Manager - [TIA-WinCC-Demo -- D:\TIA-WinC]
File Edit Insert PLC View Options Window Help
< No Filter >
TIA-WinCC-Demo
SIMATIC 400(1)
Object name Symbolic name Type Size Author Last modified Com
Hardware --- Station ... --- 01/15/2009 04:16:24 PM
Open Object Ctrl+Alt+O
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Access Protection
Rename F2

Opens selected object.</td></tr>
<tr><td>4.</td><td>Insert a rack "UR1" with the order number: 6ES7 400-1TA00 from the hardware catalog (View > Catalog).

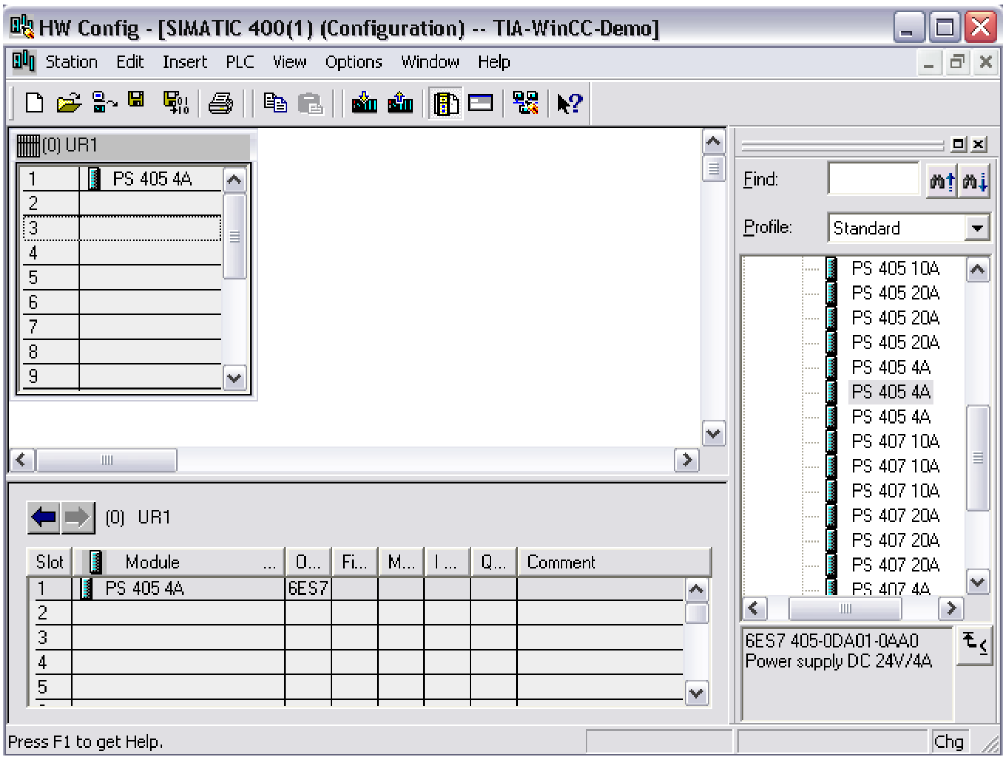


HW Config - [SIMATIC 400(1) (Configuration) -- TIA-WinCC-Demo]
Station Edit Insert PLC View Options Window Help
(0) UR1
1
2
3
4
5
6
7
8
9
(0) UR1
Slot Module Order number Firmw... M... I ... Q... Comment
1
2
3
4
5
Find:
Profile: Standard
RACK-400
CR2
CR2
CR3
ER1
ER1
ER2
ER2
UR1
UR1
UR2
UR2
UR2-H
UR2ALU
Chg

6ES7 400-1TA00-0AA0 Universal rack, 18 slots, not suitable for redundant power supply modules

Press F1 to get Help.</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5.</td><td>Insert a power supply "PS 405 4A" with the order number: 6ES7 405-0DA01-0AA0 on slot 1 of the rack from the hardware catalog (View > Catalog).



Profile: Standard

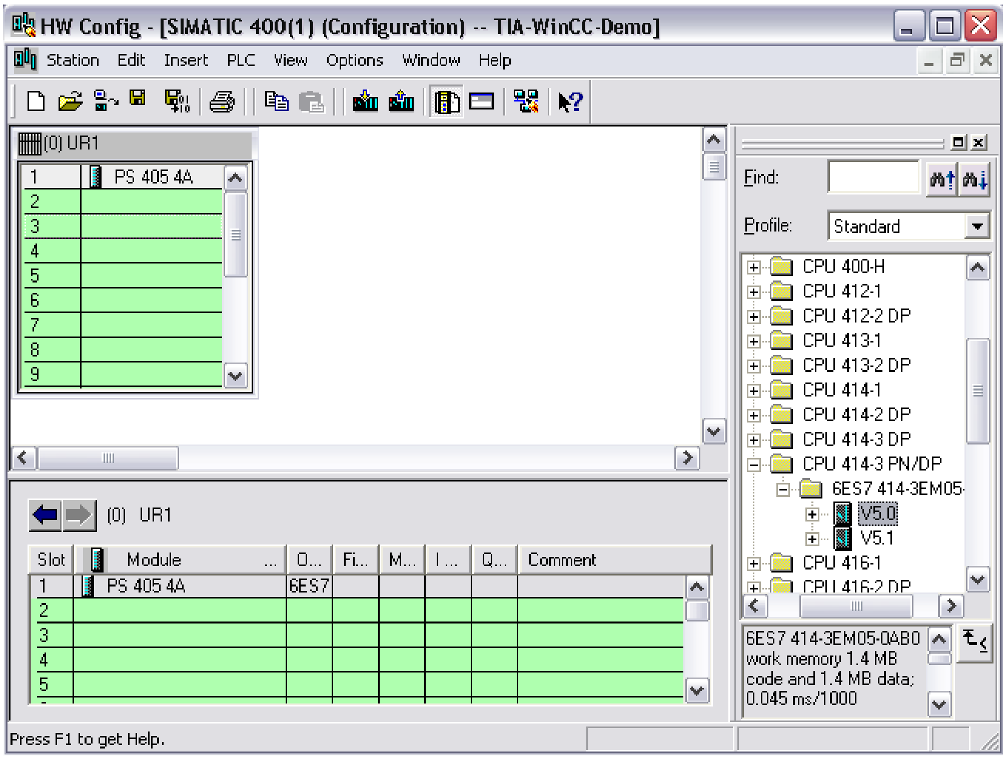
Slot	Module
1	PS 405 4A
2	
3	
4	
5	
6	
7	
8	
9	

Slot	Module	O...	Fi...	M...	I ...	Q...	Comment
1	PS 405 4A	6ES7					
2							
3							
4							
5							

6ES7 405-0DA01-0AA0
Power supply DC 24V/4A

Press F1 to get Help.</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
6.	Insert a CPU "414-3 PN/DP" V5.0 with the order number: 6ES7 414-3EM05-0AB0 on slot 2 of the rack from the hardware catalog (View > Catalog). **Note:** When you select the CPU in the catalog all slots which can be used in the rack are highlighted. 

HW Config - [SIMATIC 400(1) (Configuration) -- TIA-WinCC-Demo]

(0) UR1

1	PS 405 4A
2	
3	
4	
5	
6	
7	
8	
9	

(0) UR1

Slot	Module	...	O...	Fi...	M...	I ...	Q...	Comment
1	PS 405 4A		6ES7					
2								
3								
4								
5								

Find:

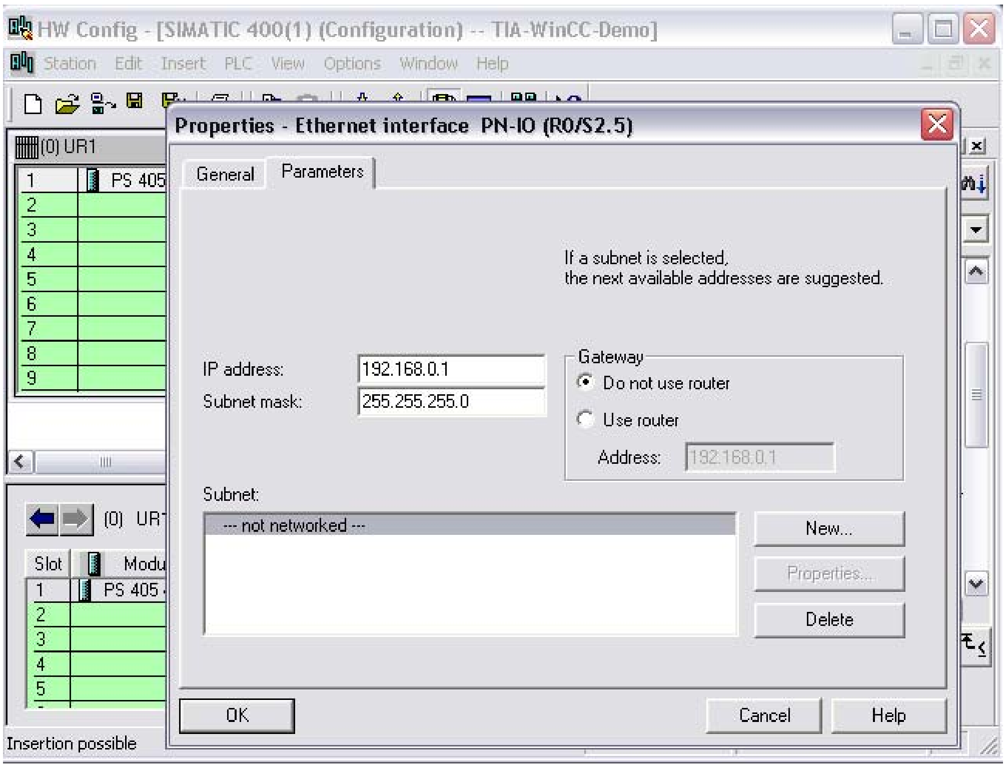
Profile: Standard

- CPU 400-H
- CPU 412-1
- CPU 412-2 DP
- CPU 413-1
- CPU 413-2 DP
- CPU 414-1
- CPU 414-2 DP
- CPU 414-3 DP
- CPU 414-3 PN/DP
  - 6ES7 414-3EM05-
    - V5.0
    - V5.1
- CPU 416-1
- CPU 416-2 DP

6ES7 414-3EM05-0AB0
work memory 1.4 MB
code and 1.4 MB data;
0.045 ms/1000

Press F1 to get Help.

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
7.	The dialog "Properties - Ethernet interface" is opened, the subnet is displayed as "not networked". Close the dialog box with “OK”. 

HW Config - [SIMATIC 400(1) (Configuration) -- TIA-WinCC-Demo]
Station Edit Insert PLC View Options Window Help
(0) UR1
PS 405
Slot
Modu
Insertion possible

Properties - Ethernet interface PN-IO (R0/S2.5)

General | Parameters

If a subnet is selected,
the next available addresses are suggested.

IP address: 192.168.0.1

Subnet mask: 255.255.255.0

Gateway

● Do not use router

○ Use router

Address: 192.168.0.1

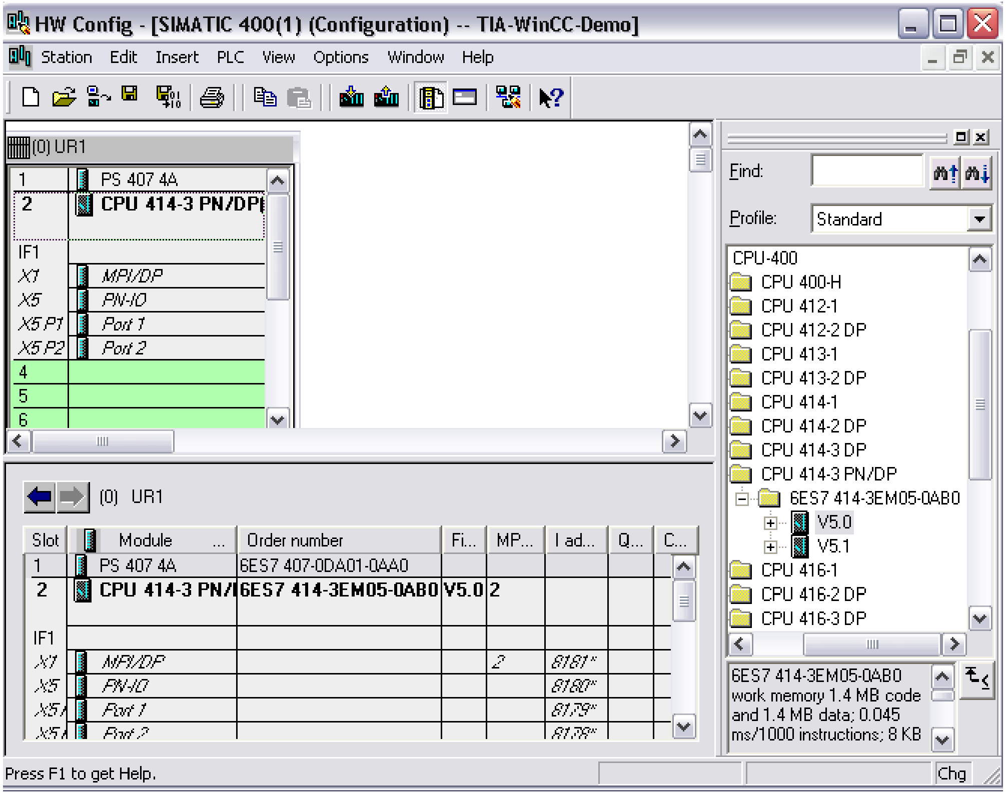
Subnet:

--- not networked ---

New... | Properties... | Delete

OK | Cancel | Help

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
8.	Save and compile HW Config (Station > Save and compile). 

HW Config - [SIMATIC 400(1) (Configuration) -- TIA-WinCC-Demo]
Station
Edit
Insert
PLC
View
Options
Window
Help

(0) UR1

1	PS 407 4A
2	CPU 414-3 PN/DP
IF1	
X1	MPI/DP
X5	PN-IO
X5 P1	Port 1
X5 P2	Port 2
4	
5	
6	

(0) UR1

Slot	Module	Order number	Fi...	MP...	I ad...	Q...	C...
1	PS 407 4A	6ES7 407-0DA01-0AA0					
2	CPU 414-3 PN/I	6ES7 414-3EM05-0AB0	V5.0	2			
IF1							
X1	MPI/DP			2	8181*		
X5	PN-IO				8180*		
X5	Port 1				8179*		
X5	Port 2				8178*		

Find:

Profile: Standard

- CPU-400
  - CPU 400-H
  - CPU 412-1
  - CPU 412-2 DP
  - CPU 413-1
  - CPU 413-2 DP
  - CPU 414-1
  - CPU 414-2 DP
  - CPU 414-3 DP
  - CPU 414-3 PN/DP
    - 6ES7 414-3EM05-0AB0
      - V5.0
      - V5.1
  - CPU 416-1
  - CPU 416-2 DP
  - CPU 416-3 DP

6ES7 414-3EM05-0AB0 work memory 1.4 MB code and 1.4 MB data; 0.045 ms/1000 instructions; 8 KB

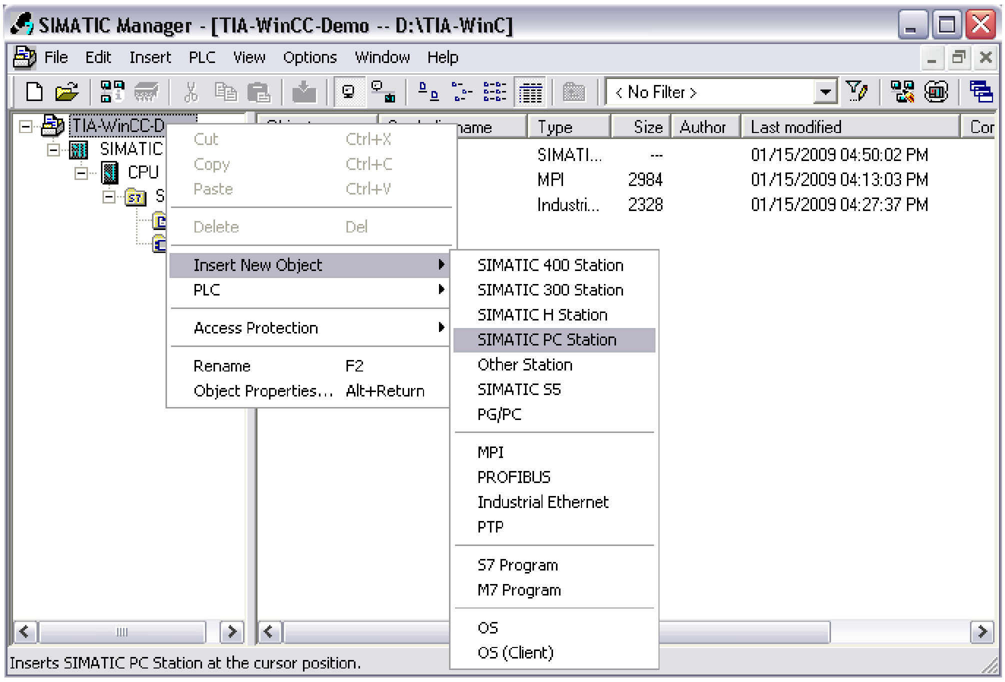
Press F1 to get Help.

Copyright © Siemens AG Copyright 2009 All rights reserved

3.2.2 Inserting the PC station (WinCC)

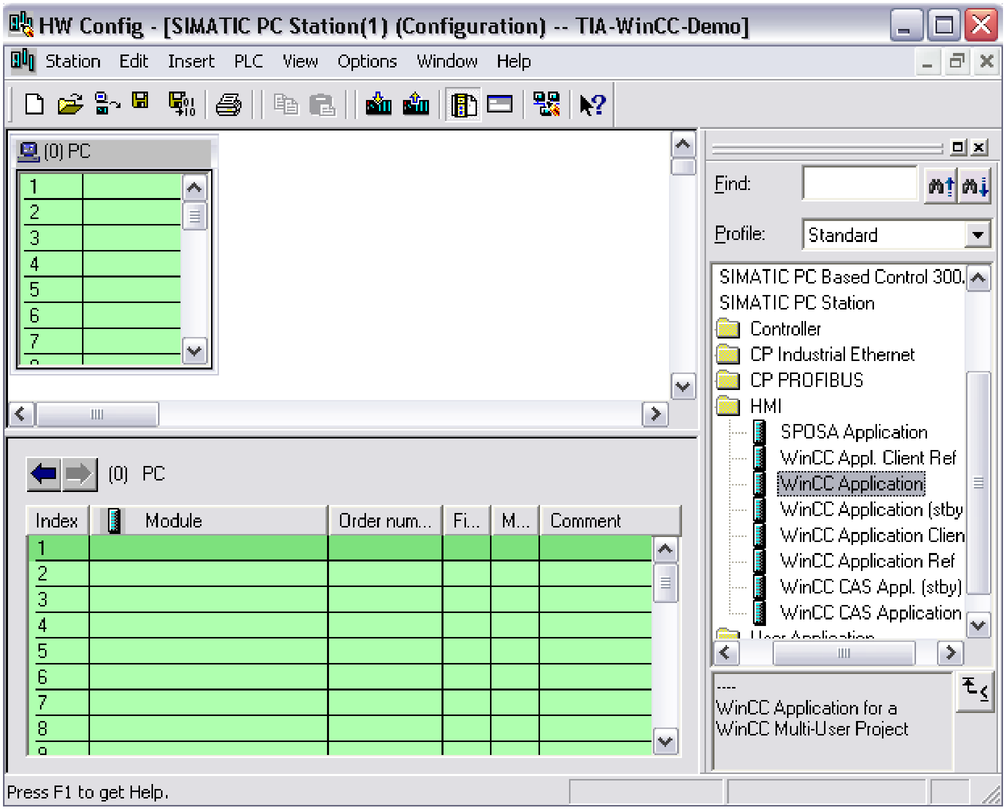
Table 3-2

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>Insert a PC station in your project (Insert > Insert New Object > SIMATIC PC Station) and open HW Config (Edit > Open Object) to configure it.

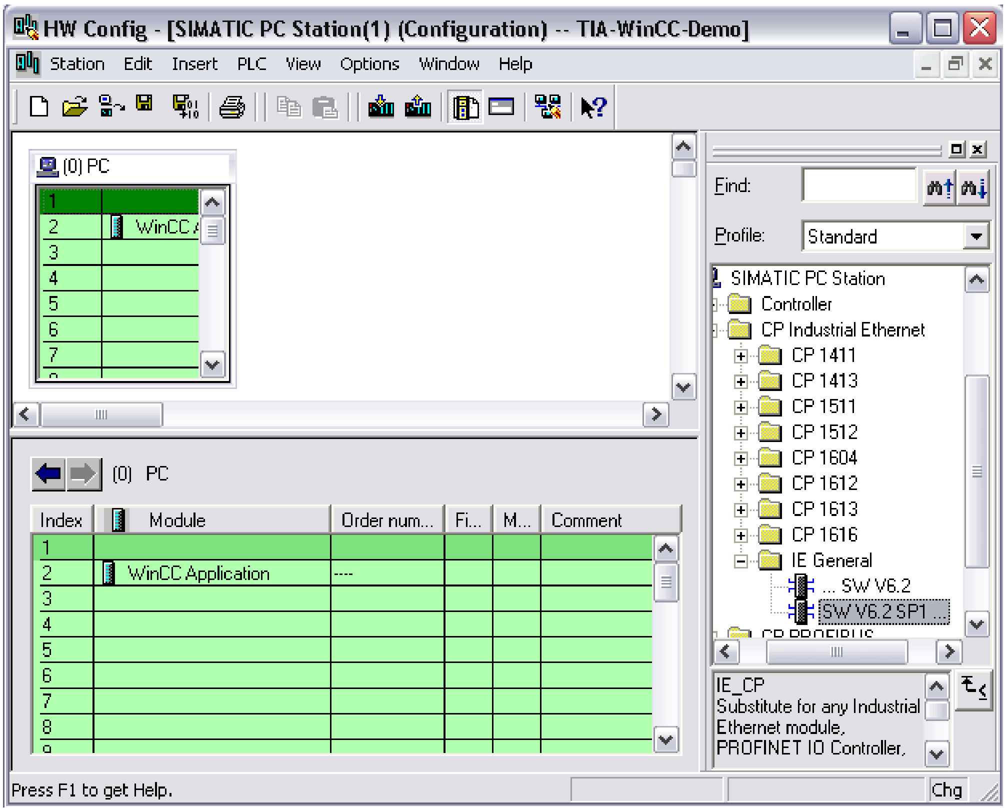


Inserts SIMATIC PC Station at the cursor position.</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
2.	From the HMI folder of the hardware catalog (View > Catalog) insert a "WinCC application" on slot 2 of the rack.  WinCC Application for a WinCC Multi-User Project

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	From the hardware catalog (View > Catalog) insert a communication processor "SW V6.2 SP1" on slot 1 of the rack. The inserted communication processor must comply with the one installed in the PC. 

Find:

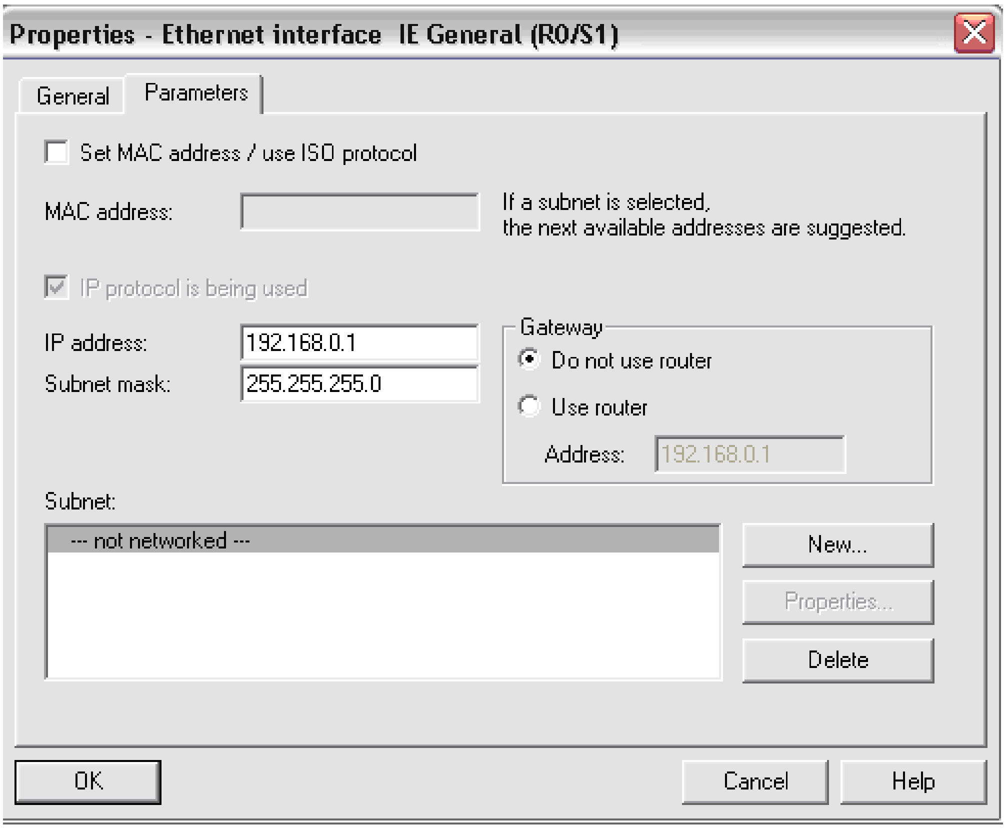
Profile: Standard

(0) PC

Index	Module	Order num...	Fi...	M...	Comment
1					
2	WinCC Application	----			
3					
4					
5					
6					
7					
8					

IE_CP
Substitute for any Industrial Ethernet module, PROFINET IO Controller,

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
4.	The dialog "Properties - Ethernet interface" is opened, the subnet is displayed as "not networked". Save and compile HW Config (Station > Save and compile). 

Properties - Ethernet interface IE General (R0/S1)

General | Parameters

□ Set MAC address / use ISO protocol

MAC address:

If a subnet is selected,
the next available addresses are suggested.

☑ IP protocol is being used

IP address: 192.168.0.1

Subnet mask: 255.255.255.0

Gateway
● Do not use router
○ Use router
Address: 192.168.0.1

Subnet:
--- not networked ---

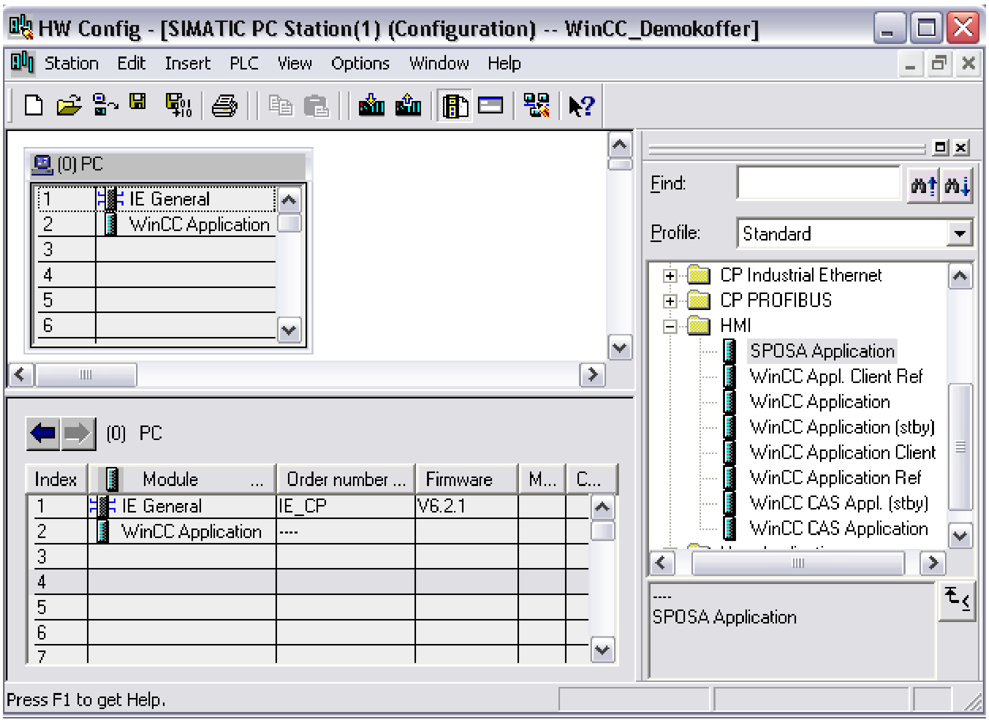
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

3.3 WinCC types

Here you will find details on the different variants of the WinCC application.

Figure 3-1


HW Config - [SIMATIC PC Station(1) (Configuration) -- WinCC_Demokoffer]
Station
Edit
Insert
PLC
View
Options
Window
Help

(0) PC

1	IE General
2	WinCC Application
3	
4	
5	
6	

(0) PC

Index	Module	Order number ...	Firmware	M...	C...
1	IE General	IE_CP	V6.2.1		
2	WinCC Application	----			
3					
4					
5					
6					
7					

Find:

Profile: Standard

- CP Industrial Ethernet
- CP PROFIBUS
- HMI
  - SPOSA Application
  - WinCC Appl. Client Ref
  - WinCC Application
  - WinCC Application (stby)
  - WinCC Application Client
  - WinCC Application Ref
  - WinCC CAS Appl. (stby)
  - WinCC CAS Application

SPOSA Application

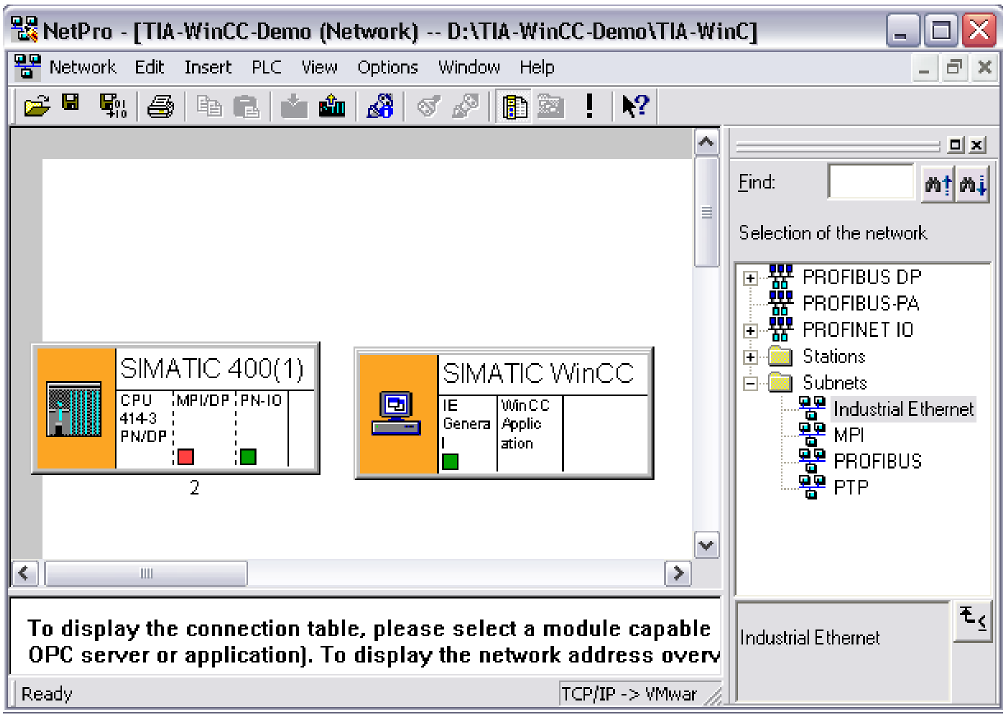
Press F1 to get Help.

Table 3-3

Name	Explanation
SPOSA Application	Connectivity Station.
WinCC Appl. Client Ref	Reference to a so-called Basis Client.
WinCC Application	Master server in a multi-station project.
WinCC Application (stby)	Standby server as redundancy partner in a multi-station project.
WinCC Application Client	Client in a multi-station project.
WinCC Application Ref	Reference to a so-called Basis-OS.
WinCC CAS Appl.	Central archive server (master server or non-redundant archive server).
WinCC CAS Appl. (stby)	Central archive server (standby server).

3.4 Network configuration

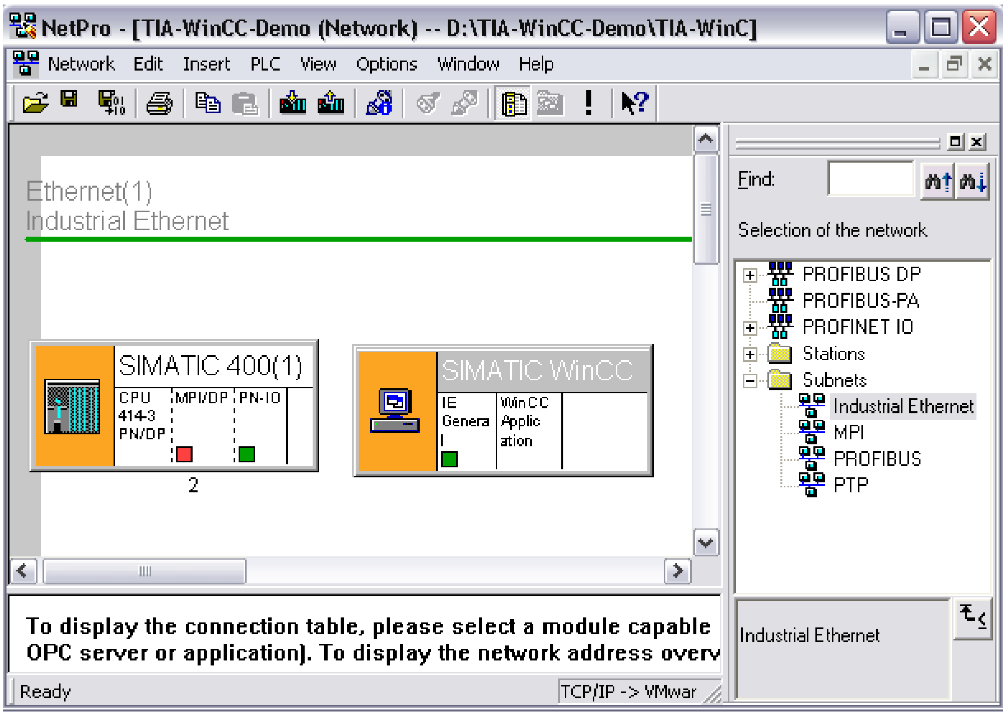
Table 3-4

Step	Action
1.	Open the NetPro editor (Options > Configure network) and import an Industrial Ethernet subnet from the hardware catalog (View > Catalog).  NetPro - [TIA-WinCC-Demo (Network) -- D:\TIA-WinCC-Demo\TIA-WinC] Network Edit Insert PLC View Options Window Help SIMATIC 400(1) CPU 414-3 PN/DP MPI/DP PN-IO 2 SIMATIC WinCC IE General WinCC Application Find: Selection of the network PROFIBUS DP PROFIBUS-PA PROFINET IO Stations Subnets Industrial Ethernet MPI PROFIBUS PTP Industrial Ethernet To display the connection table, please select a module capable OPC server or application). To display the network address overv Ready TCP/IP -> VMwar

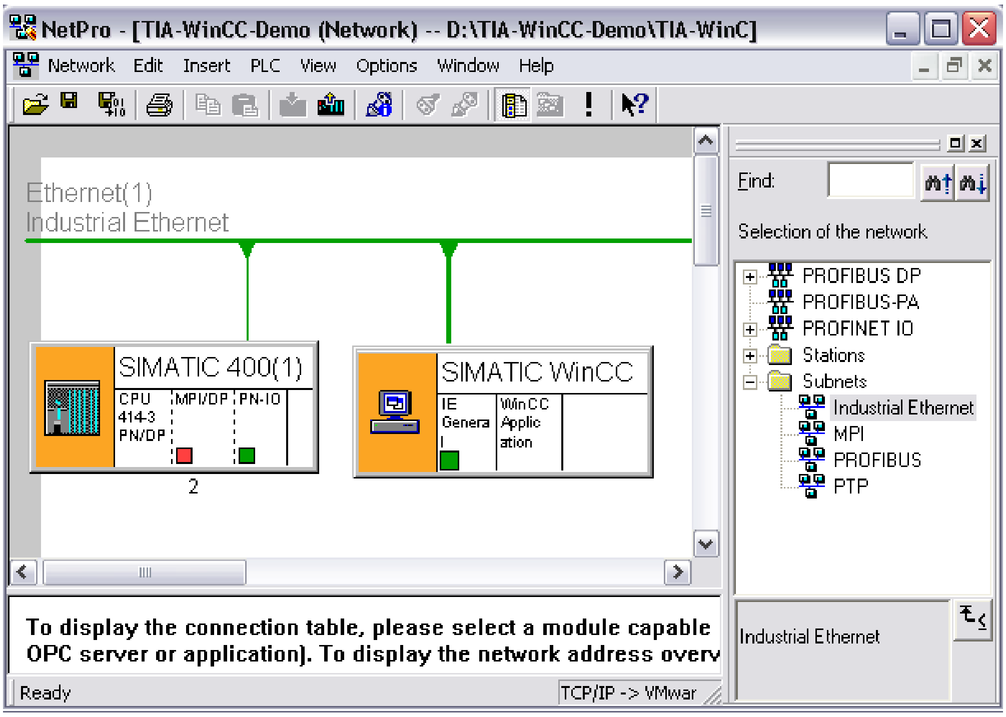
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

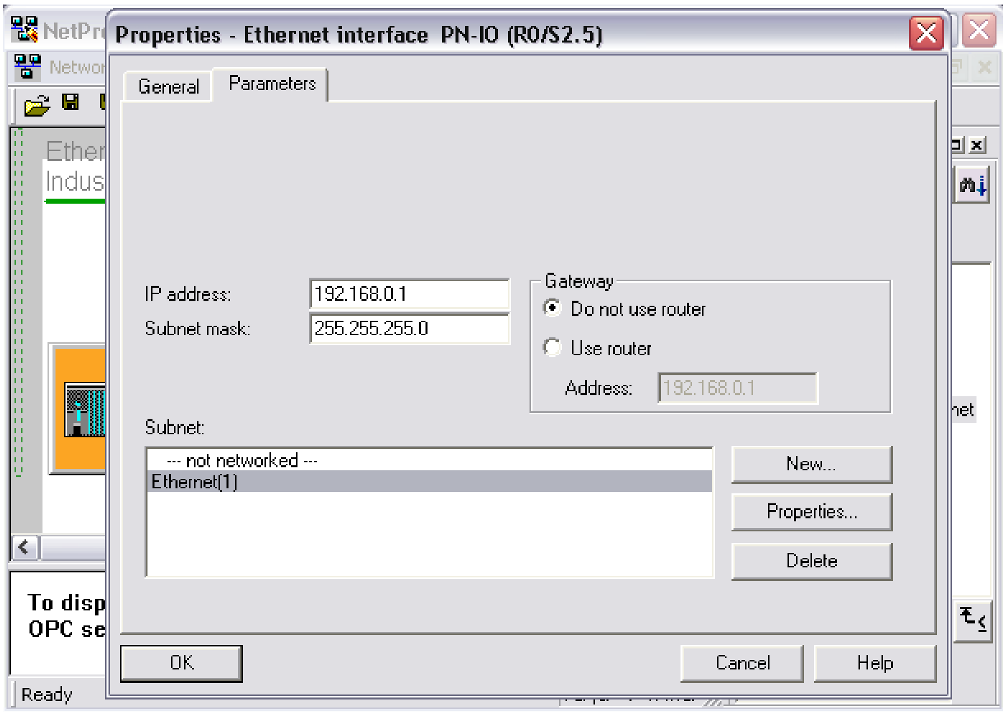
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2.</td><td>The Industrial Ethernet subnet is created.



To display the connection table, please select a module capable OPC server or application]. To display the network address overv</td></tr>
<tr><td>3.</td><td>Click on the icon of the interface of a node (green field), keep the left mouse-button pressed and drag the mouse pointer to the subnet.



To display the connection table, please select a module capable OPC server or application]. To display the network address overv</td></tr>
</table>

Step	Action
4.	Defining the properties: Double-click on the interface node and define the IP address in the dialog field "Properties > Parameters". Save the settings and load the parameters to all involved network nodes then.  Properties - Ethernet interface PN-IO (R0/S2.5) General | Parameters IP address: 192.168.0.1 Subnet mask: 255.255.255.0 Gateway ● Do not use router ○ Use router Address: 192.168.0.1 Subnet: --- not networked --- Ethernet(1) New... Properties... Delete OK Cancel Help NetPro Network Ether Indus To disp OPC se Ready

Copyright © Siemens AG Copyright 2009 All rights reserved

3.5 Network connections

The following table shows the different connection types, their networks and the blocks required for communication.

Table 3-5

Connection type	Subnet	Connection between...	SFB/FB/FC
S7 connection	MPI, PROFIBUS, Industrial Ethernet	S7 - S7, S7 - PG/PC, S7 - PG/PC with WinCC With MPI also: M7 - M7, M7 - S7, M7 - PG/PC S7 - Partners in another project (S7, PG/PC with WinCC)	SFBs USEND, URCV, BSEND, BRCV, GET, PUT, START, STOP, RESUME, STATUS, USTATUS
S7 connection, fault-tolerant	PROFIBUS, Industrial Ethernet	S7(H) - S7(H), S7(H) - PC Station (H)	SFBs USEND, URCV, BSEND, BRCV, START, STOP, RESUME, STATUS, USTATUS
PTP connection	Point-to-point (computer log RK 12/3964(R))	S7 - S7, S7 - S5, S7 - Non-Siemens devices S7 - Partners in another project (S7, non-Siemens devices)	SFBs BSEND, BRCV, GET, PUT, STATUS, PRINT
FMS connection	PROFIBUS (FMS protocol)	S7 - S7, S7 - S5, S7 - PG/PC, S7 - non-Siemens devices, S7 – message to all nodes S7 - Partners in another project (S7, S5, PG/PC, non-Siemens devices)	FBs READ, WRITE, IDENTIFY, OSTATUS, REPORT
FDL connection	PROFIBUS (FDL protocol)	S7 - S7, S7 - S5, S7 - PC/PG, S7 - non-Siemens devices S7 - Partners in another project (S7, S5, PG/PC, non-Siemens devices)	FCs AG_SEND, AG_RECV, AG_LSEND, AG_LRECV
ISO Transport	Industrial Ethernet (ISO Transport)	S7 - S7, S7 - S5, S7 - PC/PG, S7 - non-Siemens devices, S7- unspecific S7 - Partners in another project (S7, S5, PG/PC, non-Siemens devices, unspecific)	FCs AGSEND, AG-RECEIVE AG_LSEND, AG_LRECV, AG_LOCK,AG_UNLOCK

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Connection type	Subnet	Connection between...	SFB/FB/FC
ISO-on-TCP connection	Industrial Ethernet (TCP/IP protocol)	S7 - S7, S7 - S5, S7 - PC/PG, S7 - non-Siemens devices, S7 – unspecific S7 - Partners in another project (S7, S5, PG/PC, non-Siemens devices, unspecific)	FCs AGSEND, AG-RECEIVE AG_LSEND, AG_LRECV, AG_LOCK, AG_UNLOCK
TCP connection Industrial Ethernet	Industrial Ethernet (TCP/IP protocol)	S7 - S7, S7 - S5, S7 - PC/PG, S7 - non-Siemens devices, S7 – unspecific S7 - Partners in another project (S7, S5, PG/PC, non-Siemens devices, unspecific)	FCs AG_SEND*, AG_RECV*, AG_LSEND**, AG_LRECV** AG_LOCK, AG_UNLOCK
UDP connection	Industrial Ethernet (TCP/IP protocol	S7 - S7, S7 - S5, S7 - PG/PC, S7 - non-Siemens devices, S7 – unspecific S7 - Partners in another project (S7, S5, PG/PC, non-Siemens devices, unspecific)	FCs AGSEND, AG-RECEIVE AG_LSEND, AG_LRECV
e-mail connection	Industrial Ethernet (TCP/IP protocol)	S7 - unspecific (S7 - mail server)	FCs AG-SEND, AG_LSEND

* The FCs „AG_SEND“ and „AG_RECV“ can only be used with an S7-300 (depending on the version of the used CPs).

** The FCs “AG_LSEND” and “AG_LRECV” can both be used with an S7-400 and with an S7-300 (depending on the version of the used CPs).

3.6 Compiling

- The HMI relevant configuration data must be transferred from STEP 7 to the WinCC database.

There are different options for starting the "Compile OS" wizard in the SIMATIC Manager.

- If you wish to compile the configuration data of a certain Operator Station, select the OS first and start the wizard via the menu option "Edit > Compile". Alternatively you can select the menu option "Compile" in the context menu of the OS.
- If you wish to compile the configuration data of several or all Operator Stations, start the wizard for "Compile several OS" (Options > Wizard "Compile several OS" > Start...).

In the transfer the process tags are stored in the tag management, user texts in the text library and alarms in the alarm logging of the WinCC project.

3.6.1 What functions are executed during the compilation?

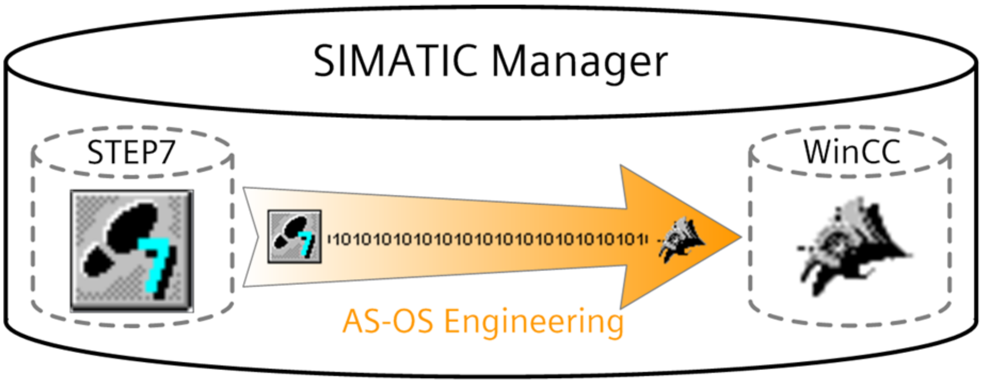
- Creation of communication driver SIMATIC S7 PROTOCOL SUITE.
- Creation of WinCC units, e.g. Industrial Ethernet, PROFIBUS, etc.
- Creation of a logic connection for every S7 program.
- Creation of raw data variables for the alarm and archiving system.
- Creation of the structure types for the block types to be transferred to WinCC and global data blocks.
- Creation of process tags in the tag management.
- Generation of alarms.
- Transfer of alarms and user texts.

3.6.2 When should the compilation be carried out?

- Before the WinCC runtime is started for the first time.
- After new block instances have been added or block names have been changed.
- After control and unit texts have been changed.
- After the control and monitoring attributes of an instance have been changed.
- After alarm and user texts have been changed.

Copyright © Siemens AG Copyright 2009 All rights reserved

Figure 3-2



3.7 Configuration tool

The configuration tool offers a simple and powerful option to configure mass data in WinCC. Microsoft Excel is used as the user interface here. It allows you to create a WinCC project in Microsoft Excel and take advantage of the control options which Microsoft Excel offers.

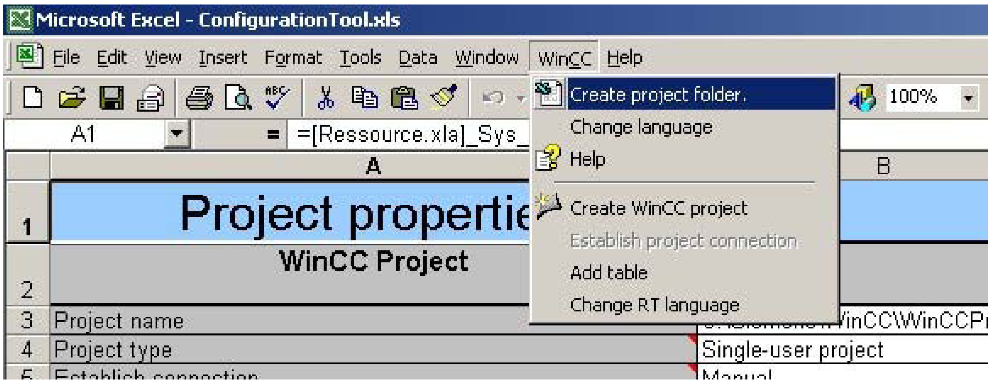
The configuration tool allows you to create a new WinCC project and to configure it in Excel from the start. Further you can import existing WinCC projects and process them further in Excel.

The configuration is made in a special type of Excel file, a so-called WinCC project file.
It contains different types of spreadsheets which serve for the configuration of certain types of WinCC objects. The configuration tool can be used to configure the data of the data manager, alarm logging, tag logging and text library.

Copyright © Siemens AG Copyright 2009 All rights reserved

Note In the configuration tool only such connections or variables of channels can be processed which are included in the standard scope of WinCC.

Figure 3-3



Microsoft Excel - ConfigurationTool.xls
File Edit View Insert Format Tools Data Window WinCC Help
Create project folder.
Change language
Help
Create WinCC project
Establish project connection
Add table
Change RT language
100%
A1
=[Ressource.xla]_Sys_
A
B

Project properties
WinCC Project
3 Project name ...inCC\WinCCP
4 Project type Single-user project
5 Establish connection Manual

Installing the configuration tool

The WinCC configuration tool can be installed in two different ways:

- During the setup of WinCC select in the dialog "Programs" the entry "WinCC V7.0 complete".
- Install the WinCC Configuration Tool from the WinCC DVD.
  - On the WinCC DVD go to the directory "InstData\WinCC\setup\Products\ConfigurationTool".
  - Double-click the "setup.exe" file.

3.8 Further reading

This list is not complete and only represents a selection of relevant literature.

Table 3-6

	Topic	Title
\1\	WinCC V7.0 Documentation Basic Knowledge	http://support.automation.siemens.com/WW/view/en/29221062
\2\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

4 Tags

4.1 Introduction

Tags with value assignment from the process are designated as process tags or external tags in WinCC.

For process tags you determine in the tag management through which communication driver WinCC is connected with the automation system and in which way the data exchange is carried out. The associated tags are created in the directory structure of this communication driver.

Tags without value assignment from the process, the so-called internal tags, are created in the directory "Internal tags".

- There are two procedures for the tag import:
  - The selection of the tags via the tag selection dialog of WinCC.
  - The automatic tag generation in WinCC via the setting of flags in the tag management of STEP 7.

Note WinCC tags can also be exported / imported with the Smart Tools "Variables Import/Export" (VarExim.exe) and "Configuration Tool". These tools are shipped with WinCC as standard.

For more information, please refer to the entry:

http://support.automation.siemens.com/WW/view/en/22016422

4.2 Selecting STEP 7 symbols

In the process of WinCC configuration you connect WinCC objects, e.g. I/O fields or archive tags, with tags via which the objects are assigned the current process values in runtime.

There are two groups of tags which you can select for the process connection:

- WinCC tags
  - This group comprises the internal and external tags of the tag management.
- STEP 7 symbols
  - These are all inputs, outputs and flags from the symbol list and all global data blocks of the assigned S7 programs.

Direct access to STEP 7 symbols is made via:

- the tag selection dialog.
- the tag bar of the Graphics Designer.

Note

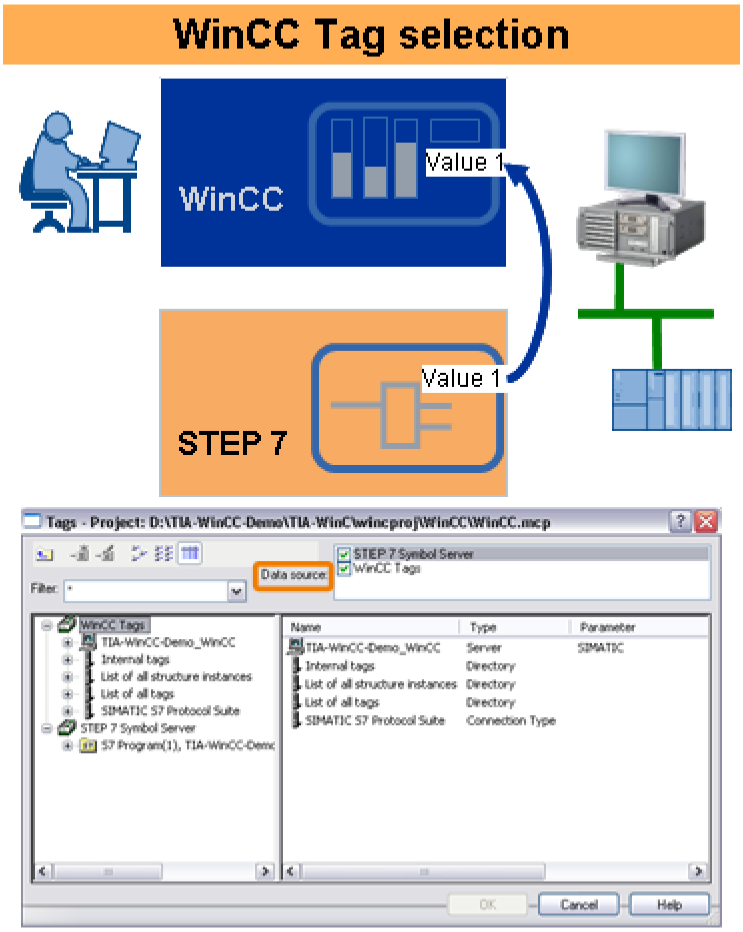
You can also export / import the symbol table of STEP 7 to edit it in Excel.

For more information, please refer to the entry:

http://support.automation.siemens.com/WW/view/en/22781586

The following figure schematically shows the most important components of the solution:

Figure 4-1



Name	Type	Parameter
TIA-WinCC-Demo_WinCC	Server	SIMATIC
Internal tags	Directory	
List of all structure instances	Directory	
List of all tags	Directory	
SIMATIC S7 Protocol Suite	Connection Type	

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

4.2.1 Principle of operation

In contrast to the external WinCC tags the STEP 7 symbols can also be accessed without previous "Compile OS" and without selection with the HMI attribute.

During the process connection an "implicit compilation" is carried out and the symbol is transferred to the tag management of the WinCC project.

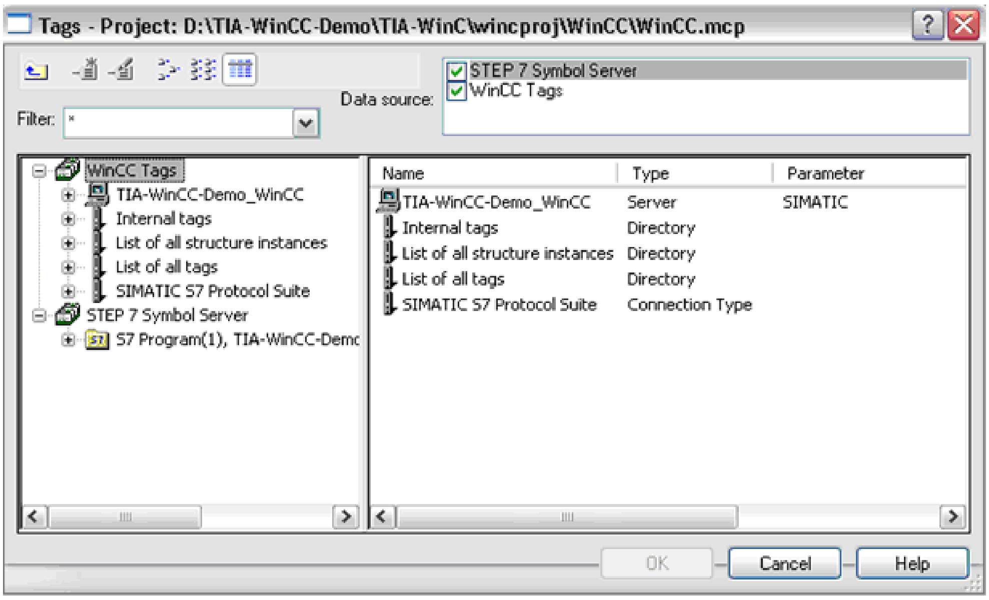
Table 4-1

Step	Action
1.	Creating STEP 7 project.
2.	Creating WinCC project or integrating existing project.
3.	Configuring network.
4.	Creating connection.
5.	Creating tags.

Overview and description of the user interface

The following screenshot shows the tag selection dialog.

Figure 4-2



Tags - Project: D:\TIA-WinCC-Demo\TIA-WinC\wincproj\WinCC\WinCC.mcp

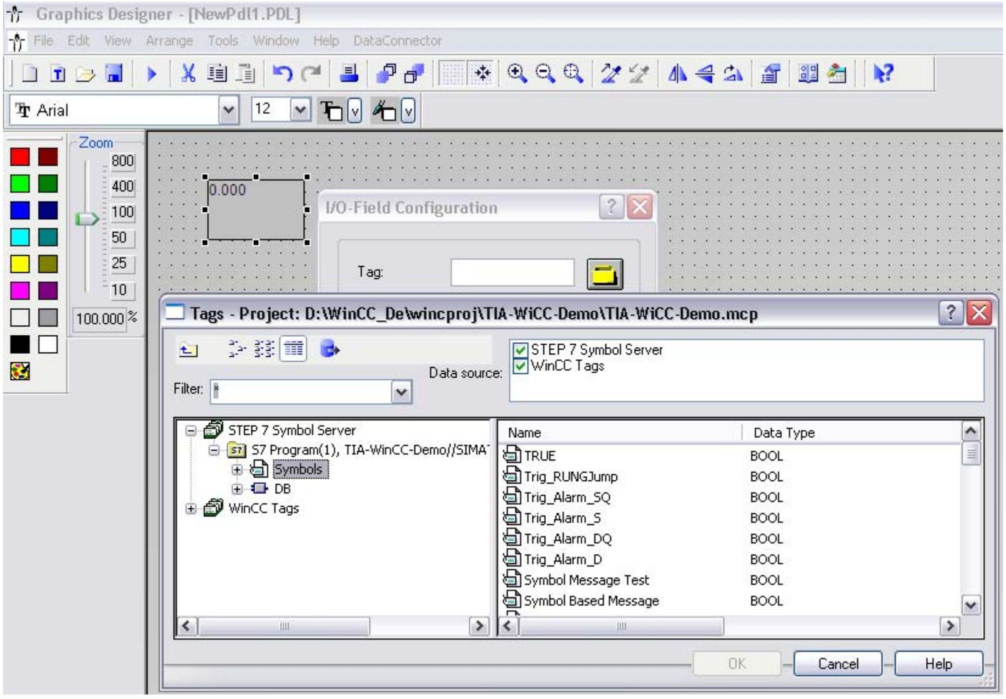
Data source: ☑ STEP 7 Symbol Server ☑ WinCC Tags

Filter: *

Name	Type	Parameter
TIA-WinCC-Demo_WinCC	Server	SIMATIC
Internal tags	Directory	
List of all structure instances	Directory	
List of all tags	Directory	
SIMATIC S7 Protocol Suite	Connection Type	

4.2.2 Transfer of tags

Table 4-2

Step	Action
1.	**Transfer of tags from the symbol table to WinCC** Select the "symbol table" and then select the tag which you want to import. 

Graphics Designer - [NewPdl1.PDL]
File Edit View Arrange Tools Window Help DataConnector
Arial
12
Zoom
800
400
100
50
25
10
100.000 %
0.000
I/O-Field Configuration
Tag:
OK
Cancel
Help

Tags - Project: D:\WinCC_De\wincproj\TIA-WiCC-Demo\TIA-WiCC-Demo.mcp

Data source: ☑ STEP 7 Symbol Server ☑ WinCC Tags

Filter: *

- STEP 7 Symbol Server
  - S7 Program(1), TIA-WinCC-Demo//SIMA
    - Symbols
    - DB
- WinCC Tags

Name	Data Type
TRUE	BOOL
Trig_RUNGJump	BOOL
Trig_Alarm_SQ	BOOL
Trig_Alarm_S	BOOL
Trig_Alarm_DQ	BOOL
Trig_Alarm_D	BOOL
Symbol Message Test	BOOL
Symbol Based Message	BOOL

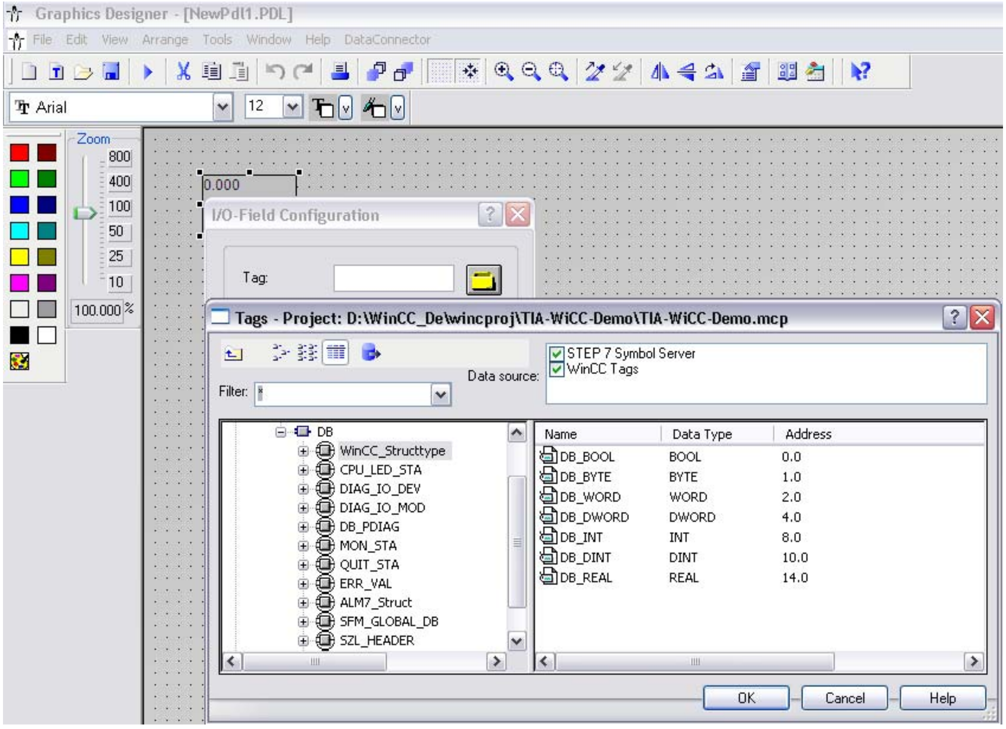
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2.</td><td>

Transfer of tags from a global data block to WinCC

Select the data block and then select the tag which you want to import.



Graphics Designer - [NewPdl1.PDL]
File Edit View Arrange Tools Window Help DataConnector
Arial
12
Zoom
800
400
100
50
25
10
100.000 %
0.000
I/O-Field Configuration
OK
Cancel
Help

Tag:

Tags - Project: D:\WinCC_De\wincproj\TIA-WiCC-Demo\TIA-WiCC-Demo.mcp

Data source: ☑ STEP 7 Symbol Server ☑ WinCC Tags

Filter: *

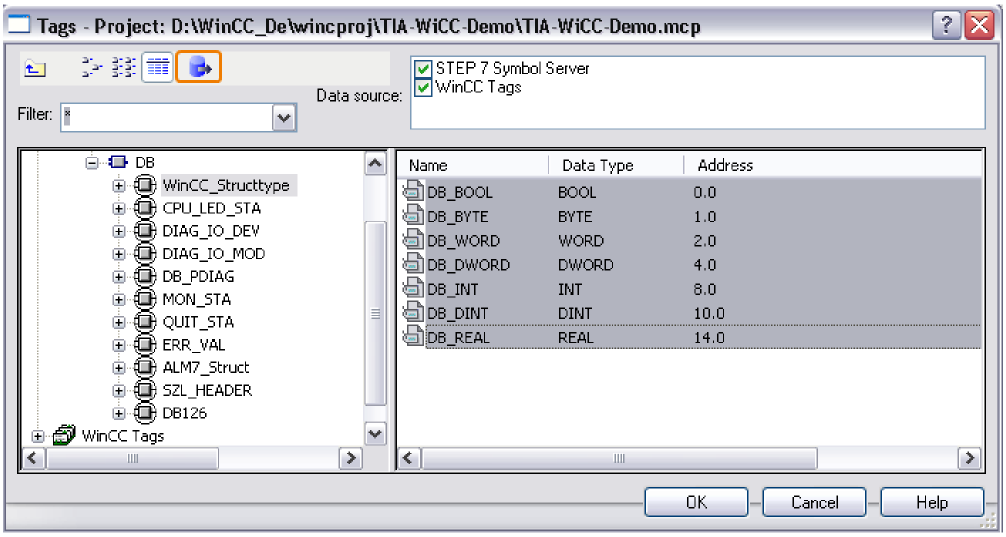
DB
- WinCC_Structtype
- CPU_LED_STA
- DIAG_IO_DEV
- DIAG_IO_MOD
- DB_PDIAG
- MON_STA
- QUIT_STA
- ERR_VAL
- ALM7_Struct
- SFM_GLOBAL_DB
- SZL_HEADER

<table>
<tr><th>Name</th><th>Data Type</th><th>Address</th></tr>
<tr><td>DB_BOOL</td><td>BOOL</td><td>0.0</td></tr>
<tr><td>DB_BYTE</td><td>BYTE</td><td>1.0</td></tr>
<tr><td>DB_WORD</td><td>WORD</td><td>2.0</td></tr>
<tr><td>DB_DWORD</td><td>DWORD</td><td>4.0</td></tr>
<tr><td>DB_INT</td><td>INT</td><td>8.0</td></tr>
<tr><td>DB_DINT</td><td>DINT</td><td>10.0</td></tr>
<tr><td>DB_REAL</td><td>REAL</td><td>14.0</td></tr>
</table>

</td></tr>
<tr><td>3.</td><td>

Transfer of several tags

Select several tags and then push the transfer symbol.



Tags - Project: D:\WinCC_De\wincproj\TIA-WiCC-Demo\TIA-WiCC-Demo.mcp

Data source: ☑ STEP 7 Symbol Server ☑ WinCC Tags

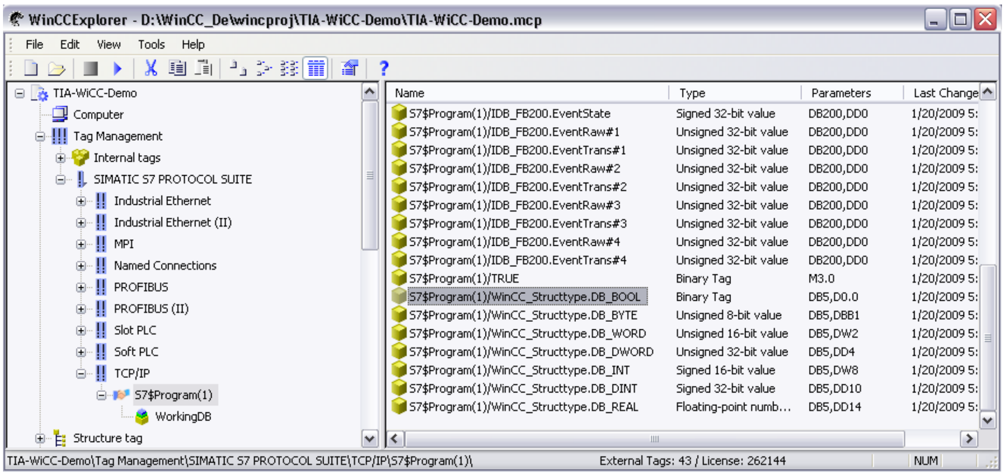
Filter: *

DB
- WinCC_Structtype
- CPU_LED_STA
- DIAG_IO_DEV
- DIAG_IO_MOD
- DB_PDIAG
- MON_STA
- QUIT_STA
- ERR_VAL
- ALM7_Struct
- SZL_HEADER
- DB126

WinCC Tags

<table>
<tr><th>Name</th><th>Data Type</th><th>Address</th></tr>
<tr><td>DB_BOOL</td><td>BOOL</td><td>0.0</td></tr>
<tr><td>DB_BYTE</td><td>BYTE</td><td>1.0</td></tr>
<tr><td>DB_WORD</td><td>WORD</td><td>2.0</td></tr>
<tr><td>DB_DWORD</td><td>DWORD</td><td>4.0</td></tr>
<tr><td>DB_INT</td><td>INT</td><td>8.0</td></tr>
<tr><td>DB_DINT</td><td>DINT</td><td>10.0</td></tr>
<tr><td>DB_REAL</td><td>REAL</td><td>14.0</td></tr>
</table>

</td></tr>
</table>

Step	Action
4.	**Structure of the tag name:** <STEP 7 program name> + <symbol name of the data block> + <tag name within the data block> 

WinCCExplorer - D:\WinCC_De\wincproj\TIA-WiCC-Demo\TIA-WiCC-Demo.mcp

Name	Type	Parameters	Last Change
S7$Program(1)/IDB_FB200.EventState	Signed 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventRaw#1	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventTrans#1	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventRaw#2	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventTrans#2	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventRaw#3	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventTrans#3	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventRaw#4	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/IDB_FB200.EventTrans#4	Unsigned 32-bit value	DB200,DD0	1/20/2009 5:
S7$Program(1)/TRUE	Binary Tag	M3.0	1/20/2009 5:
S7$Program(1)/WinCC_Structtype.DB_BOOL	Binary Tag	DB5,D0.0	1/20/2009 5:
S7$Program(1)/WinCC_Structtype.DB_BYTE	Unsigned 8-bit value	DB5,DBB1	1/20/2009 5:
S7$Program(1)/WinCC_Structtype.DB_WORD	Unsigned 16-bit value	DB5,DW2	1/20/2009 5:
S7$Program(1)/WinCC_Structtype.DB_DWORD	Unsigned 32-bit value	DB5,DD4	1/20/2009 5:
S7$Program(1)/WinCC_Structtype.DB_INT	Signed 16-bit value	DB5,DW8	1/20/2009 5:
S7$Program(1)/WinCC_Structtype.DB_DINT	Signed 32-bit value	DB5,DD10	1/20/2009 5:
S7$Program(1)/WinCC_Structtype.DB_REAL	Floating-point numb…	DB5,DD14	1/20/2009 5:

TIA-WiCC-Demo\Tag Management\SIMATIC S7 PROTOCOL SUITE\TCP/IP\S7$Program(1)\

External Tags: 43 / License: 262144

Copyright © Siemens AG Copyright 2009 All rights reserved

4.3 Automatic generation

Tags via which the current process values shall be assigned to the objects in runtime get the attribute "S7_m_c" in STEP 7. This HMI attribute is evaluated during the OS compilation and the respective tag is automatically created in WinCC.

4.3.1 Principle of operation

In contrast to the selection of STEP 7 symbols through the tag selection dialog, the tags are marked with the HMI attribute in STEP7 here.

During "Compile OS" the tags are transferred to the tag management of the WinCC project then.

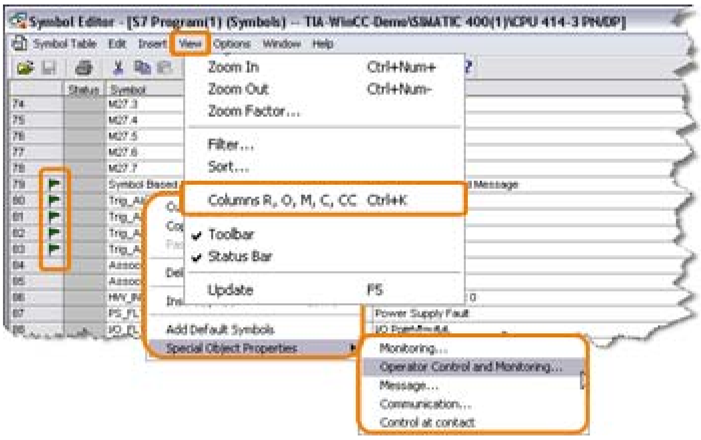
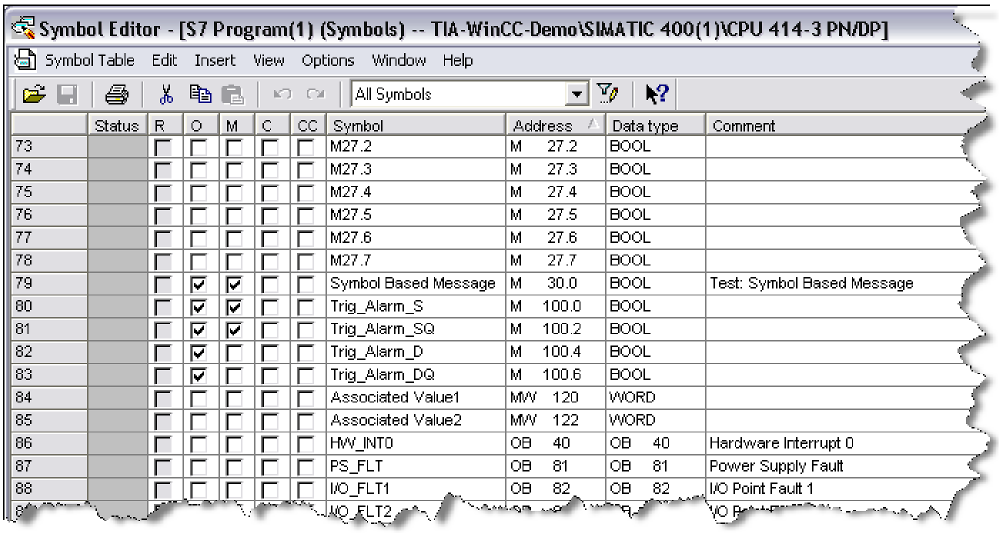
Table 4-3

Step	Action
1.	Creating STEP 7 project.
2.	Creating WinCC project or integrating existing project.
3.	Configuring network.
4.	Setting attributes (flags)
5.	Creating connection and tags

Copyright © Siemens AG Copyright 2009 All rights reserved

4.3.2 Attributing individual tags in the symbol editor

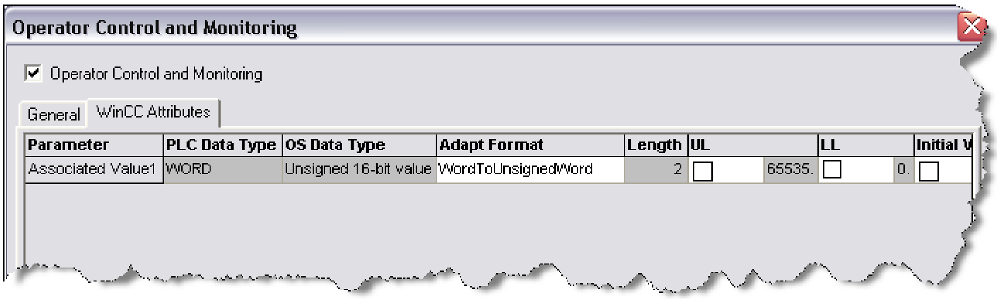
Table 4-4

Step	Action
1.	Open the symbol editor and select "View > Columns R, O, M, C, CC". The respective attributes can be set via the properties dialog "Special Object Properties" of a symbol.  Symbol Editor - [S7 Program(1) (Symbols) -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP] Symbol Table Edit Insert View Options Window Help Zoom In Ctrl+Num+ Zoom Out Ctrl+Num- Zoom Factor... Filter... Sort... Columns R, O, M, C, CC Ctrl+K ✓ Toolbar ✓ Status Bar Update F5 Add Default Symbols Special Object Properties Monitoring... Operator Control and Monitoring... Message... Communication... Control at contact
2.	Select the attribute "Operator Control and Monitoring" to make the symbol available as tag in WinCC. • Overview of the special object properties - R = Monitoring - O = Operator Control and Monitoring with WinCC - M = Alarm properties - C = Communication properties - CC = Control at Contact 

Symbol Editor - [S7 Program(1) (Symbols) -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP]

	Status	R	O	M	C	CC	Symbol	Address		Data type	Comment
73		□	□	□	□	□	M27.2	M	27.2	BOOL	
74		□	□	□	□	□	M27.3	M	27.3	BOOL	
75		□	□	□	□	□	M27.4	M	27.4	BOOL	
76		□	□	□	□	□	M27.5	M	27.5	BOOL	
77		□	□	□	□	□	M27.6	M	27.6	BOOL	
78		□	□	□	□	□	M27.7	M	27.7	BOOL	
79		□	☑	☑	□	□	Symbol Based Message	M	30.0	BOOL	Test: Symbol Based Message
80		□	☑	☑	□	□	Trig_Alarm_S	M	100.0	BOOL	
81		□	☑	☑	□	□	Trig_Alarm_SQ	M	100.2	BOOL	
82		□	☑	□	□	□	Trig_Alarm_D	M	100.4	BOOL	
83		□	☑	□	□	□	Trig_Alarm_DQ	M	100.6	BOOL	
84		□	□	□	□	□	Associated Value1	MW	120	WORD	
85		□	□	□	□	□	Associated Value2	MW	122	WORD	
86		□	□	□	□	□	HW_INT0	OB	40	OB 40	Hardware Interrupt 0
87		□	□	□	□	□	PS_FLT	OB	81	OB 81	Power Supply Fault
88		□	□	□	□	□	I/O_FLT1	OB	82	OB 82	I/O Point Fault 1
							I/O_FLT2				

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	When you create the attribute "Operator Control and Monitoring" you can specify additional parameters for the tag using the "More>>" button. 

Operator Control and Monitoring

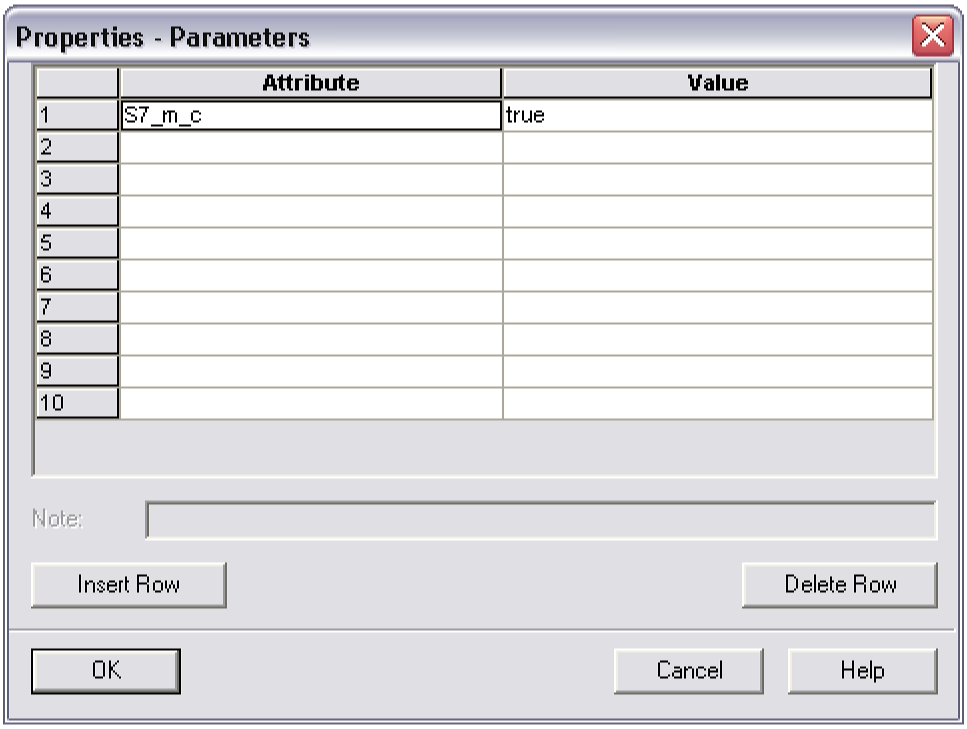
☑ Operator Control and Monitoring

General | WinCC Attributes

Parameter	PLC Data Type	OS Data Type	Adapt Format	Length	UL		LL		Initial V
Associated Value1	WORD	Unsigned 16-bit value	WordToUnsignedWord	2	□	65535.	□	0.	□

4.3.3 Attributing of individual tags in a data block

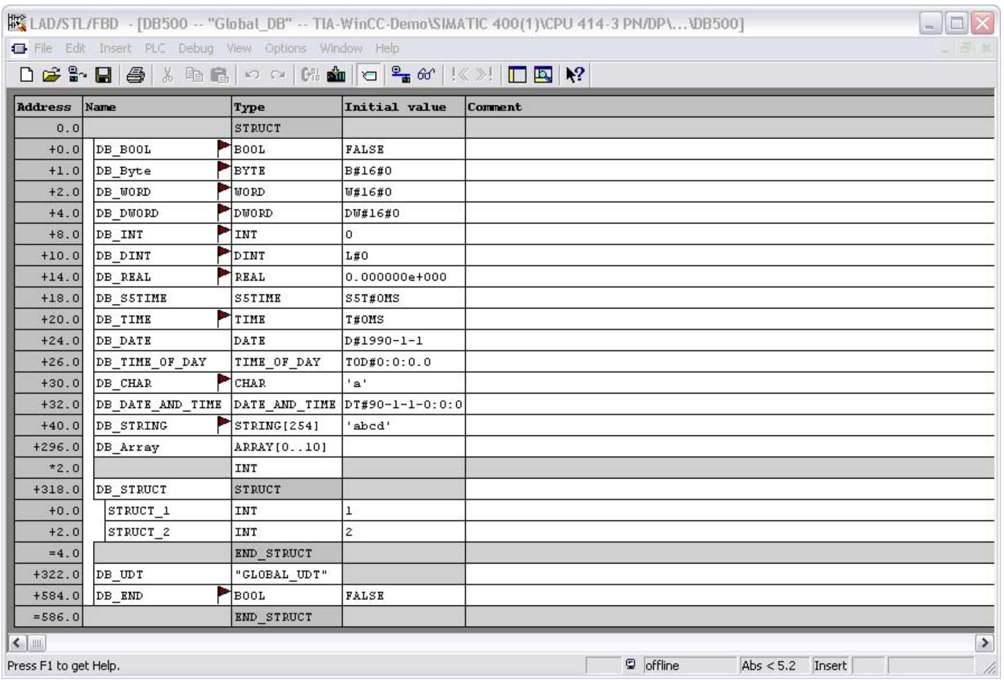
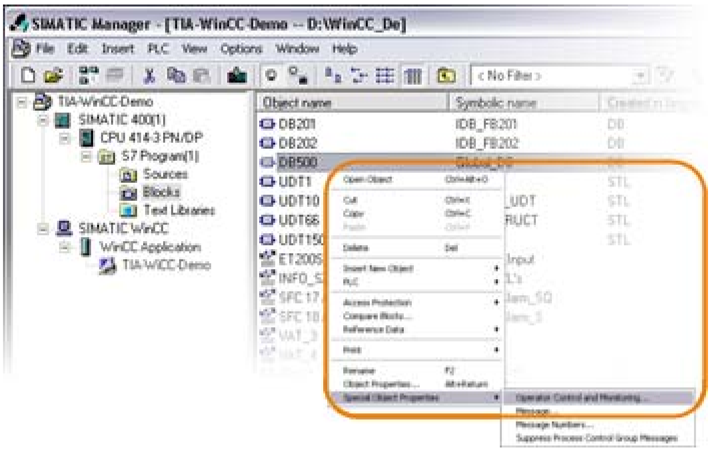
Table 4-5

Step	Action
1.	Open the data block in the block editor. The respective attributes can be set via the properties dialog "Object Properties" of a symbol. Set the attribute "S7_m_c" and the corresponding value to "true". Save and close the data block. 

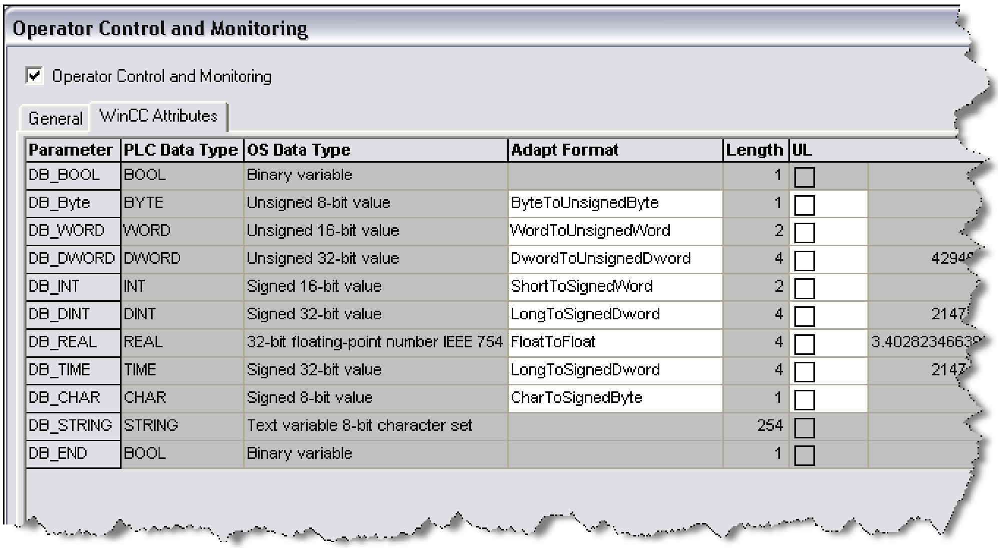
Properties - Parameters

	Attribute	Value
1	S7_m_c	true
2		
3		
4		
5		
6		
7		
8		
9		
10		

Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2.</td><td>If in the respective line at least one attribute has been set, it will be marked with a flag.

LAD/STL/FBD - [DB500 -- "Global_DB" -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP\...\DB500]
File Edit Insert PLC Debug View Options Window Help
<table>
<tr><th>Address</th><th>Name</th><th>Type</th><th>Initial value</th><th>Comment</th></tr>
<tr><td>0.0</td><td></td><td>STRUCT</td><td></td><td></td></tr>
<tr><td>+0.0</td><td>DB_BOOL ⚑</td><td>BOOL</td><td>FALSE</td><td></td></tr>
<tr><td>+1.0</td><td>DB_Byte ⚑</td><td>BYTE</td><td>B#16#0</td><td></td></tr>
<tr><td>+2.0</td><td>DB_WORD ⚑</td><td>WORD</td><td>W#16#0</td><td></td></tr>
<tr><td>+4.0</td><td>DB_DWORD ⚑</td><td>DWORD</td><td>DW#16#0</td><td></td></tr>
<tr><td>+8.0</td><td>DB_INT ⚑</td><td>INT</td><td>0</td><td></td></tr>
<tr><td>+10.0</td><td>DB_DINT ⚑</td><td>DINT</td><td>L#0</td><td></td></tr>
<tr><td>+14.0</td><td>DB_REAL ⚑</td><td>REAL</td><td>0.000000e+000</td><td></td></tr>
<tr><td>+18.0</td><td>DB_S5TIME</td><td>S5TIME</td><td>S5T#0MS</td><td></td></tr>
<tr><td>+20.0</td><td>DB_TIME ⚑</td><td>TIME</td><td>T#0MS</td><td></td></tr>
<tr><td>+24.0</td><td>DB_DATE</td><td>DATE</td><td>D#1990-1-1</td><td></td></tr>
<tr><td>+26.0</td><td>DB_TIME_OF_DAY</td><td>TIME_OF_DAY</td><td>TOD#0:0:0.0</td><td></td></tr>
<tr><td>+30.0</td><td>DB_CHAR ⚑</td><td>CHAR</td><td>'a'</td><td></td></tr>
<tr><td>+32.0</td><td>DB_DATE_AND_TIME</td><td>DATE_AND_TIME</td><td>DT#90-1-1-0:0:0</td><td></td></tr>
<tr><td>+40.0</td><td>DB_STRING ⚑</td><td>STRING[254]</td><td>'abcd'</td><td></td></tr>
<tr><td>+296.0</td><td>DB_Array</td><td>ARRAY[0..10]</td><td></td><td></td></tr>
<tr><td>*2.0</td><td></td><td>INT</td><td></td><td></td></tr>
<tr><td>+318.0</td><td>DB_STRUCT</td><td>STRUCT</td><td></td><td></td></tr>
<tr><td>+0.0</td><td>STRUCT_1</td><td>INT</td><td>1</td><td></td></tr>
<tr><td>+2.0</td><td>STRUCT_2</td><td>INT</td><td>2</td><td></td></tr>
<tr><td>=4.0</td><td></td><td>END_STRUCT</td><td></td><td></td></tr>
<tr><td>+322.0</td><td>DB_UDT</td><td>"GLOBAL_UDT"</td><td></td><td></td></tr>
<tr><td>+584.0</td><td>DB_END ⚑</td><td>BOOL</td><td>FALSE</td><td></td></tr>
<tr><td>=586.0</td><td></td><td>END_STRUCT</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>3.</td><td>Invoke the "Special Object Properties" of the attributed data block via the properties dialog.

</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
4.	Tick "Operator Control and Monitoring" to activate the previously set attributes. 

Operator Control and Monitoring

☑ Operator Control and Monitoring

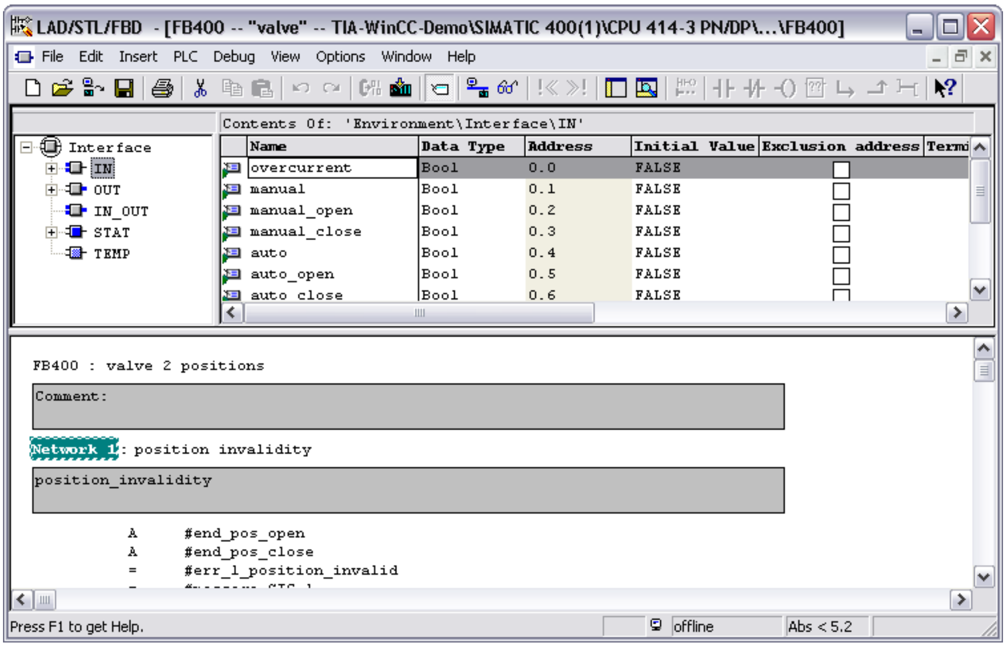
General | WinCC Attributes

Parameter	PLC Data Type	OS Data Type	Adapt Format	Length	UL	
DB_BOOL	BOOL	Binary variable		1	□	
DB_Byte	BYTE	Unsigned 8-bit value	ByteToUnsignedByte	1	□	
DB_WORD	WORD	Unsigned 16-bit value	WordToUnsignedWord	2	□	
DB_DWORD	DWORD	Unsigned 32-bit value	DwordToUnsignedDword	4	□	42949
DB_INT	INT	Signed 16-bit value	ShortToSignedWord	2	□	
DB_DINT	DINT	Signed 32-bit value	LongToSignedDword	4	□	2147
DB_REAL	REAL	32-bit floating-point number IEEE 754	FloatToFloat	4	□	3.40282346639
DB_TIME	TIME	Signed 32-bit value	LongToSignedDword	4	□	2147
DB_CHAR	CHAR	Signed 8-bit value	CharToSignedByte	1	□	
DB_STRING	STRING	Text variable 8-bit character set		254	□	
DB_END	BOOL	Binary variable		1	□	

Copyright © Siemens AG Copyright 2009 All rights reserved

4.3.4 Attributing input and output parameters of a function block

Table 4-6

Step	Action
1.	Invoke the "Object Properties" of an interface symbol in the function block via the properties dialog. **Note:** Only IN, OUT and IN_OUT parameters can be assigned an HMI attribute. 

LAD/STL/FBD - [FB400 -- "valve" -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP\...\FB400]

- Interface
  - IN
  - OUT
  - IN_OUT
  - STAT
  - TEMP

Contents Of: 'Environment\Interface\IN'

Name	Data Type	Address	Initial Value	Exclusion address	Termi
overcurrent	Bool	0.0	FALSE	□	
manual	Bool	0.1	FALSE	□	
manual_open	Bool	0.2	FALSE	□	
manual_close	Bool	0.3	FALSE	□	
auto	Bool	0.4	FALSE	□	
auto_open	Bool	0.5	FALSE	□	
auto_close	Bool	0.6	FALSE	□	

FB400 : valve 2 positions

Comment:

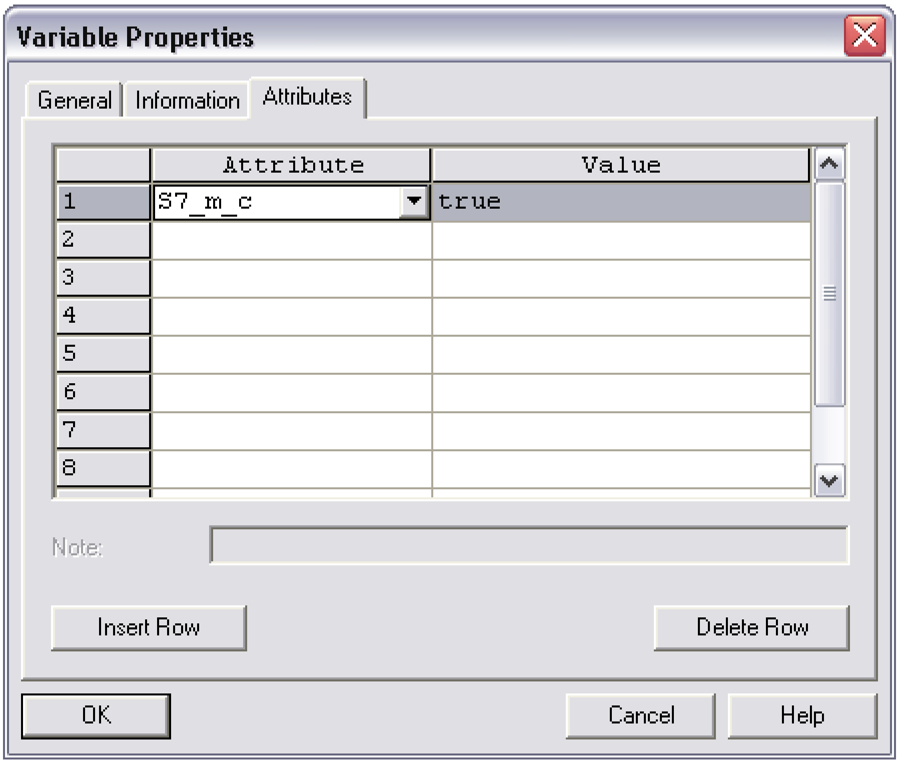
Network 1: position invalidity

position_invalidity

```
          A      #end_pos_open
          A      #end_pos_close
          =      #err_1_position_invalid
```

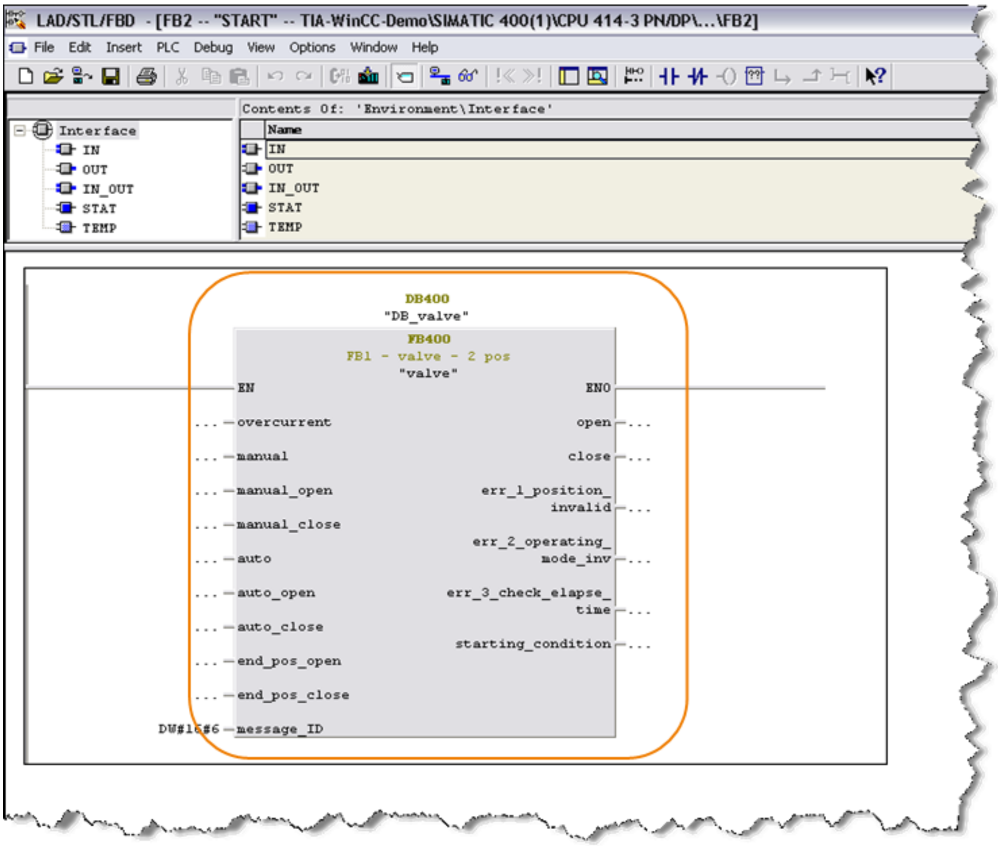
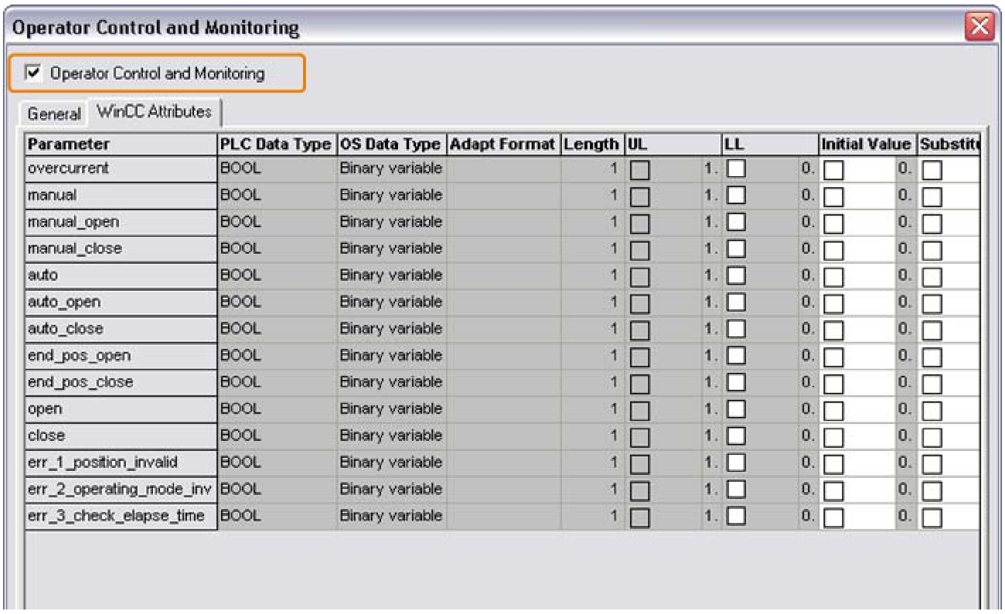
Press F1 to get Help. offline Abs < 5.2

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
2.	Set the attribute "S7_m_c" and the corresponding value to "true" there.  Variable Properties General | Information | Attributes Attribute | Value 1 | S7_m_c | true Note: 2 3 4 5 6 7 8 Insert Row Delete Row OK Cancel Help

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	Invoke the function block with its corresponding instance data block. 
4.	Invoke the "Special Object Properties" of the attributed instance data block via the properties dialog and tick "Operator Control and Monitoring" to activate the previously set attributes. 

LAD/STL/FBD - [FB2 -- "START" -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP\...\FB2]

Contents Of: 'Environment\Interface'

Name
IN
OUT
IN_OUT
STAT
TEMP

Operator Control and Monitoring

☑ Operator Control and Monitoring

Parameter	PLC Data Type	OS Data Type	Adapt Format	Length	UL	LL	Initial Value	Substit
overcurrent	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
manual	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
manual_open	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
manual_close	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
auto	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
auto_open	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
auto_close	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
end_pos_open	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
end_pos_close	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
open	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
close	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
err_1_position_invalid	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
err_2_operating_mode_inv	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐
err_3_check_elapse_time	BOOL	Binary variable		1	☐ 1.	☐ 0.	☐ 0.	☐

4.3.5 Compiling

To transfer the changes to WinCC a compilation must be started. For further information, please refer to the Chapter 3.6.

Note WinCC tags get the status "write-protected" if they have been created by AS-OS-Engineering (OS compilation). In that case the tags cannot be edited in the WinCC project but only in the corresponding STEP 7 project. If, for instance, the attribute "S7_m_c = true" is set at a block connection, an entry in the global data block or symbol table, a corresponding tag will be created in the WinCC tag management during the compilation. The WinCC data type depends on the data type in the STEP 7 project here.

Copyright © Siemens AG Copyright 2009 All rights reserved

4.3.6 S7 data types supported by WinCC

Table 4-7

Data type	Format adaptation
Binary tag	No
Signed 8-bit value	yes
Unsigned 8-bit value	yes
Signed 16-bit value	yes
Unsigned 16-bit value	yes
Signed 32-bit value	yes
Unsigned 32-bit value	yes
Floating-point number 32-bit IEEE 754	yes
Text variable 8-bit character set	yes
Signed 8-bit value	no
Raw data type	no

Copyright © Siemens AG Copyright 2009 All rights reserved

Note Arrays, structures and UDTs (user defined tags) are not supported.

4.4 Further reading

Bibliographic references

This list is not complete and only represents a selection of relevant literature.

Table 4-8

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

Internet links

This list is not complete and only represents a selection of relevant literature.

Table 4-9

	Topic	Title
\1\	Options of the variable export / import	http://support.automation.siemens.com/WW/view/en/22016422
\2\	Options of the symbol table export / import	http://support.automation.siemens.com/WW/view/en/22781586

5 Messages

5.1 Introduction

The alarm system is a subsystem of WinCC which serves for monitoring the processes.

At certain states and changes in the process the alarm system generates alarms and outputs them in tables in runtime. The alarms help to detect critical situations at an early stage and to avoid downtimes.

- There are two different message procedures:
  - the bit message procedure.
  - the message number procedure.

5.2 Bit message procedure

When the bit message procedure is used the alarms are configured in WinCC. Tags are assigned to the alarms. During the process the tag values are read out from the control at regular intervals. Depending on the states of the read out values the configured alarms are displayed in WinCC.

5.2.1 Principle of operation

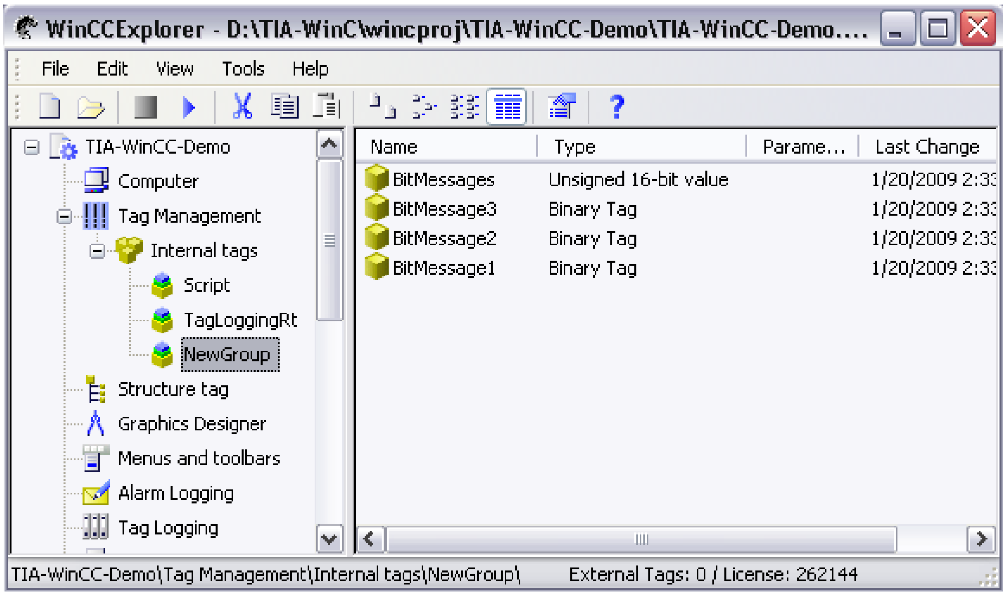
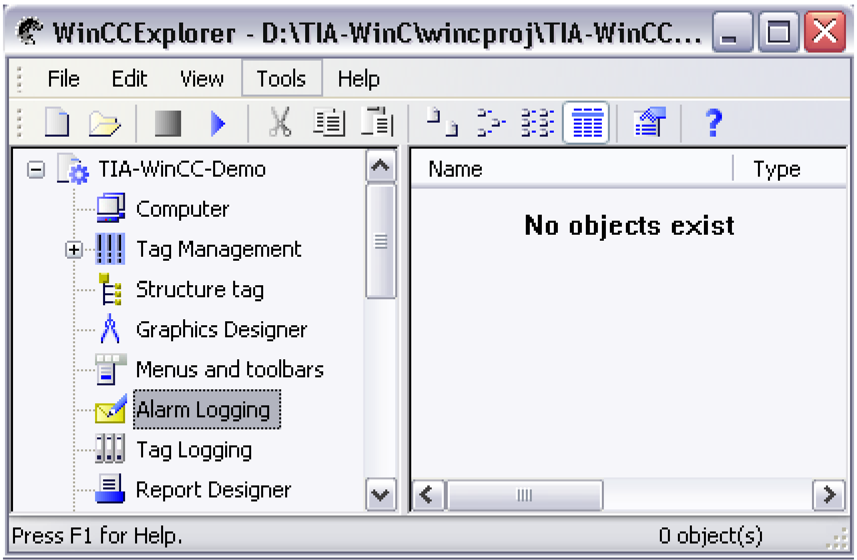
The bit message procedure has the following features:

- The configuration is made in WinCC.
- WinCC polls the tags in regular intervals.
- High bus load
- The time stamp is assigned by Alarm Logging.

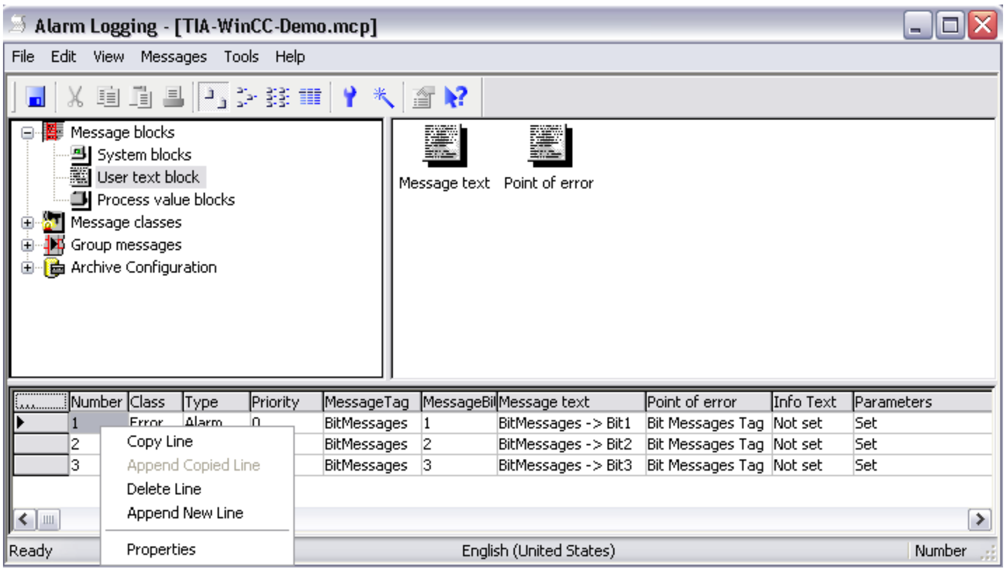
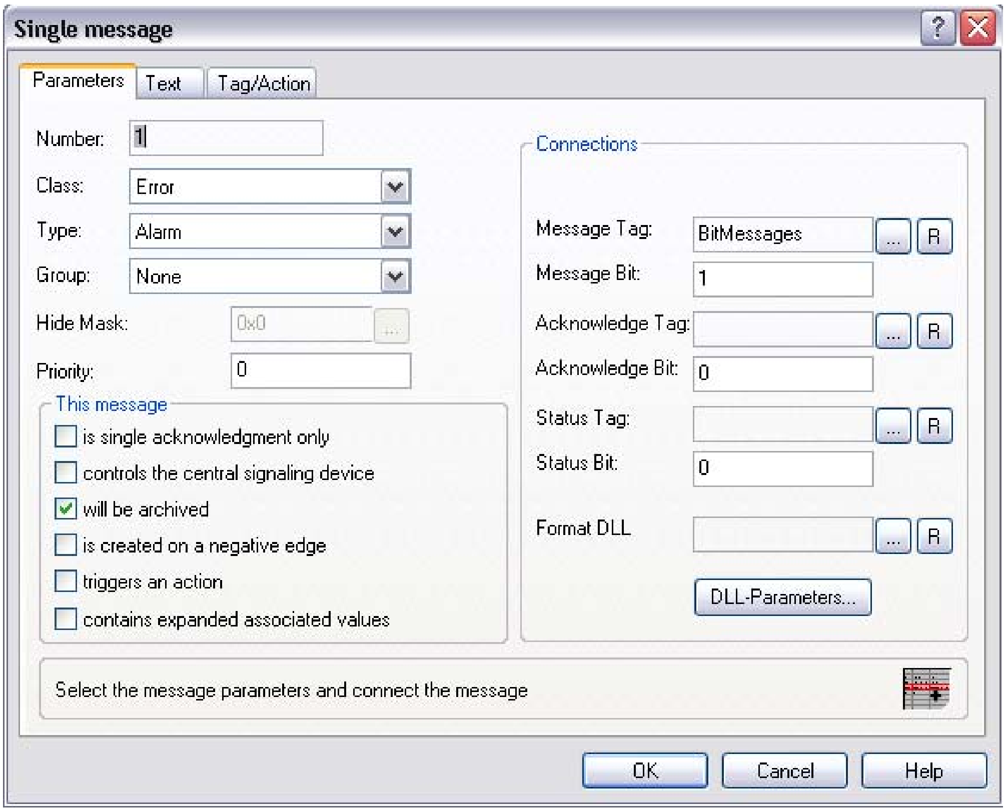
Copyright © Siemens AG Copyright 2009 All rights reserved

5.2.2 Configuring bit messages

Table 5-1

Step	Action
1.	Create a new tag of the data type "Unsigned 16-bit value".  WinCCExplorer - D:\TIA-WinC\wincproj\TIA-WinCC-Demo\TIA-WinCC-Demo.... File Edit View Tools Help TIA-WinCC-Demo Computer Tag Management Internal tags Script TagLoggingRt NewGroup Structure tag Graphics Designer Menus and toolbars Alarm Logging Tag Logging Name | Type | Parame... | Last Change BitMessages | Unsigned 16-bit value | | 1/20/2009 2:3 BitMessage3 | Binary Tag | | 1/20/2009 2:3 BitMessage2 | Binary Tag | | 1/20/2009 2:3 BitMessage1 | Binary Tag | | 1/20/2009 2:3 TIA-WinCC-Demo\Tag Management\Internal tags\NewGroup\ External Tags: 0 / License: 262144
2.	Open in the WinCC Explorer the "Alarm Logging" editor.  WinCCExplorer - D:\TIA-WinC\wincproj\TIA-WinCC... File Edit View Tools Help TIA-WinCC-Demo Computer Tag Management Structure tag Graphics Designer Menus and toolbars Alarm Logging Tag Logging Report Designer Name | Type No objects exist Press F1 for Help. 0 object(s)

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	Create a new bit message in the "Alarm Logging" editor. To do this, click on "Append New Line" in the context menu of the table window. 
4.	Select the message tag. 

Alarm Logging - [TIA-WinCC-Demo.mcp]

Number	Class	Type	Priority	MessageTag	MessageBil	Message text	Point of error	Info Text	Parameters
1	Error	Alarm	0	BitMessages	1	BitMessages -> Bit1	Bit Messages Tag	Not set	Set
2				BitMessages	2	BitMessages -> Bit2	Bit Messages Tag	Not set	Set
3				BitMessages	3	BitMessages -> Bit3	Bit Messages Tag	Not set	Set

Ready English (United States) Number

Single message

Number: 1

Class: Error

Type: Alarm

Group: None

Hide Mask: 0x0

Priority: 0

This message

- ☐ is single acknowledgment only
- ☐ controls the central signaling device
- ☑ will be archived
- ☐ is created on a negative edge
- ☐ triggers an action
- ☐ contains expanded associated values

Connections

Message Tag: BitMessages

Message Bit: 1

Acknowledge Tag:

Acknowledge Bit: 0

Status Tag:

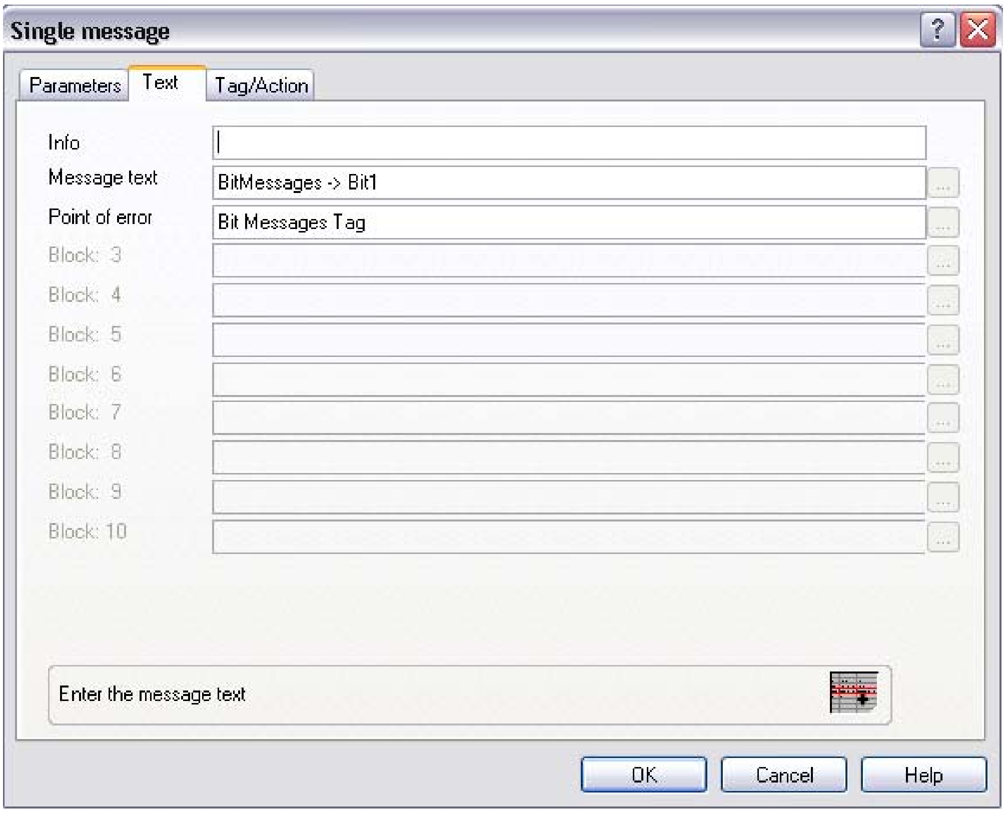
Status Bit: 0

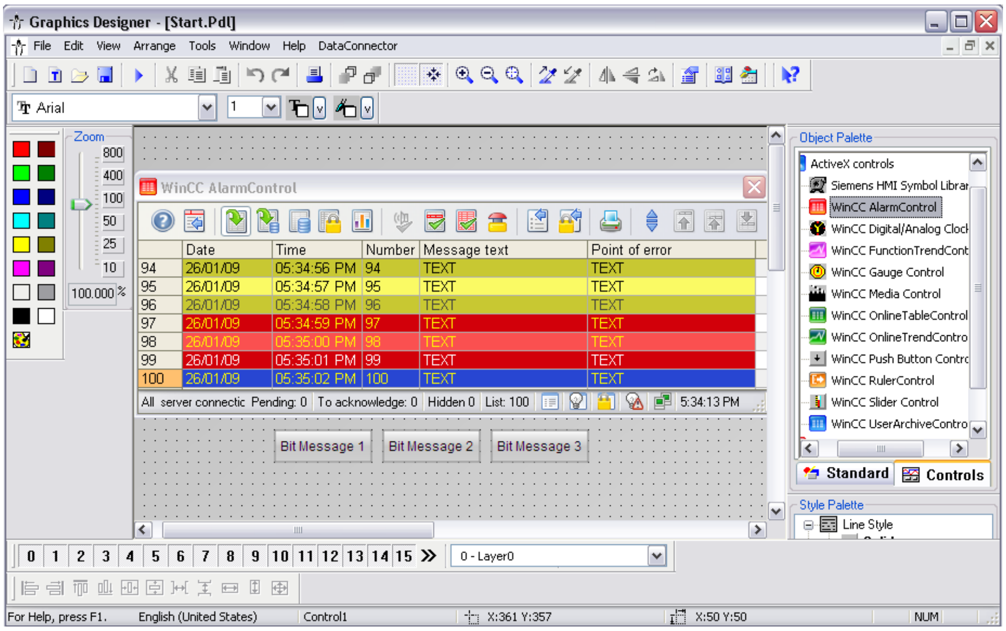
Format DLL

Select the message parameters and connect the message

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

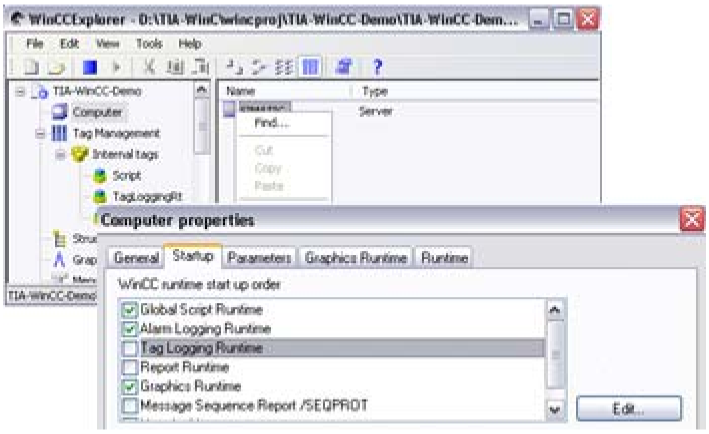
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5.</td><td>Set the properties of the bit message.


Single message
<table>
<tr><td>Info</td><td></td></tr>
<tr><td>Message text</td><td>BitMessages -> Bit1</td></tr>
<tr><td>Point of error</td><td>Bit Messages Tag</td></tr>
<tr><td>Block: 3</td><td></td></tr>
<tr><td>Block: 4</td><td></td></tr>
<tr><td>Block: 5</td><td></td></tr>
<tr><td>Block: 6</td><td></td></tr>
<tr><td>Block: 7</td><td></td></tr>
<tr><td>Block: 8</td><td></td></tr>
<tr><td>Block: 9</td><td></td></tr>
<tr><td>Block: 10</td><td></td></tr>
</table>
Enter the message text
</td></tr>
<tr><td>6.</td><td>Create a message display in the "Graphics Designer".


Graphics Designer - [Start.Pdl]

WinCC AlarmControl
<table>
<tr><th></th><th>Date</th><th>Time</th><th>Number</th><th>Message text</th><th>Point of error</th></tr>
<tr><td>94</td><td>26/01/09</td><td>05:34:56 PM</td><td>94</td><td>TEXT</td><td>TEXT</td></tr>
<tr><td>95</td><td>26/01/09</td><td>05:34:57 PM</td><td>95</td><td>TEXT</td><td>TEXT</td></tr>
<tr><td>96</td><td>26/01/09</td><td>05:34:58 PM</td><td>96</td><td>TEXT</td><td>TEXT</td></tr>
<tr><td>97</td><td>26/01/09</td><td>05:34:59 PM</td><td>97</td><td>TEXT</td><td>TEXT</td></tr>
<tr><td>98</td><td>26/01/09</td><td>05:35:00 PM</td><td>98</td><td>TEXT</td><td>TEXT</td></tr>
<tr><td>99</td><td>26/01/09</td><td>05:35:01 PM</td><td>99</td><td>TEXT</td><td>TEXT</td></tr>
<tr><td>100</td><td>26/01/09</td><td>05:35:02 PM</td><td>100</td><td>TEXT</td><td>TEXT</td></tr>
</table>
All server connectic Pending: 0 To acknowledge: 0 Hidden 0 List: 100 5:34:13 PM

For Help, press F1. English (United States) Control1 X:361 Y:357 X:50 Y:50 NUM
</td></tr>
</table>

Step	Action
7.	Enable the start of the "Alarm Logging" in the properties dialog of the "Computer" settings.  Computer properties General · Startup · Parameters · Graphics Runtime · Runtime WinCC runtime start up order ☑ Global Script Runtime ☑ Alarm Logging Runtime □ Tag Logging Runtime □ Report Runtime ☑ Graphics Runtime □ Message Sequence Report /SEQPROT

Copyright © Siemens AG Copyright 2009 All rights reserved

5.3 Message number procedure

- When the message number procedure is used the events to be signalled are already assigned message texts during the program creation in STEP 7 and assigned to the message numbers.
- Message numbers and the corresponding message texts are transferred to WinCC during generation.
- Thus, when in the production mode an event occurs which has to be signalled, the CPU only transfers the alarm number to WinCC with the time stamp.
  In WinCC the alarm number, the time of the event and the corresponding message text will be displayed.

5.3.1 Features

The message number procedure has the following features:

- The configuration is made in STEP 7.
- The control actively sends a message telegram.
- Low bus load
- The time stamp is assigned by the control.
- High effort when changes are made to an existing plant.

5.3.2 Message types

There are three different message types to be considered in the configuration:

- Block-related messages
- Symbol-related messages
- User-defined diagnostic messages

Block-related messages

They are used in the event of program-synchronous events, e.g. limit value monitoring, and they have the following features:

- Synchronous to cycle of the PLC.
- WinCC or WinCC flexible (only Alarm_S and Alarm_D) can be used for displaying.
- Supported by S7-300 and S7-400.
- Is triggered via message blocks:
  ALARM_8, ALARM_8P, NOTIFY, NOTIFY_8P, ALARM_S(Q), ALARM_D(Q).
- Transfer to WinCC through AS-OS compilation.

Symbol-related messages

They are used if a program-synchronous display is not required, e.g. for displaying a button as a symbol, and they have the following features:

- Asynchronous to cycle of the PLC.
- Only WinCC can be used for displaying.
- Supported only by S7-400.
- Configured via the symbol table.
- Downloaded to control via SDBs.
- Transfer to WinCC through AS-OS compilation.

User-defined diagnostic messages

They are used when diagnostic messages of the diagnostic buffer are displayed.

- Synchronous to cycle of the PLC.
- Display of the diagnostic buffer on the programming device.
- Supported by S7-300 and S7-400.
- Triggered via the message block "WR_USMSG".

Copyright © Siemens AG Copyright 2009 All rights reserved

5.3.3 Overview of message blocks

Table 5-2

Symbolic block name	System block	Acknowledgeable	Accompanying values	CPU
ALARM_SQ	SFC17	yes	yes, 1	S7-300 / S7-400
ALARM_S	SFC18	no	yes, 1	S7-300 / S7-400
ALARM_DQ	SFC107	yes	yes, 1	S7-300 / S7-400
ALARM_D	SFC108	no	yes, 1	S7-300 / S7-400
NOTIFY	SFB36	no	yes, max. 10	only S7-400
NOTIFY_8P	SFB31	no	yes, max. 10	only S7-400
ALARM	SFB33	yes	yes, max. 10	only S7-400
ALARM_8	SFB34	yes	no	only S7-400
ALARM_8P	SFB35	yes	yes, max. 10	only S7-400

Copyright © Siemens AG Copyright 2009 All rights reserved

Note

ALARM_S(Q) and ALARM_D(Q) are preferably used in the lower performance range (WinCC flexible) whereas the other message blocks are used in the higher performance range (WinCC).

In the message creation with ALARM_S(Q) and ALARM_D(Q) the operating system uses temporarily storage space in the system memory.

If you delete, for instance, an FB in the CPU with ALARM_S(Q) and ALARM_D(Q) calls it may happen that the corresponding system resources will be occupied permanently.

If you reload the FB with ALARM_S(Q) and ALARM_D(Q) calls, it may happen that ALARM_S(Q) and ALARM_D(Q) will not work properly anymore.

ALARM_D(Q) provides the advantage over ALARM_S(Q) that the system resources can be released temporarily with the system function "DEL_SI".

Copyright © Siemens AG Copyright 2009 All rights reserved

5.3.4 Message classes

When you configure the message system every message is assigned a message class.

Thus you need not specify numerous basic settings individually for each message but you can determine the settings for the whole message class.

WinCC provides 16 message classes and two preset system message classes.

The following message classes are offered as a standard:

- Fault.
- System requiring acknowledgement.
- System, without acknowledgement.

Configure the following basic settings for message classes:

- the assigned message types
- the acknowledgement philosophy and the corresponding status texts
- the output of acoustic / optical signals

OS compilation

Through OS compilation the chronological messages are transferred to the WinCC project. In this process the messages which are configured in STEP 7 are created in WinCC Alarm Logging and the corresponding WinCC message classes and message types are used.

Thus there is an assignment of the STEP 7 message classes to the WinCC -message classes and message types.

In order to make possible that the messages which were configured in STEP 7 are displayed in WinCC at runtime, you have to create in WinCC Alarm Logging the message classes and message types which are used in STEP 7.

Table 5-3

STEP 7 Message class	Remark	WinCC Message class	WinCC Message type	WinCC name Message class > message type
Alarm - high		1	1	Alarm > Alarm High
Alarm - low		1	2	Alarm > Alarm Low
Warning - high		2	19	Warning > Warning High
Warning - low		2	20	Warning > Warning Low
Tolerance - high		3	37	Tolerance > Tolerance High
Tolerance - low		3	38	Tolerance > Tolerance

STEP 7 Message class	Remark	WinCC Message class	WinCC Message type	WinCC name Message class > message type
				Low
AS control system message - fault		4	55	AS control system messages > fault
AS control system message - error		4	56	AS control system messages > error
OS control system message - fault		5	71	OS control system messages > fault
	Not used by STEP 7	5	72	OS control system messages > error
Preventive maintenance - general		6	89	Preventive maintenance > Maintenance
Process message - with acknowledgement		7	106	Process message > process message
Process message - without acknowledgement	Without acknowledgement (NOTIFY_8P)	8	122	Operational message > process message
Operator input request - general	Without acknowledgement (NOTIFY_8P)	9	139	Operator input request > operator input request
Operator message - general	Without acknowledgement (NOTIFY_8P) / gone without message (not in message list)	10	156	Operator message > operator message
Status message - AS	Without acknowledgement (NOTIFY_8P) / gone without message (not in message list)	16	253	Status message > status AS
Status message - OS	Without acknowledgement (NOTIFY_8P) / gone without message (not in message list)	16	254	Status message > status OS
	Not used by STEP 7	17	257	System, requiring acknowledgement > control system
	Not used by STEP 7	17	258	System, requiring acknowledgement > system messages

Copyright © Siemens AG Copyright 2009 All rights reserved

STEP 7 Message class	Remark	WinCC Message class	WinCC Message type	WinCC name Message class > message type
	Not used by STEP 7	18	273	System, without acknowledgement/control system
	Not used by STEP 7	18	274	System, without acknowledgement/operator messages

NOTE **If in STEP 7 chronological message classes are used whose respective WinCC message class and message type have not been created there will be no error message upon the OS compilation but these messages will not be displayed in runtime either.**

In that case you will find entries "Invalid message number " in the WinCC log file "...\SIEMENS\WinCC\Diagnose\WinCC_Sys_0x.log".

Copyright © Siemens AG Copyright 2009 All rights reserved

5.4 Symbol-related messages

Symbol-related messages (SCAN) are directly assigned to a signal in the symbol table. Admissible signals are exclusively Boolean operands: i.e. inputs (I), outputs (O) and memory bits (M).

You can assign to these signals various attributes, message texts and up to 10 associated values in the message configuration. The selection of signals from the symbol table is made easier for you by setting filters.

You can scan a signal in a preset time interval with a symbol-related message to determine whether a signal change has occurred.

Notes The time interval depends on the used CPU.

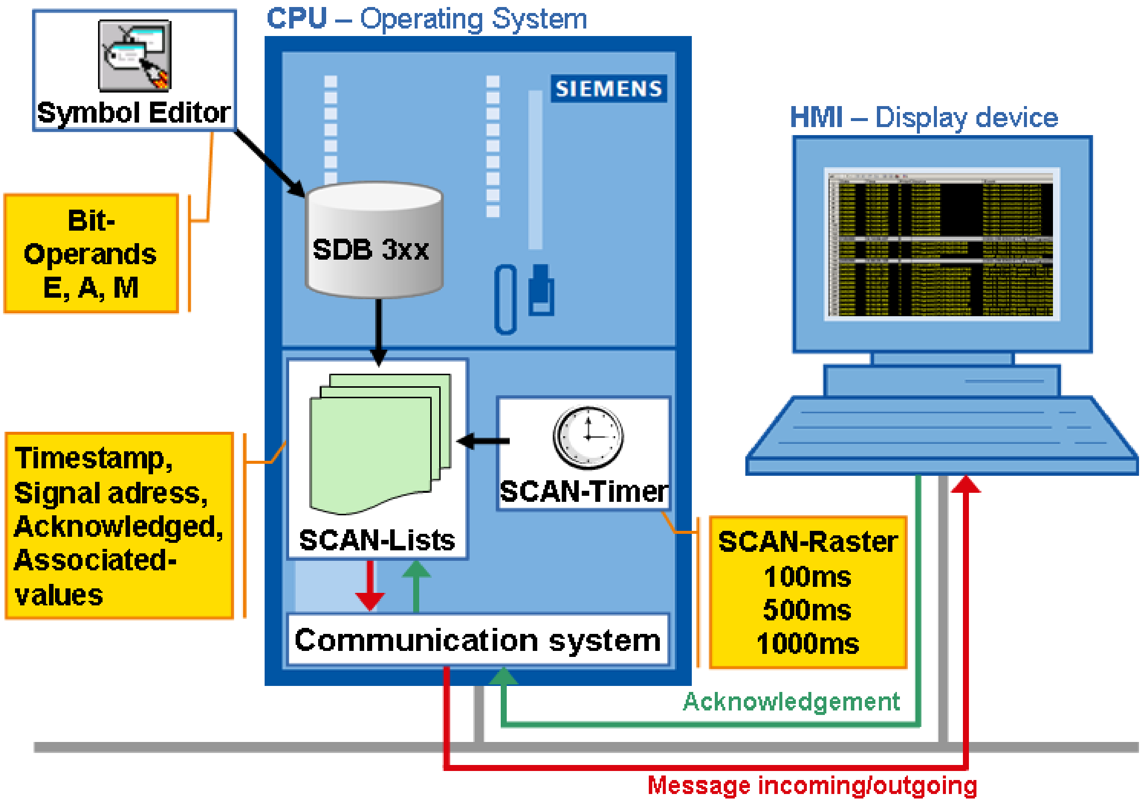
In the event of rapid signal changes (the signal which is to be monitored changes faster than the scan interval) messages can get lost.

Symbol-related messages cannot be simulated with S7-PLCSim.

Overview of the message processing

The following figure schematically shows the principle of operation of the scan messages in WinCC:

Figure 5-1



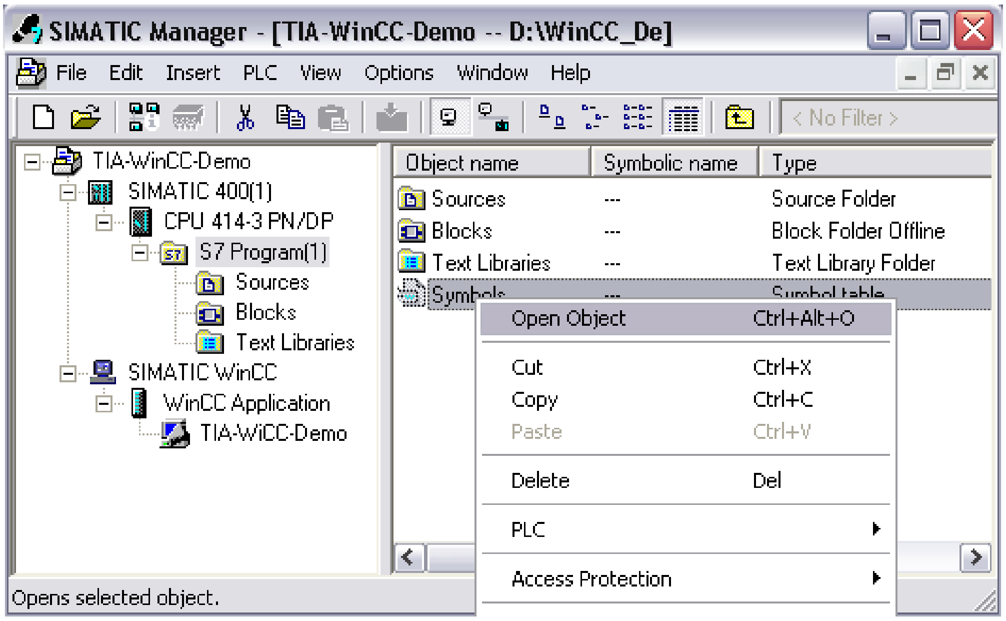
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

5.4.1 Configuring scan messages

Table 5-4

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>
Open the symbol table.

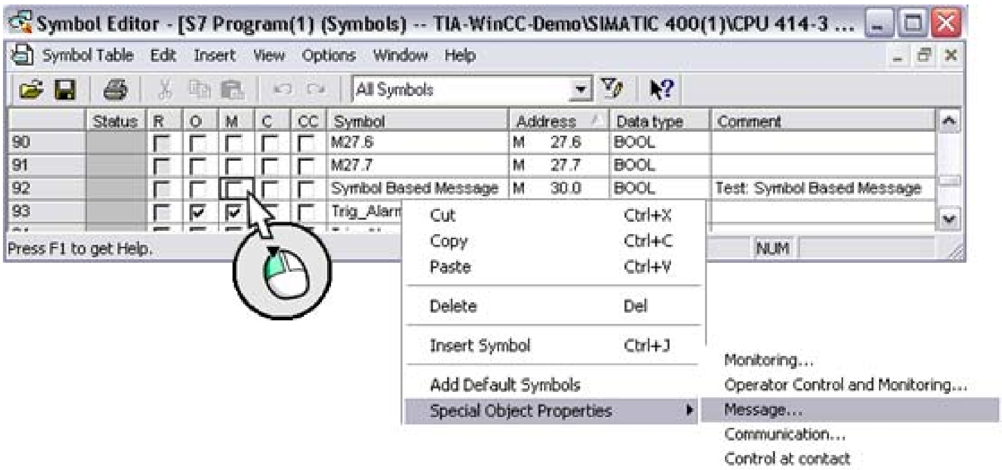


SIMATIC Manager - [TIA-WinCC-Demo -- D:\WinCC_De]

<table>
<tr><th>Object name</th><th>Symbolic name</th><th>Type</th></tr>
<tr><td>Sources</td><td>---</td><td>Source Folder</td></tr>
<tr><td>Blocks</td><td>---</td><td>Block Folder Offline</td></tr>
<tr><td>Text Libraries</td><td>---</td><td>Text Library Folder</td></tr>
<tr><td>Symbols</td><td>---</td><td>Symbol table</td></tr>
</table>

Opens selected object.

</td></tr>
<tr><td>2.</td><td>
Open the symbol editor and select "View > Columns R, O, M, C, CC".
The respective attributes can be set via the properties dialog "Special Object Properties" of a symbol. Select the attribute "Message" to make the symbol available as scan message in WinCC.



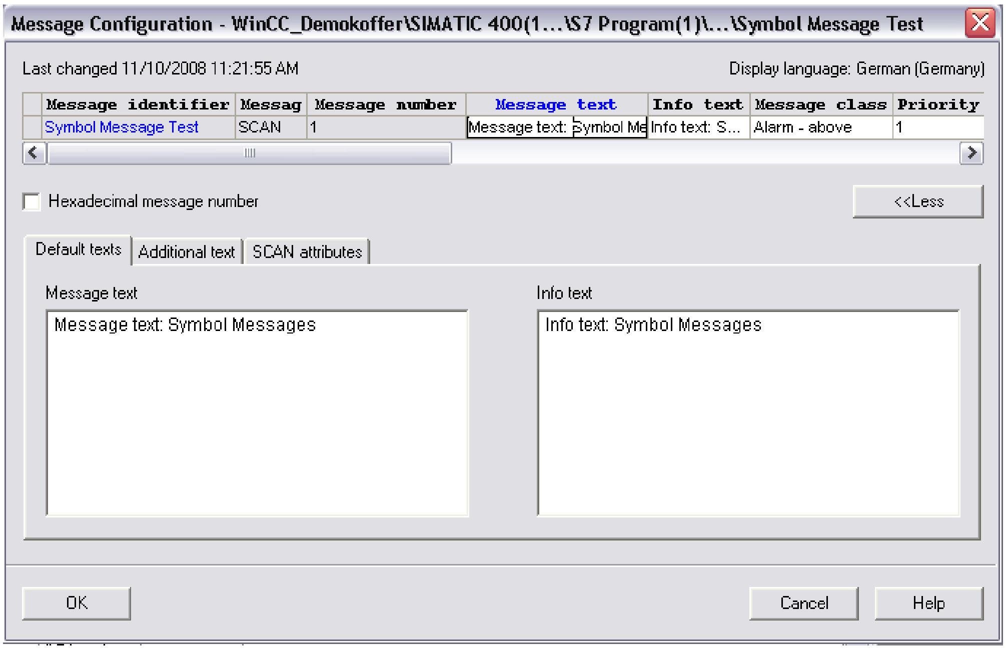
Symbol Editor - [S7 Program(1) (Symbols) -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 ...

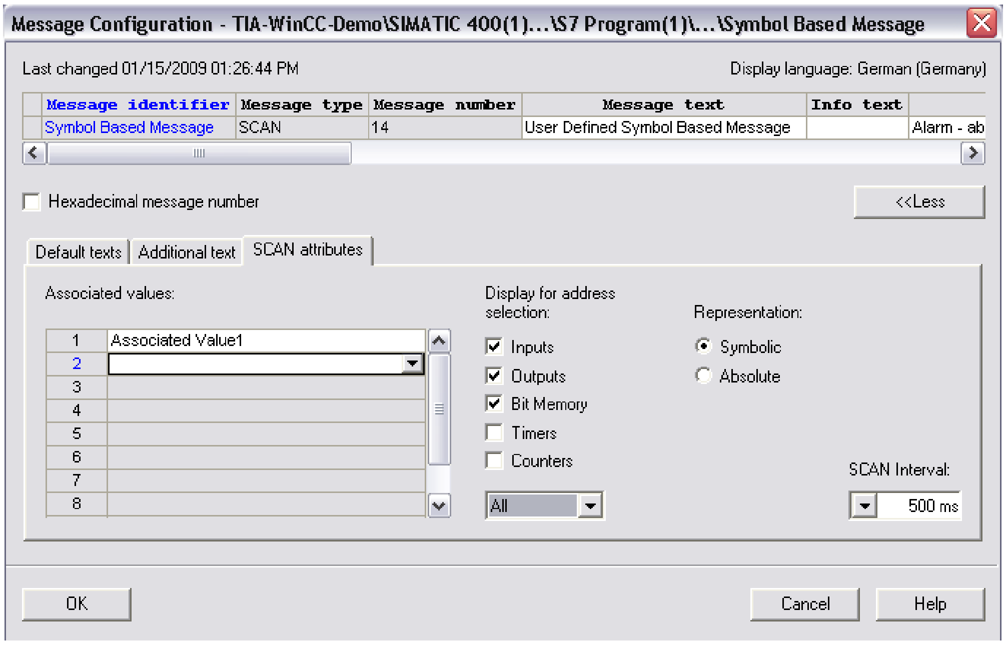
<table>
<tr><th></th><th>Status</th><th>R</th><th>O</th><th>M</th><th>C</th><th>CC</th><th>Symbol</th><th>Address</th><th></th><th>Data type</th><th>Comment</th></tr>
<tr><td>90</td><td></td><td>□</td><td>□</td><td>□</td><td>□</td><td>□</td><td>M27.6</td><td>M</td><td>27.6</td><td>BOOL</td><td></td></tr>
<tr><td>91</td><td></td><td>□</td><td>□</td><td>□</td><td>□</td><td>□</td><td>M27.7</td><td>M</td><td>27.7</td><td>BOOL</td><td></td></tr>
<tr><td>92</td><td></td><td>□</td><td>□</td><td>□</td><td>□</td><td>□</td><td>Symbol Based Message</td><td>M</td><td>30.0</td><td>BOOL</td><td>Test: Symbol Based Message</td></tr>
<tr><td>93</td><td></td><td>□</td><td>☑</td><td>☑</td><td></td><td>□</td><td>Trig_Alarm</td><td></td><td></td><td></td><td></td></tr>
</table>

Press F1 to get Help.

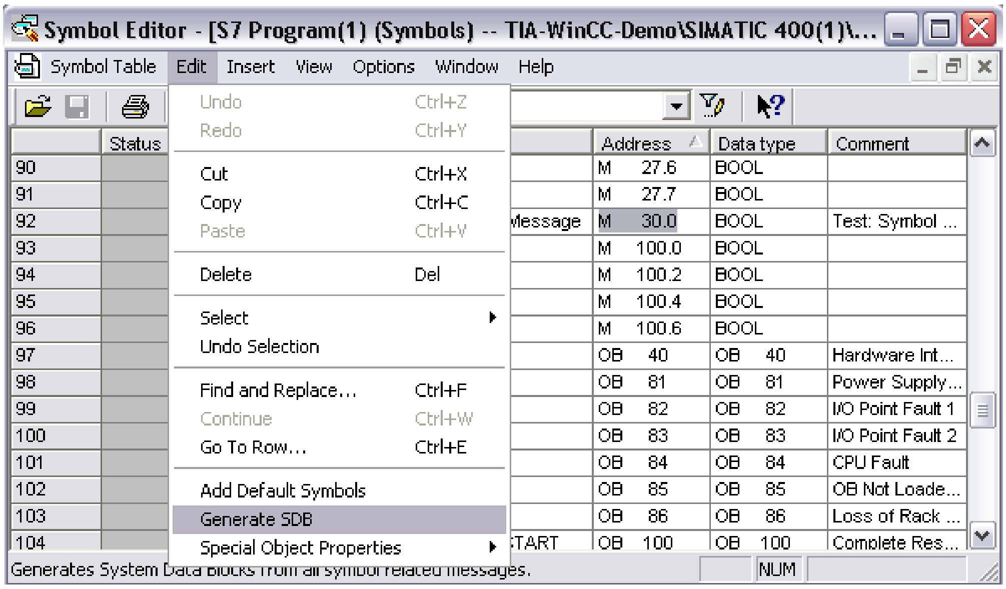
</td></tr>
</table>

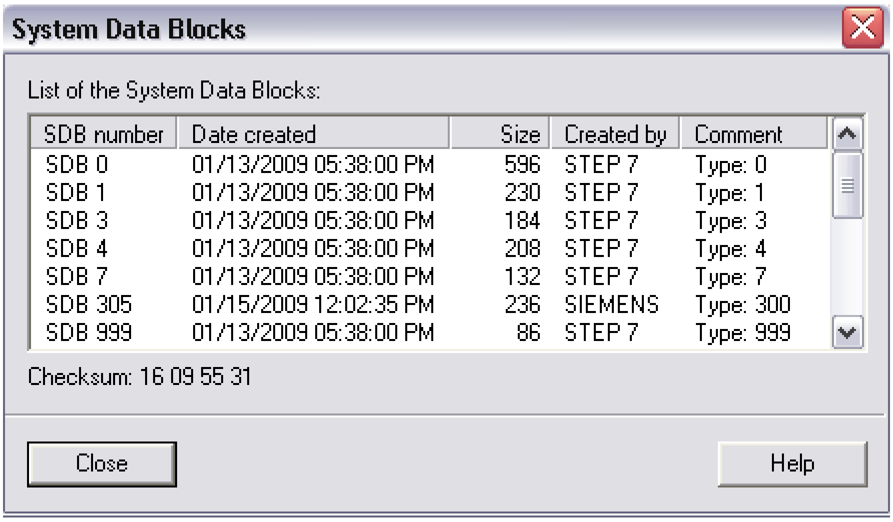
Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3.</td><td>
Assign the message text, info text, message class, priority and type of acknowledgement for your scan message now.
<b>Notes:</b>
The message number is automatically assigned by the system.
The texts must not be longer than 255 characters.

Message Configuration - WinCC_Demokoffer\SIMATIC 400(1...\S7 Program(1)\...\Symbol Message Test
Last changed 11/10/2008 11:21:55 AM
Display language: German (Germany)
<table>
<tr><th>Message identifier</th><th>Messag</th><th>Message number</th><th>Message text</th><th>Info text</th><th>Message class</th><th>Priority</th></tr>
<tr><td>Symbol Message Test</td><td>SCAN</td><td>1</td><td>Message text: Symbol Me</td><td>Info text: S...</td><td>Alarm - above</td><td>1</td></tr>
</table>
□ Hexadecimal message number
Message text: Message text: Symbol Messages
Info text: Info text: Symbol Messages

</td></tr>
<tr><td>4.</td><td>
Add to your message additional associated values (max. 10) if required. You can only select operands from the symbol table. You can specify different time intervals depending on the control.

Message Configuration - TIA-WinCC-Demo\SIMATIC 400(1)...\S7 Program(1)\...\Symbol Based Message
Last changed 01/15/2009 01:26:44 PM
Display language: German (Germany)
<table>
<tr><th>Message identifier</th><th>Message type</th><th>Message number</th><th>Message text</th><th>Info text</th><th></th></tr>
<tr><td>Symbol Based Message</td><td>SCAN</td><td>14</td><td>User Defined Symbol Based Message</td><td></td><td>Alarm - ab</td></tr>
</table>
□ Hexadecimal message number
Associated values:
<table>
<tr><td>1</td><td>Associated Value1</td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td></td></tr>
<tr><td>8</td><td></td></tr>
</table>
Display for address selection:
☑ Inputs
☑ Outputs
☑ Bit Memory
□ Timers
□ Counters
All
Representation:
● Symbolic
○ Absolute
SCAN Interval: 500 ms

</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5.</td><td>Generate the SDBs via "Edit > Generate SDB". Alternatively, the SDBs are also automatically created when the symbol table is saved.


<table>
<tr><th></th><th>Status</th><th></th><th>Address</th><th>Data type</th><th>Comment</th></tr>
<tr><td>90</td><td></td><td></td><td>M 27.6</td><td>BOOL</td><td></td></tr>
<tr><td>91</td><td></td><td></td><td>M 27.7</td><td>BOOL</td><td></td></tr>
<tr><td>92</td><td></td><td>Message</td><td>M 30.0</td><td>BOOL</td><td>Test: Symbol ...</td></tr>
<tr><td>93</td><td></td><td></td><td>M 100.0</td><td>BOOL</td><td></td></tr>
<tr><td>94</td><td></td><td></td><td>M 100.2</td><td>BOOL</td><td></td></tr>
<tr><td>95</td><td></td><td></td><td>M 100.4</td><td>BOOL</td><td></td></tr>
<tr><td>96</td><td></td><td></td><td>M 100.6</td><td>BOOL</td><td></td></tr>
<tr><td>97</td><td></td><td></td><td>OB 40</td><td>OB 40</td><td>Hardware Int...</td></tr>
<tr><td>98</td><td></td><td></td><td>OB 81</td><td>OB 81</td><td>Power Supply...</td></tr>
<tr><td>99</td><td></td><td></td><td>OB 82</td><td>OB 82</td><td>I/O Point Fault 1</td></tr>
<tr><td>100</td><td></td><td></td><td>OB 83</td><td>OB 83</td><td>I/O Point Fault 2</td></tr>
<tr><td>101</td><td></td><td></td><td>OB 84</td><td>OB 84</td><td>CPU Fault</td></tr>
<tr><td>102</td><td></td><td></td><td>OB 85</td><td>OB 85</td><td>OB Not Loade...</td></tr>
<tr><td>103</td><td></td><td></td><td>OB 86</td><td>OB 86</td><td>Loss of Rack ...</td></tr>
<tr><td>104</td><td></td><td>TART</td><td>OB 100</td><td>OB 100</td><td>Complete Res...</td></tr>
</table>
Generates System Data Blocks from all symbol related messages.</td></tr>
<tr><td>6.</td><td>Result: The messages were stored in SDB 305.
The numbering of the SDBs 3xx depends on the selected time interval:
SDB 301 to SDB 304: 100 ms
SDB 305 to SDB 312: 500 ms
SDB 313 to SDB 320: 1000 ms


List of the System Data Blocks:
<table>
<tr><th>SDB number</th><th>Date created</th><th>Size</th><th>Created by</th><th>Comment</th></tr>
<tr><td>SDB 0</td><td>01/13/2009 05:38:00 PM</td><td>596</td><td>STEP 7</td><td>Type: 0</td></tr>
<tr><td>SDB 1</td><td>01/13/2009 05:38:00 PM</td><td>230</td><td>STEP 7</td><td>Type: 1</td></tr>
<tr><td>SDB 3</td><td>01/13/2009 05:38:00 PM</td><td>184</td><td>STEP 7</td><td>Type: 3</td></tr>
<tr><td>SDB 4</td><td>01/13/2009 05:38:00 PM</td><td>208</td><td>STEP 7</td><td>Type: 4</td></tr>
<tr><td>SDB 7</td><td>01/13/2009 05:38:00 PM</td><td>132</td><td>STEP 7</td><td>Type: 7</td></tr>
<tr><td>SDB 305</td><td>01/15/2009 12:02:35 PM</td><td>236</td><td>SIEMENS</td><td>Type: 300</td></tr>
<tr><td>SDB 999</td><td>01/13/2009 05:38:00 PM</td><td>86</td><td>STEP 7</td><td>Type: 999</td></tr>
</table>
Checksum: 16 09 55 31</td></tr>
</table>

5.4.2 Compiling

To transfer the changes to WinCC a compilation must be started. For more information refer to the Chapter 3.6.

Copyright © Siemens AG Copyright 2009 All rights reserved

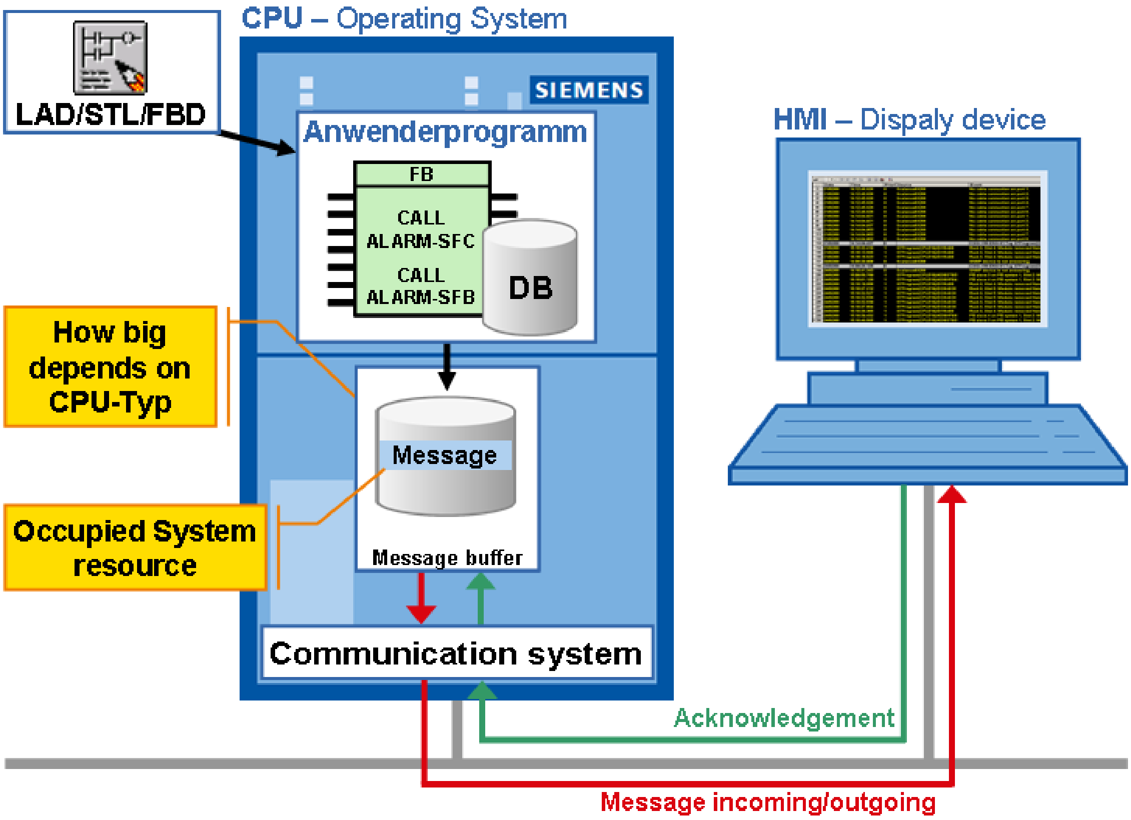
5.5 Block-related messages

Block-related messages are assigned to a block (instance DB). You can use system function blocks (SFBs) and system functions (SFCs) as message blocks to create a block-related message.

Overview of the message processing

The following figure schematically shows the principle of operation of the block-related messages in WinCC:

Figure 5-2

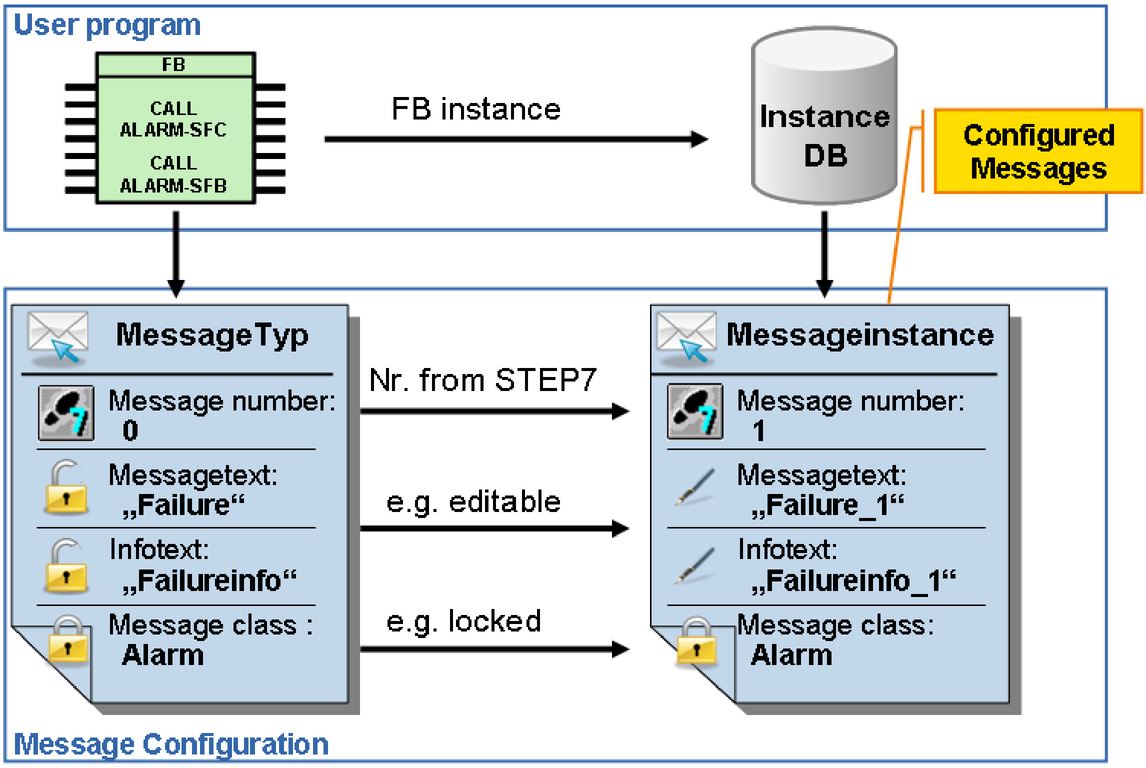


Copyright © Siemens AG Copyright 2009 All rights reserved

Instance concept of the message block

The following figure schematically shows the type instance of a message block:

Figure 5-3



Copyright © Siemens AG Copyright 2009 All rights reserved

5.5.1 Configuring messages with "ALARM_S(Q)"

Table 5-5

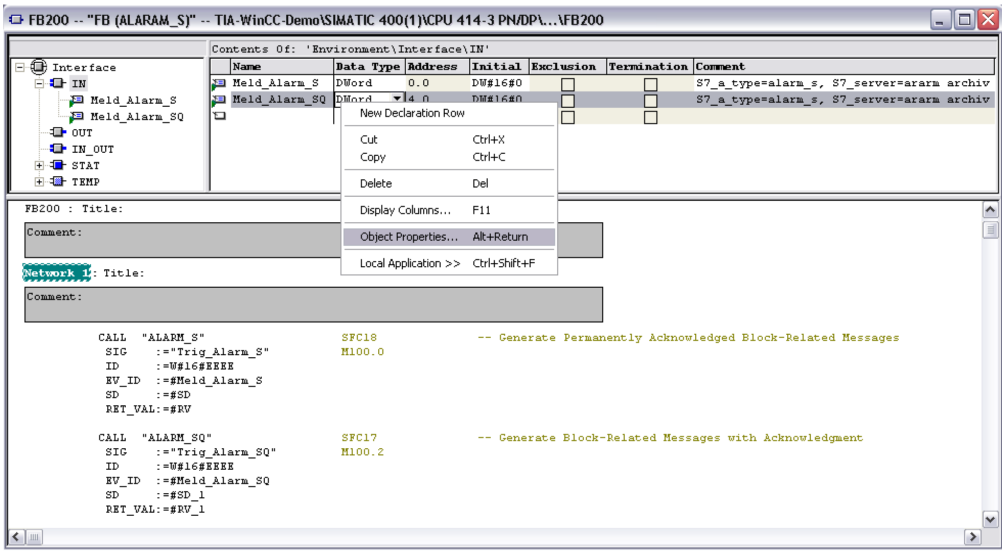
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>

You have to declare corresponding parameters in the variable declaration table for each message block which is called in FB:

- For the parameter "IN" a symbolic name for the message block input of the data type "DWORD", e.g. "Meld_Alarm_S".
- For the parameter "STAT" a symbolic name for the message block to be called with the corresponding data type, e.g. "SFC18" for Alarm_S (see also Table 5.3.3.).

Invoke the "Object Properties" of an interface symbol in the declaration part via the properties dialog then.

Note:
Only IN, OUT and IN_OUT parameters can be assigned a message attribute.



FB200 -- "FB (ALARAM_S)" -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP\...\FB200

Contents Of: 'Environment\Interface\IN'

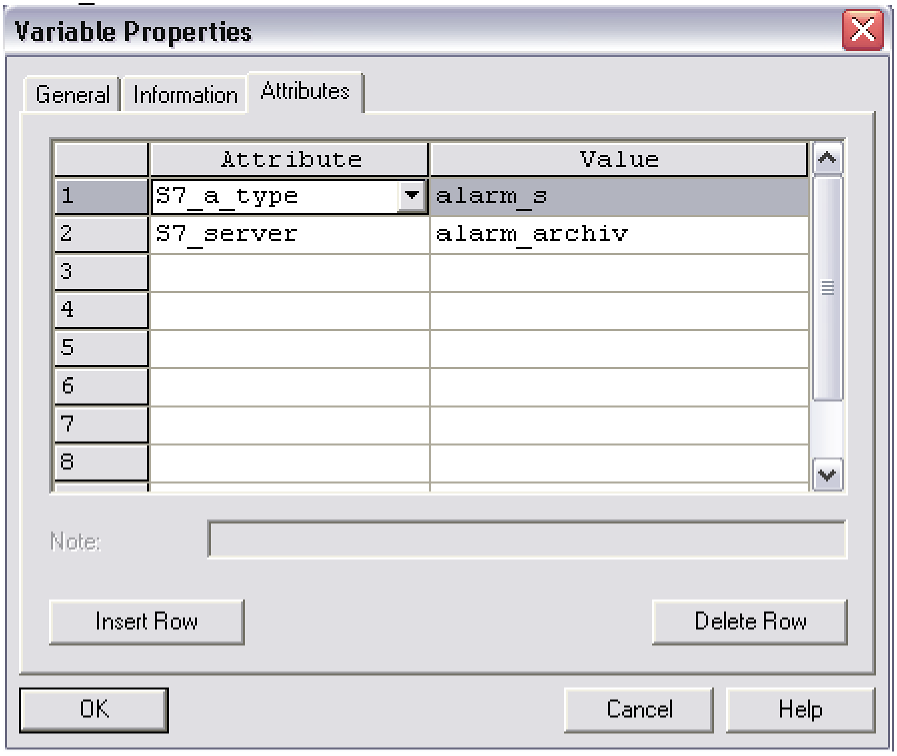
Name	Data Type	Address	Initial	Exclusion	Termination	Comment
Meld_Alarm_S	DWord	0.0	DW#16#0	□	□	S7_a_type=alarm_s, S7_server=ararm archiv
Meld_Alarm_SQ	DWord	4.0	DW#16#0	□	□	S7_a_type=alarm_s, S7_server=ararm archiv
				□	□	

```
FB200 : Title:
Comment:

Network 1: Title:
Comment:

      CALL  "ALARM_S"              SFC18          -- Generate Permanently Acknowledged Block-Related Messages
       SIG    :="Trig_Alarm_S"     M100.0
       ID     :=W#16#EEEE
       EV_ID  :=#Meld_Alarm_S
       SD     :=#SD
       RET_VAL:=#RV

      CALL  "ALARM_SQ"             SFC17          -- Generate Block-Related Messages with Acknowledgment
       SIG    :="Trig_Alarm_SQ"    M100.2
       ID     :=W#16#EEEE
       EV_ID  :=#Meld_Alarm_SQ
       SD     :=#SD_1
       RET_VAL:=#RV_1
```

</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2.</td><td>Append the following system attributes for the parameters:
"S7_server" and "S7_a_type".

Assign to the system attributes the values which correspond to the message blocks which were called in your program code. The value for "S7_server" is "alarm_archiv" as a rule, the value for "S7_a_type" corresponds to the called message block, i.e. "alarm_s" here.


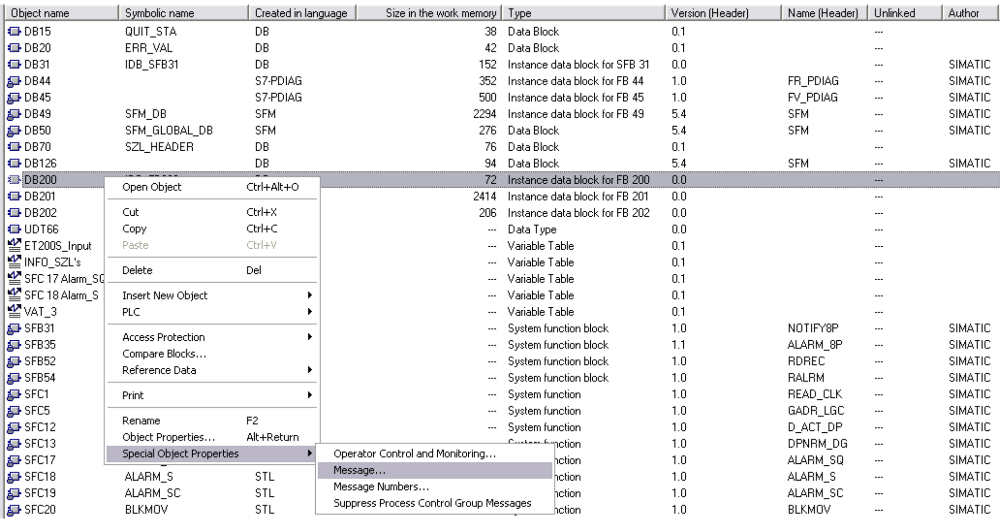
<table>
<tr><th></th><th>Attribute</th><th>Value</th></tr>
<tr><td>1</td><td>S7_a_type</td><td>alarm_s</td></tr>
<tr><td>2</td><td>S7_server</td><td>alarm_archiv</td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td></tr>
<tr><td>6</td><td></td><td></td></tr>
<tr><td>7</td><td></td><td></td></tr>
<tr><td>8</td><td></td><td></td></tr>
</table>

</td></tr>
<tr><td>3.</td><td>Program the calling of the message block in the statement section of the FB.
Connect the parameters of the system message block with the respective I/Os of the function block.
Save the function block then.

Notes:
The parameter "SIG" initiates the message.
The parameter "ID" is permanently assigned the value "W#16#EEEE".
The parameter "EV_ID" gets the message number generated by the system.
You can use the parameter "SD" to configure an associated value.
The parameter "RET_VAL" contains error information.</td></tr>
<tr><td>4.</td><td>Call the function block in your program.
Note:
The IDs for the messages are automatically generated by STEP 7. These IDs must not be changed!</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

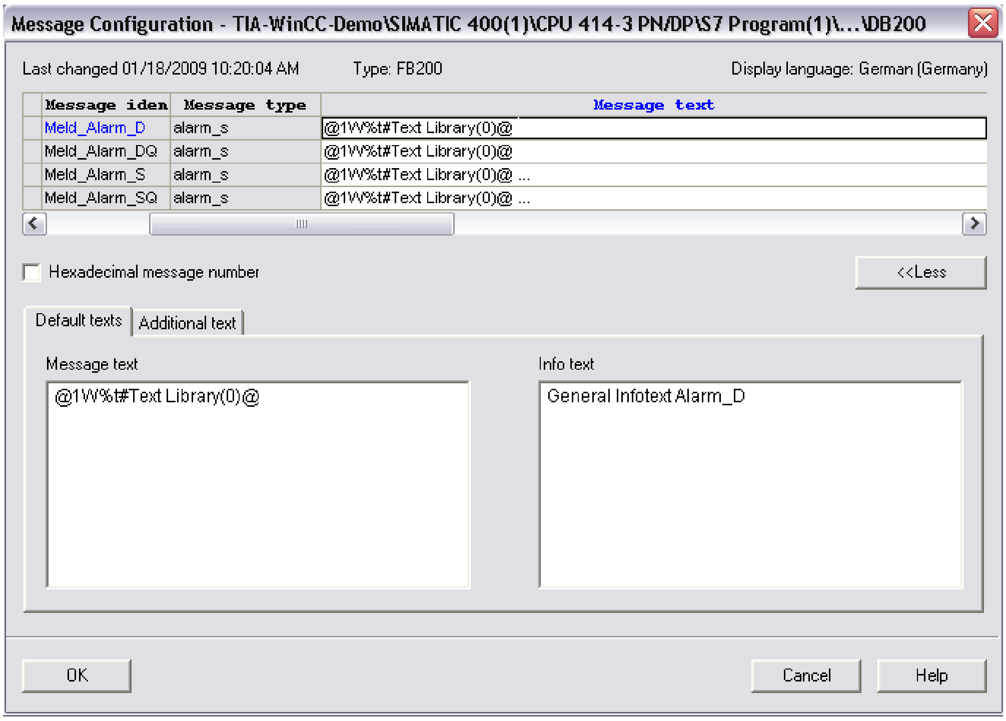
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5.</td><td>Select the instance data block of the FB in the SIMATIC Manager. Go to "Special Object Properties > Message..." in the context menu.



<table>
<tr><th>Object name</th><th>Symbolic name</th><th>Created in language</th><th>Size in the work memory</th><th>Type</th><th>Version (Header)</th><th>Name (Header)</th><th>Unlinked</th><th>Author</th></tr>
<tr><td>DB15</td><td>QUIT_STA</td><td>DB</td><td>38</td><td>Data Block</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>DB20</td><td>ERR_VAL</td><td>DB</td><td>42</td><td>Data Block</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>DB31</td><td>IDB_SFB31</td><td>DB</td><td>152</td><td>Instance data block for SFB 31</td><td>0.0</td><td></td><td>---</td><td>SIMATIC</td></tr>
<tr><td>DB44</td><td></td><td>S7-PDIAG</td><td>352</td><td>Instance data block for FB 44</td><td>1.0</td><td>FR_PDIAG</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>DB45</td><td></td><td>S7-PDIAG</td><td>500</td><td>Instance data block for FB 45</td><td>1.0</td><td>FV_PDIAG</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>DB49</td><td>SFM_DB</td><td>SFM</td><td>2294</td><td>Instance data block for FB 49</td><td>5.4</td><td>SFM</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>DB50</td><td>SFM_GLOBAL_DB</td><td>SFM</td><td>276</td><td>Data Block</td><td>5.4</td><td>SFM</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>DB70</td><td>SZL_HEADER</td><td>DB</td><td>76</td><td>Data Block</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>DB126</td><td></td><td>DB</td><td>94</td><td>Data Block</td><td>5.4</td><td>SFM</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>DB200</td><td></td><td></td><td>72</td><td>Instance data block for FB 200</td><td>0.0</td><td></td><td>---</td><td></td></tr>
<tr><td>DB201</td><td></td><td></td><td>2414</td><td>Instance data block for FB 201</td><td>0.0</td><td></td><td>---</td><td></td></tr>
<tr><td>DB202</td><td></td><td></td><td>206</td><td>Instance data block for FB 202</td><td>0.0</td><td></td><td>---</td><td></td></tr>
<tr><td>UDT66</td><td></td><td></td><td>---</td><td>Data Type</td><td>0.0</td><td></td><td>---</td><td></td></tr>
<tr><td>ET200S_Input</td><td></td><td></td><td>---</td><td>Variable Table</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>INFO_SZL's</td><td></td><td></td><td>---</td><td>Variable Table</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>SFC 17 Alarm_SQ</td><td></td><td></td><td>---</td><td>Variable Table</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>SFC 18 Alarm_S</td><td></td><td></td><td>---</td><td>Variable Table</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>VAT_3</td><td></td><td></td><td>---</td><td>Variable Table</td><td>0.1</td><td></td><td>---</td><td></td></tr>
<tr><td>SFB31</td><td></td><td></td><td>---</td><td>System function block</td><td>1.0</td><td>NOTIFY8P</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFB35</td><td></td><td></td><td>---</td><td>System function block</td><td>1.1</td><td>ALARM_8P</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFB52</td><td></td><td></td><td>---</td><td>System function block</td><td>1.0</td><td>RDREC</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFB54</td><td></td><td></td><td>---</td><td>System function block</td><td>1.0</td><td>RALRM</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC1</td><td></td><td></td><td>---</td><td>System function</td><td>1.0</td><td>READ_CLK</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC5</td><td></td><td></td><td>---</td><td>System function</td><td>1.0</td><td>GADR_LGC</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC12</td><td></td><td></td><td>---</td><td>System function</td><td>1.0</td><td>D_ACT_DP</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC13</td><td></td><td></td><td></td><td>nction</td><td>1.0</td><td>DPNRM_DG</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC17</td><td></td><td></td><td></td><td>nction</td><td>1.0</td><td>ALARM_SQ</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC18</td><td>ALARM_S</td><td>STL</td><td></td><td>nction</td><td>1.0</td><td>ALARM_S</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC19</td><td>ALARM_SC</td><td>STL</td><td></td><td>nction</td><td>1.0</td><td>ALARM_SC</td><td>---</td><td>SIMATIC</td></tr>
<tr><td>SFC20</td><td>BLKMOV</td><td>STL</td><td></td><td>nction</td><td>1.0</td><td>BLKMOV</td><td>---</td><td>SIMATIC</td></tr>
</table>

</td></tr>
<tr><td>6.</td><td>Input the message text for the messages.

Note:
You can either input the message text directly in the field "Message text" or, as shown in the figure, input a reference to the text library.
For further information, please refer to Chapter 5.5.7 .



Message Configuration - TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP\S7 Program(1)\...\DB200

Last changed 01/18/2009 10:20:04 AM Type: FB200 Display language: German (Germany)

<table>
<tr><th>Message iden</th><th>Message type</th><th>Message text</th></tr>
<tr><td>Meld_Alarm_D</td><td>alarm_s</td><td>@1W%t#Text Library(0)@</td></tr>
<tr><td>Meld_Alarm_DQ</td><td>alarm_s</td><td>@1W%t#Text Library(0)@</td></tr>
<tr><td>Meld_Alarm_S</td><td>alarm_s</td><td>@1W%t#Text Library(0)@ ...</td></tr>
<tr><td>Meld_Alarm_SQ</td><td>alarm_s</td><td>@1W%t#Text Library(0)@ ...</td></tr>
</table>

☐ Hexadecimal message number

Message text: @1W%t#Text Library(0)@

Info text: General Infotext Alarm_D

</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

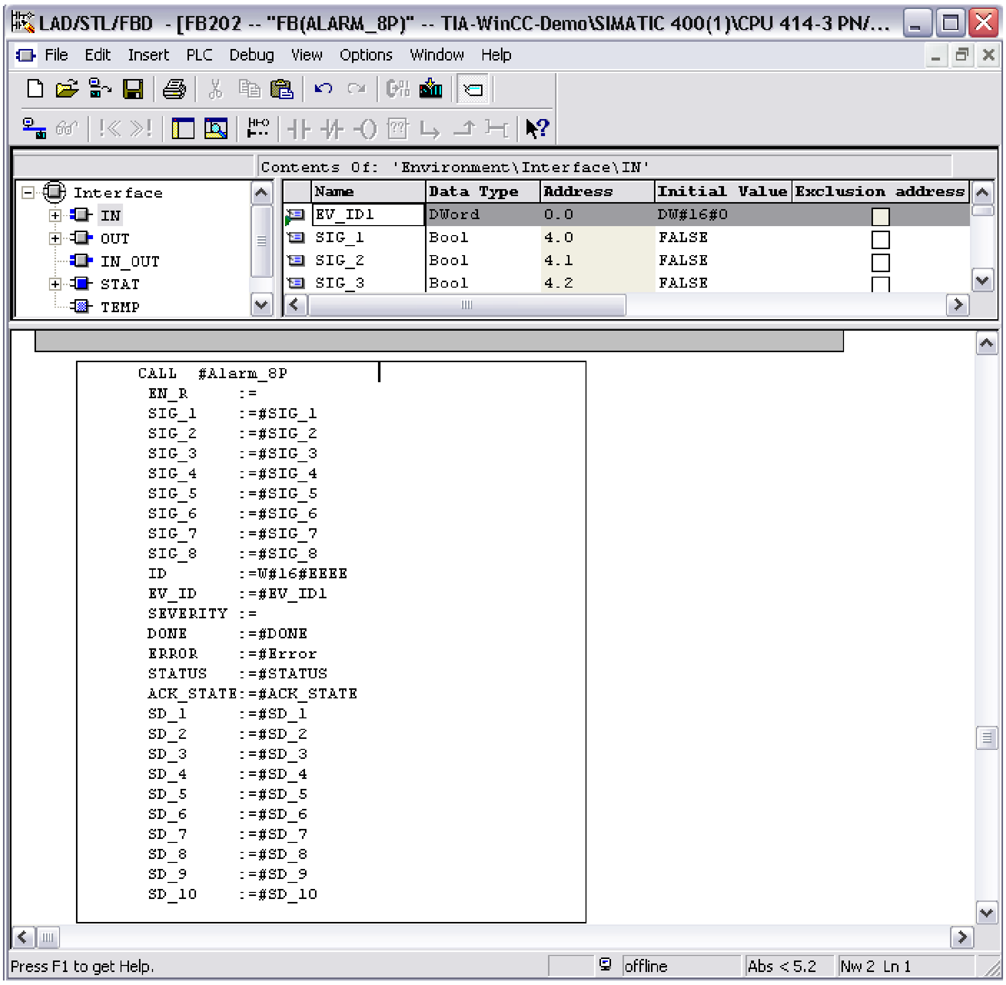
5.5.2 Compiling

To transfer the changes to WinCC a compilation must be started. For more information refer to the Chapter 3.6.

Copyright © Siemens AG Copyright 2009 All rights reserved

5.5.3 Configuring messages with "ALARM_8P"

Table 5-6

Step	Action
1.	You have to declare corresponding parameters in the variable declaration table for each message block which is called in FB: • For the parameter "IN" a symbolic name for the message block input of the data type "DWORD", e.g. "EV_ID1" and the required signals "SIG_x" and associated values "SD_x". • For the parameter "STAT" a symbolic name for the message block to be called with the corresponding data type, e.g. "SFB35" for Alarm_8P (see also Table 5.3.3.). Invoke the "Object Properties" of an interface symbol in the declaration part via the properties dialog then. **Note:** Only IN, OUT and IN_OUT parameters can be assigned a message attribute. 

LAD/STL/FBD - [FB202 -- "FB(ALARM_8P)" -- TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/...
File Edit Insert PLC Debug View Options Window Help
Interface
IN
OUT
IN_OUT
STAT
TEMP
Press F1 to get Help.
offline
Abs < 5.2
Nw 2 Ln 1

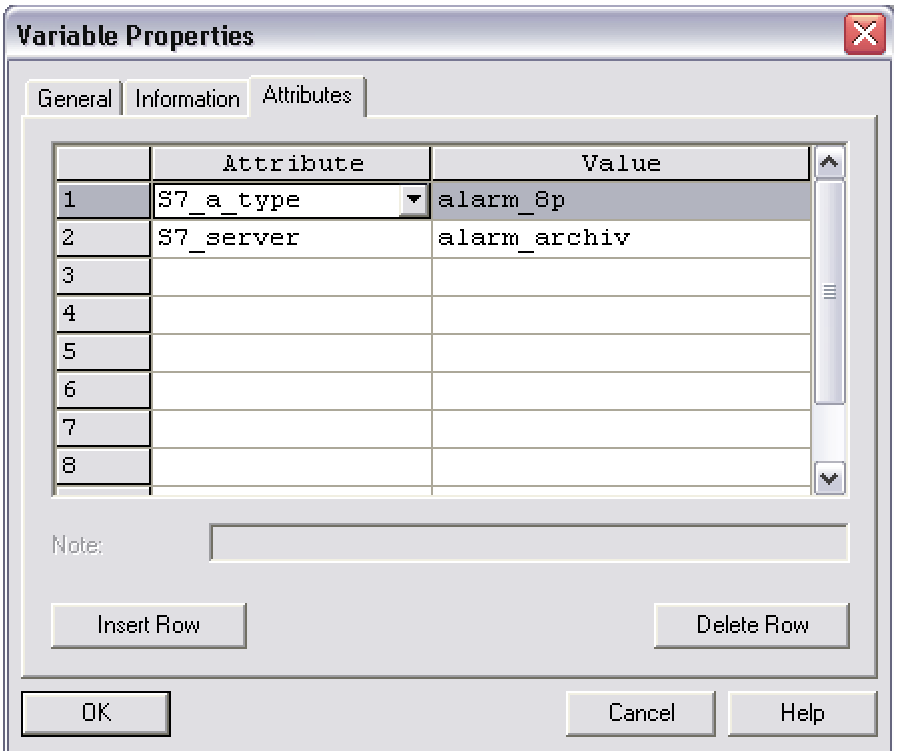
Contents Of: 'Environment\Interface\IN'

Name	Data Type	Address	Initial Value	Exclusion address
EV_ID1	DWord	0.0	DW#16#0	□
SIG_1	Bool	4.0	FALSE	□
SIG_2	Bool	4.1	FALSE	□
SIG_3	Bool	4.2	FALSE	□

```
      CALL  #Alarm_8P
       EN_R     :=
       SIG_1    :=#SIG_1
       SIG_2    :=#SIG_2
       SIG_3    :=#SIG_3
       SIG_4    :=#SIG_4
       SIG_5    :=#SIG_5
       SIG_6    :=#SIG_6
       SIG_7    :=#SIG_7
       SIG_8    :=#SIG_8
       ID       :=W#16#EEEE
       EV_ID    :=#EV_ID1
       SEVERITY :=
       DONE     :=#DONE
       ERROR    :=#Error
       STATUS   :=#STATUS
       ACK_STATE:=#ACK_STATE
       SD_1     :=#SD_1
       SD_2     :=#SD_2
       SD_3     :=#SD_3
       SD_4     :=#SD_4
       SD_5     :=#SD_5
       SD_6     :=#SD_6
       SD_7     :=#SD_7
       SD_8     :=#SD_8
       SD_9     :=#SD_9
       SD_10    :=#SD_10
```

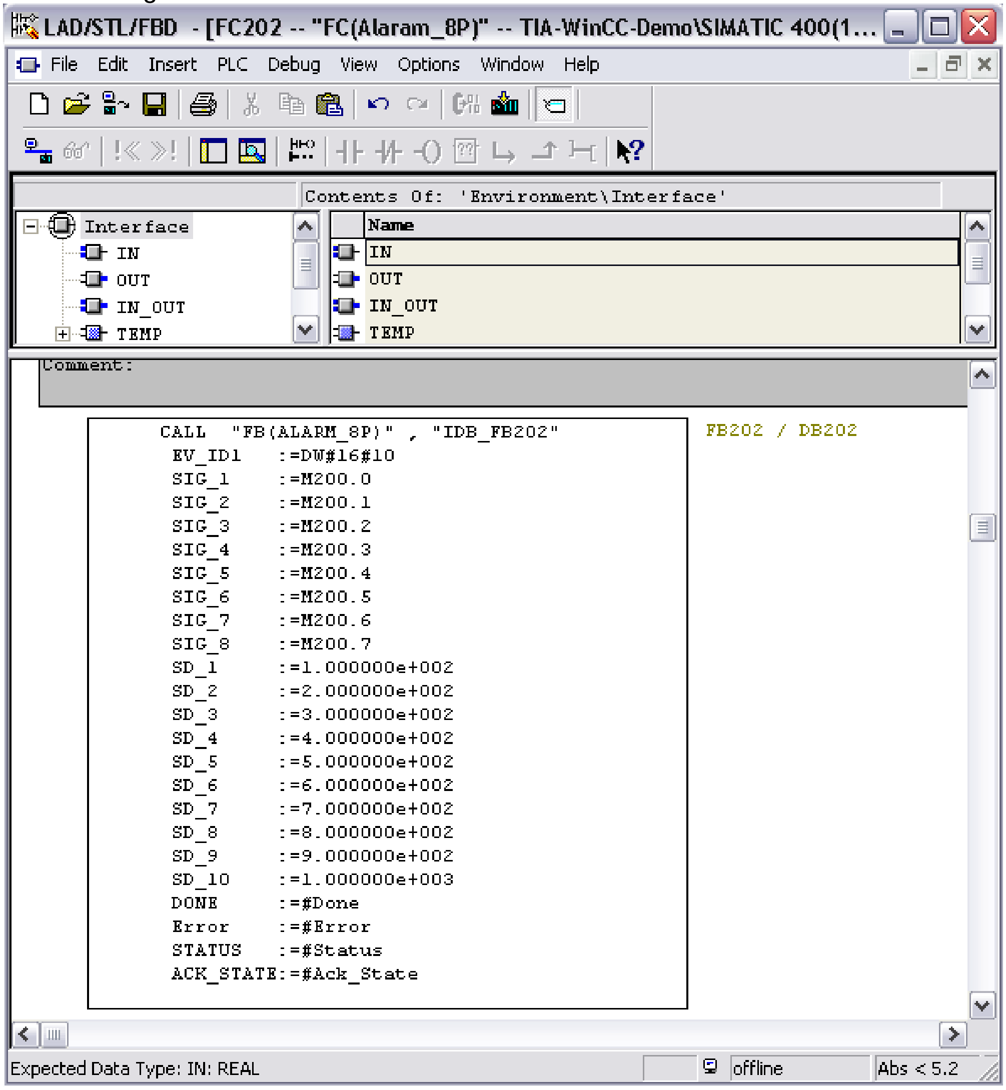
Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2.</td><td>Append the following system attributes for the parameters:
"S7_server" and "S7_a_type".

Assign to the system attributes the values which correspond to the message blocks which were called in your program code. The value for "S7_server" is "alarm_archiv" as a rule, the value for "S7_a_type" corresponds to the called message block, i.e. "alarm_8p" here.

Variable Properties
General
Information
Attributes
Note:
Insert Row
Delete Row
OK
Cancel
Help
<table>
<tr><th></th><th>Attribute</th><th>Value</th></tr>
<tr><td>1</td><td>S7_a_type</td><td>alarm_8p</td></tr>
<tr><td>2</td><td>S7_server</td><td>alarm_archiv</td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td></tr>
<tr><td>6</td><td></td><td></td></tr>
<tr><td>7</td><td></td><td></td></tr>
<tr><td>8</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>3.</td><td>Program the calling of the message block in the statement section of the FB.
Connect the parameters of the system message block with the respective I/Os of the function block.
Save the function block then.

<b>Notes:</b>
The parameters "SIG1" to "SIG8" initiate the messages.
The parameter "ID" is permanently assigned the value "W#16#EEEE".
The parameter "EV_ID" gets the message number generated by the system.
You can use the parameters "SD1" to "SD8" to configure associated values.
The parameters DONE, ERROR, STATUS and ACK_STATe inform about processing, error and alarm statuses.</td></tr>
</table>

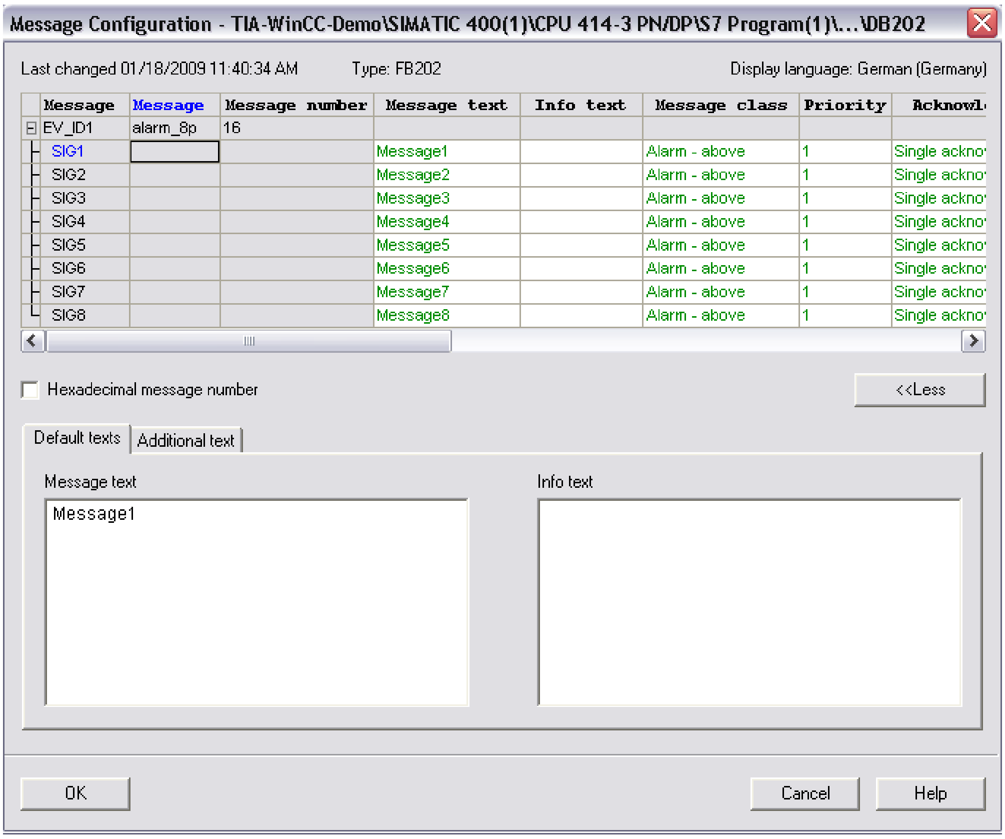
Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
4.	Call the function block in your program. **Note:** The IDs for the messages are automatically generated by STEP 7. These IDs must not be changed! 

LAD/STL/FBD - [FC202 -- "FC(Alaram_8P)" -- TIA-WinCC-Demo\SIMATIC 400(1...
File Edit Insert PLC Debug View Options Window Help
Contents Of: 'Environment\Interface'
Interface
IN
OUT
IN_OUT
TEMP
Name
IN
OUT
IN_OUT
TEMP
Comment:
FB202 / DB202
Expected Data Type: IN: REAL
offline
Abs < 5.2

```
      CALL  "FB(ALARM_8P)" , "IDB_FB202"
       EV_ID1   :=DW#16#10
       SIG_1    :=M200.0
       SIG_2    :=M200.1
       SIG_3    :=M200.2
       SIG_4    :=M200.3
       SIG_5    :=M200.4
       SIG_6    :=M200.5
       SIG_7    :=M200.6
       SIG_8    :=M200.7
       SD_1     :=1.000000e+002
       SD_2     :=2.000000e+002
       SD_3     :=3.000000e+002
       SD_4     :=4.000000e+002
       SD_5     :=5.000000e+002
       SD_6     :=6.000000e+002
       SD_7     :=7.000000e+002
       SD_8     :=8.000000e+002
       SD_9     :=9.000000e+002
       SD_10    :=1.000000e+003
       DONE     :=#Done
       Error    :=#Error
       STATUS   :=#Status
       ACK_STATE:=#Ack_State
```

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
5.	Select the instance data block of the FB in the SIMATIC Manager. Go to "Special Object Properties > Message..." in the context menu. Input the message text for the messages. 

Message Configuration - TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP\S7 Program(1)\...\DB202

Last changed 01/18/2009 11:40:34 AM Type: FB202 Display language: German (Germany)

Message	Message	Message number	Message text	Info text	Message class	Priority	Acknowl
EV_ID1	alarm_8p	16					
SIG1			Message1		Alarm - above	1	Single ackno
SIG2			Message2		Alarm - above	1	Single ackno
SIG3			Message3		Alarm - above	1	Single ackno
SIG4			Message4		Alarm - above	1	Single ackno
SIG5			Message5		Alarm - above	1	Single ackno
SIG6			Message6		Alarm - above	1	Single ackno
SIG7			Message7		Alarm - above	1	Single ackno
SIG8			Message8		Alarm - above	1	Single ackno

□ Hexadecimal message number

Message text: Message1

Info text:

Copyright © Siemens AG Copyright 2009 All rights reserved

5.5.4 Compiling

To transfer the changes to WinCC a compilation must be started. For more information refer to the Chapter 3.6.

5.5.5 Buffering messages with "ALRM7PBT"

On the one hand the "ALRM7PBT" function block can be used to transfer events from subsystems to WinCC buffered with existing time stamps. On the other hand local events can be processed with or without existing time stamp.

Copyright © Siemens AG Copyright 2009 All rights reserved

Application areas

The common alarm mechanisms "Alarm_8" and "Alarm_8P" can be used to transfer status changes of events/alarms to the WinCC system together with a time stamp. This time stamp refers to the time when the alarm block was invoked and not to the time when the event/alarm occurred.

"Alarm_8" and "Alarm_8P" can intermediately store two status changes of an event/alarm. Other status changes would get lost, for instance, upon a communication failure.

Whenever this system response is not sufficient, the solution described here can be used successfully:

- Certain applications entail the request to provide events/alarms which occur in subordinated systems with the original time stamp there and to transfer them together to WinCC via a central S7-400 control, e.g.
  - for hierarchical control topologies with subordinated S7-300 which do not support "Alarm_8",
  - signal time stamping in the ET 200M,
  - remote control.
- In the power plant field or Konti processes alarms should not get lost even if the coupling is disturbed temporarily or WinCC is not ready for receiving alarms.

  The "regular" alarm mechanisms of an S7-400 control can only store intermediately two status changes of an alarm; e.g.
  - Alarm1: max. pressure of boiler 002KOG1 exceeded
  - Alarm2: max. pressure of boiler 002KOG1 exceeded, going

Other status changes of the alarm signal would get lost, for instance, upon a communication failure.

Solution with the block ALRM7PBT

The ALRM7PBT block made available here acquires and buffers events/alarms with the corresponding time stamps and two associated values and transfers them to WinCC then.

For sending the events the ALRM7PBT block uses internally an "ALARM_8P" instance. The acquisition and the sending of the events are asynchronous.

The buffering ensures that events will not get lost even in the event of a rush of messages or temporary communication failures.

If the buffering capacity of the "ALRM7PBT" should not be sufficient, e.g. due to a prolonged communication failure (cable break), the signal 8 (SIG_8) of the internally invoked "ALARM_8P" block is used for the message "Buffer overflow coming". New further events are also acquired and stored if the buffer is full; the oldest events will be overwritten and get lost. After the communication fault has been remedied, the "ALRM7PBT" block signals "Buffer overflow going".

The internally used "ALARM_8P" is only invoked if the events have to be sent. After all buffered events have been processed, the "ALARM_8P" block is no longer invoked - which, ultimately, saves cycle time but which also means that acknowledgements from HMI cannot be evaluated by the user program.

Restart response:

A specific start behaviour has not been implemented in the block. If the user wants to reset the internal message buffer during the start, he has to invoke the respective "ALRM7PBT" instance in the restart OB himself and to reset it via the parameter "RESET".

Compatibility:

The block is executable on controls which support the "ALARM_8P".

The "ALRM7PBT" exclusively uses standard mechanisms. Thus no special software is required on the WinCC side.

List of interfaces:

Table 5-7

Parameters	Declaration	Data type	Memory area	Description
EN_SEND	INPUT	BOOL	E, A, M, D, L, konst	Enable for sending the events to the HMI
EN_READ	INPUT	BOOL	E, A, M, D, L, konst	Enable for acquiring the events
RESET	INPUT	BOOL	E, A, M, D, L, konst	Resetting the instance DB and thus the buffer
EXT_TS	INPUT	BOOL	E, A, M, D, L, konst	TRUE: Using the transferred external time stamps FALSE: Creating time stamp internally
SIG_i	INPUT	BOOL	E, A, M, D, L, konst	i-th signal to be monitored, positive and negative edges cause the acquisition of the coming/going events

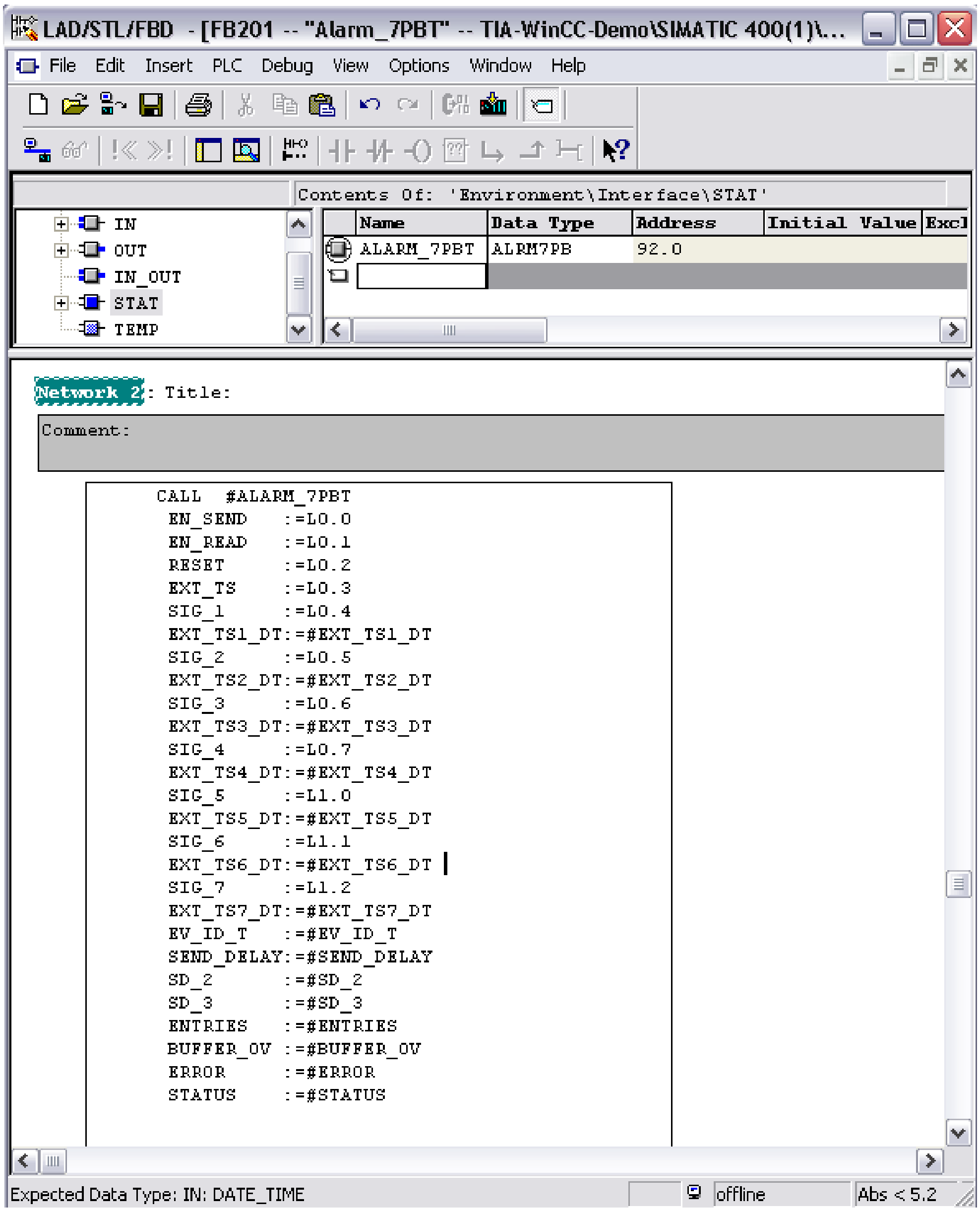
Copyright © Siemens AG Copyright 2009 All rights reserved

Parameters	Declaration	Data type	Memory area	Description
EXT_TSi_DT	INPUT	DT	D, L, konst	i-th time stamp to be transferred
EV_ID_T	INPUT	DWORD	E, A, M, D, L, konst	Message number; automatically assigned by the S7 message number server.
SEND_DELAY	INPUT	TIME	E, A, M, D, L, konst	Time distance of two successive messages; reduces the message load, e.g. after logging-on of HMI station
SD_1	INPUT	REAL	E, A, M, D, L, konst	1. Associated value of the message
SD_2	INPUT	REAL	E, A, M, D, L, konst	2. Associated value of the message
ENTRIES	OUTPUT	INT	E, A, M, D, L, konst	Number of currently buffered events
BUFFER_OV	OUTPUT	BOOL	E, A, M, D, L, konst	Buffer overflow
ERROR	OUTPUT	BOOL	E, A, M, D, L, konst	Error of the ALARM_8P
STATUS	OUTPUT	WORD	E, A, M, D, L, konst	Status of the ALARM_8P

Copyright © Siemens AG Copyright 2009 All rights reserved

Parameter declaration:

Figure 5-4



LAD/STL/FBD - [FB201 -- "Alarm_7PBT" -- TIA-WinCC-Demo\SIMATIC 400(1)\...

Contents Of: 'Environment\Interface\STAT'

- IN
- OUT
- IN_OUT
- STAT
- TEMP

Name	Data Type	Address	Initial Value	Excl
ALARM_7PBT	ALRM7PB	92.0		

Network 2: Title:

Comment:

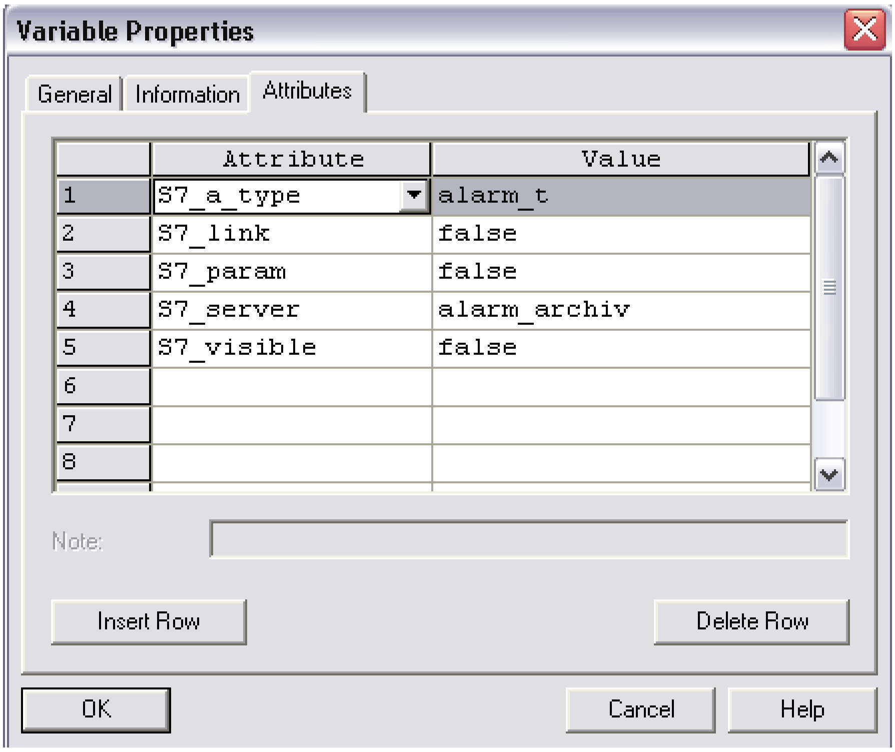
```
      CALL  #ALARM_7PBT
       EN_SEND    :=L0.0
       EN_READ    :=L0.1
       RESET      :=L0.2
       EXT_TS     :=L0.3
       SIG_1      :=L0.4
       EXT_TS1_DT:=#EXT_TS1_DT
       SIG_2      :=L0.5
       EXT_TS2_DT:=#EXT_TS2_DT
       SIG_3      :=L0.6
       EXT_TS3_DT:=#EXT_TS3_DT
       SIG_4      :=L0.7
       EXT_TS4_DT:=#EXT_TS4_DT
       SIG_5      :=L1.0
       EXT_TS5_DT:=#EXT_TS5_DT
       SIG_6      :=L1.1
       EXT_TS6_DT:=#EXT_TS6_DT
       SIG_7      :=L1.2
       EXT_TS7_DT:=#EXT_TS7_DT
       EV_ID_T    :=#EV_ID_T
       SEND_DELAY:=#SEND_DELAY
       SD_2       :=#SD_2
       SD_3       :=#SD_3
       ENTRIES    :=#ENTRIES
       BUFFER_OV  :=#BUFFER_OV
       ERROR      :=#ERROR
       STATUS     :=#STATUS
```

Expected Data Type: IN: DATE_TIME   offline   Abs < 5.2

Copyright © Siemens AG Copyright 2009 All rights reserved

System attributes for the parameters:

Figure 5-5



	Attribute	Value
1	S7_a_type	alarm_t
2	S7_link	false
3	S7_param	false
4	S7_server	alarm_archiv
5	S7_visible	false
6		
7		
8		

5.5.6 Entering associated values in messages

To append current information, e.g. of the process, to block-related and symbol-related messages you can insert associated values at any points of a message text.

Procedure:

- Put together a block with the following structure:
  @<No. of the associated value><element type><format>@.
- Insert this block at positions in the message text where the associated value is to be displayed.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Element type:

Used to uniquely configure the data type of the associated value:

Table 5-8

Element type	Data type
Y	BYTE
W	WORD
X	DWORD
I	INTEGER
D	INTEGER
B	BOOL
C	CHAR
R	REAL

The element type only makes unique the data type which is transferred by the AS. It is not used as casting operator.

Format:

Determine the output format of the associated value on the output device. The format output is started with the character "%". The following fixed formats exist for message texts:

Table 5-9

Format	Description
%[i]X	Hexadecimal number with i digits
%[i]u	Decimal number, unsigned with i digits.
%[i]d	Decimal number, signed with i digits.
%[i]b	Binary number with i digits.
%[i][.y]f	Fixed point number Signed value of the form [-]dddd.dddd dddd: one or several numbers with y digits after the decimal point and i total digits.
%[i]s	Character string (ANSI string) with i digits Characters are printed up to the first 0 byte (00Hex).
%t#<name of text library>	Access to text library.

If the format display is too short, the value will be output in full length nevertheless.

If the format display is too long, a matching number of blanks will be output in front of the value.

Note Please note that you can enter "[i]" optionally where the squared brackets have to be left out when you enter the i.

Examples of associated values:

- @1I%6d@: The value of the associated value 1 is displayed as a decimal number with maximally 6 digits.
- @2R%6f@: The value "5.4", for instance, of the associated value 2 is displayed as fixed point number "5.4" (three leading blanks).
- @2R%2f@: The value "5.4", for instance, of the associated value 2 is displayed as fixed point number "5.4" (no cutting if the number of digits is too small).
- @1W%t#Textbib1@: Associated value 1 of data type WORD is the index.

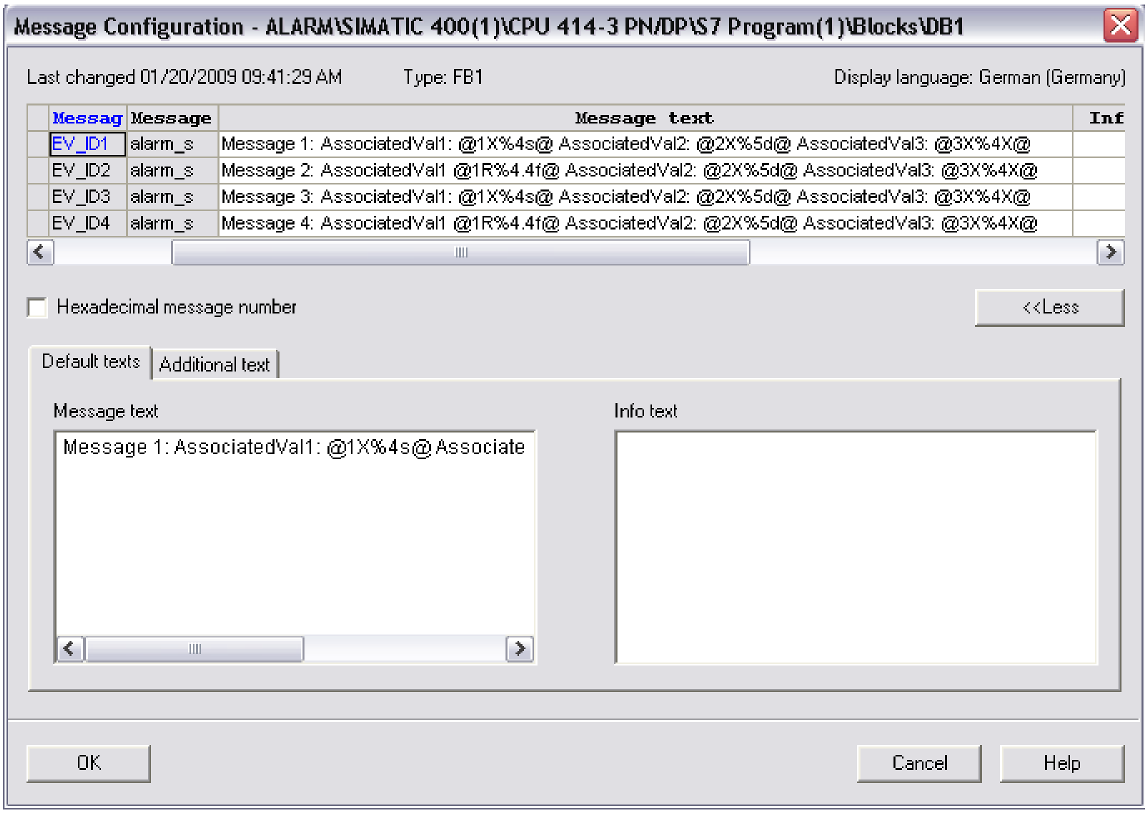
Note For S7-PDIAG "C" must be specified as the element type for CHAR and "R" for REAL as a rule. "X" must be given for the other element types BOOL, BYTE, WORD, INT, DWORD and DINT valid for S7-PDIAG as a rule.

If you want to append to one of the ALARM_S blocks more than one associated value, you can append an array with maximally 12 bytes length. This can be, for instance, maximally 12 bytes or chars, maximally 6 Word or Int or maximally 3 DWord, Real or DInt.

Copyright © Siemens AG Copyright 2009 All rights reserved

Message with associated value:

Figure 5-6



Message Configuration - ALARM\SIMATIC 400(1)\CPU 414-3 PN/DP\S7 Program(1)\Blocks\DB1

Last changed 01/20/2009 09:41:29 AM Type: FB1 Display language: German (Germany)

	Messag	Message	Message text	Inf
	EV_ID1	alarm_s	Message 1: AssociatedVal1: @1X%4s@ AssociatedVal2: @2X%5d@ AssociatedVal3: @3X%4X@	
	EV_ID2	alarm_s	Message 2: AssociatedVal1 @1R%4.4f@ AssociatedVal2: @2X%5d@ AssociatedVal3: @3X%4X@	
	EV_ID3	alarm_s	Message 3: AssociatedVal1: @1X%4s@ AssociatedVal2: @2X%5d@ AssociatedVal3: @3X%4X@	
	EV_ID4	alarm_s	Message 4: AssociatedVal1 @1R%4.4f@ AssociatedVal2: @2X%5d@ AssociatedVal3: @3X%4X@	

□ Hexadecimal message number

Message text: Message 1: AssociatedVal1: @1X%4s@ Associate

Info text:

5.5.7 Using text libraries

There are two types of text libraries to create or edit messages:

- User text libraries
- System text libraries

System text libraries and user text libraries provide a list of texts which can be integrated into messages, updated dynamically in runtime and displayed on the PU or other output devices.

Messages in system text libraries and user text libraries can be compiled externally.

You can integrate any number of texts from maximally four different text libraries into one message. The texts can be placed freely, therefore it is possible to also use them in messages in other languages.

Procedure:

- In the SIMATIC Manager select the CPU or an object which is subordinated to the CPU and select the menu option "Options > Text

Copyright © Siemens AG Copyright 2009 All rights reserved

Libraries > System Text Library" or "Options > Text Libraries > User Text Library" to open a text library.

- Determine the index of the text which you want to integrate.
- Enter a wildcard with the format @[Index]%t#[Textbib]@ at the position in the message where the text is to appear.

Note [Index] = e.g. 1W, where 1W is the first associated value of the message with the type WORD.

NOTE **You can only integrate texts into messages from user text libraries if you have selected the assignment of the message numbers used CPU-wide.**

Copyright © Siemens AG Copyright 2009 All rights reserved

Example:

Configured message text: Pressure has increased @2W%t#Textbib1@.
Text library with the name "Textbib1":

Table 5-10

Index	German	French
1734	zu hoch	trop haut

Translating text libraries:

The texts in system text libraries are provided by STEP 7 or STEP 7-option packages. There can be several text libraries for one CPU which can be translated to the required languages.

The languages which are available in a project can be selected via "Options > Language for Display Devices" in the SIMATIC Manager. It is also possible to add or delete languages later.

If you want to translate a text library via "Options > Manage multilingual texts > Export", an export file is created which you can edit, for instance, with Microsoft EXCEL. After opening it a table is displayed whose columns give different languages. For further information refer to the Chapter 5.6.1.

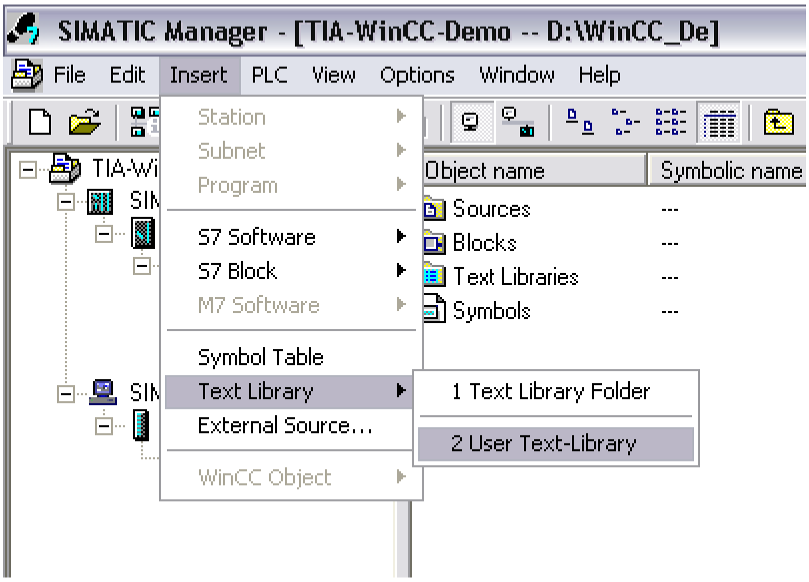
NOTE **An export file in the CSV format must not be opened with a double-click on the file. Open this file via "File > Open" in Microsoft EXCEL instead.**

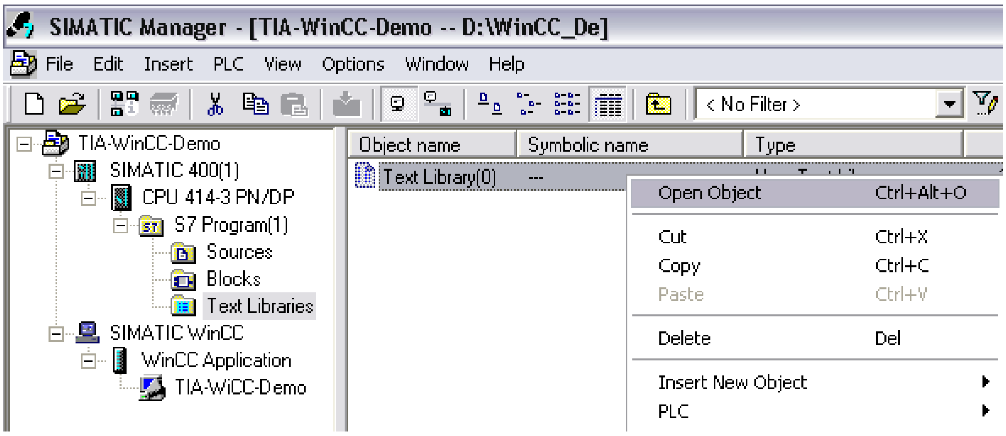
Copyright © Siemens AG Copyright 2009 All rights reserved

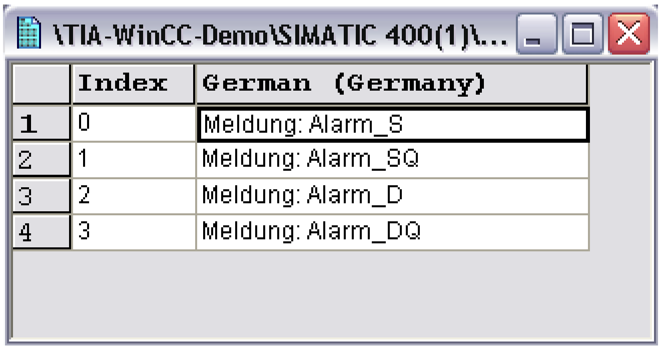
Creating user text libraries:

Table 5-11

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>Add a new user text library via "Insert > Text Library > User Text Library".


</td></tr>
<tr><td>2.</td><td>Open the text library.

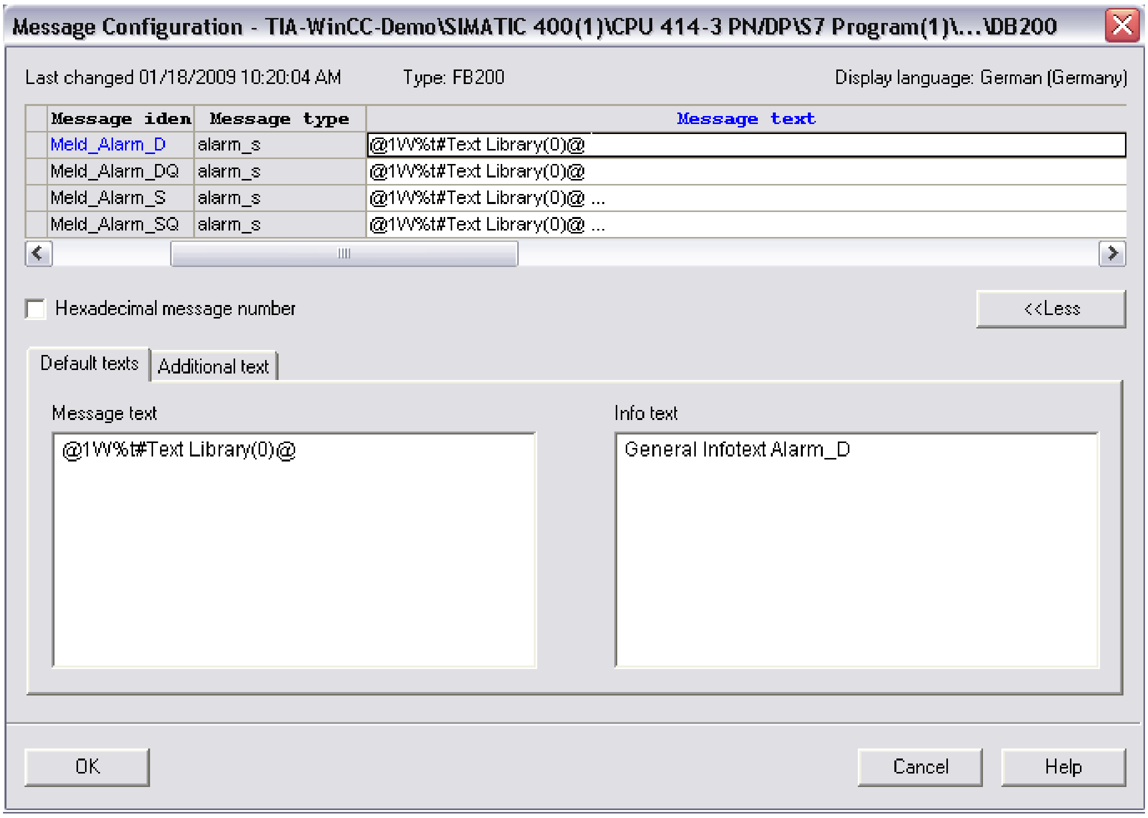

</td></tr>
<tr><td>3.</td><td>Create the texts in the text library.



<table>
<tr><th></th><th>Index</th><th>German (Germany)</th></tr>
<tr><td>1</td><td>0</td><td>Meldung: Alarm_S</td></tr>
<tr><td>2</td><td>1</td><td>Meldung: Alarm_SQ</td></tr>
<tr><td>3</td><td>2</td><td>Meldung: Alarm_D</td></tr>
<tr><td>4</td><td>3</td><td>Meldung: Alarm_DQ</td></tr>
</table></td></tr>
</table>

Message text from the text library:

Figure 5-7



Message Configuration - TIA-WinCC-Demo\SIMATIC 400(1)\CPU 414-3 PN/DP\S7 Program(1)\...\DB200

Last changed 01/18/2009 10:20:04 AM Type: FB200 Display language: German (Germany)

Message iden	Message type	Message text
Meld_Alarm_D	alarm_s	@1W%t#Text Library(0)@
Meld_Alarm_DQ	alarm_s	@1W%t#Text Library(0)@
Meld_Alarm_S	alarm_s	@1W%t#Text Library(0)@ ...
Meld_Alarm_SQ	alarm_s	@1W%t#Text Library(0)@ ...

□ Hexadecimal message number

Message text: @1W%t#Text Library(0)@

Info text: General Infotext Alarm_D

5.6 Language settings

STEP 7 supports several languages for the creation of messages.

When you create messages the language settings in STEP 7 must comply with those of WinCC.

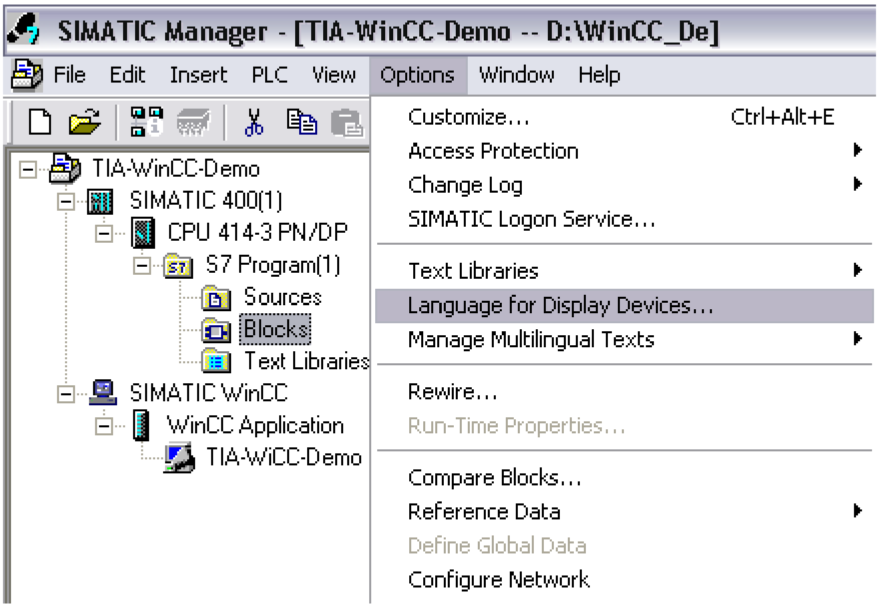
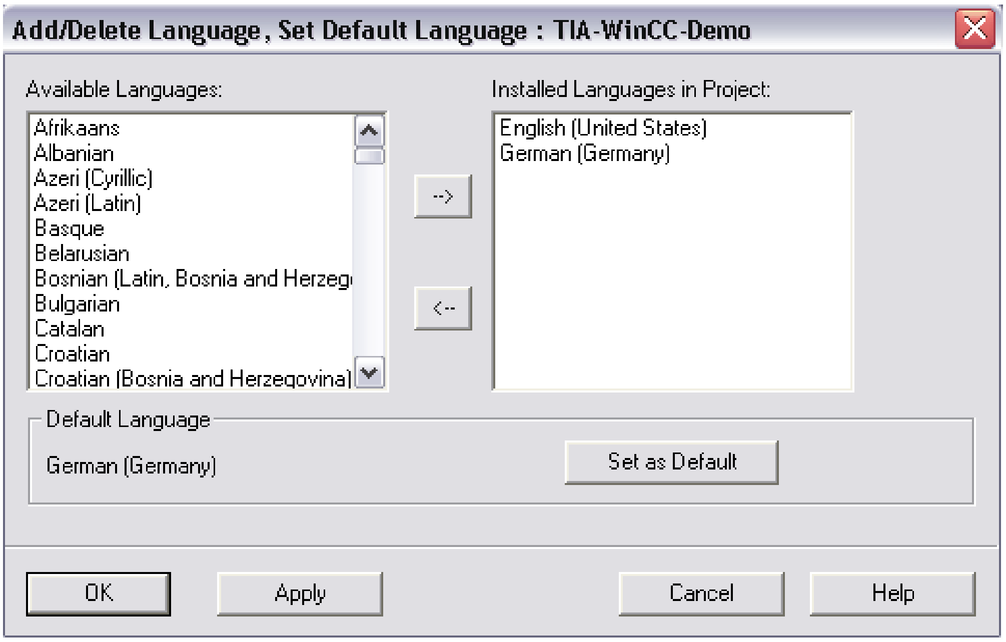
If different languages have been selected, inconsistencies may result during the translation.

Copyright © Siemens AG Copyright 2009 All rights reserved

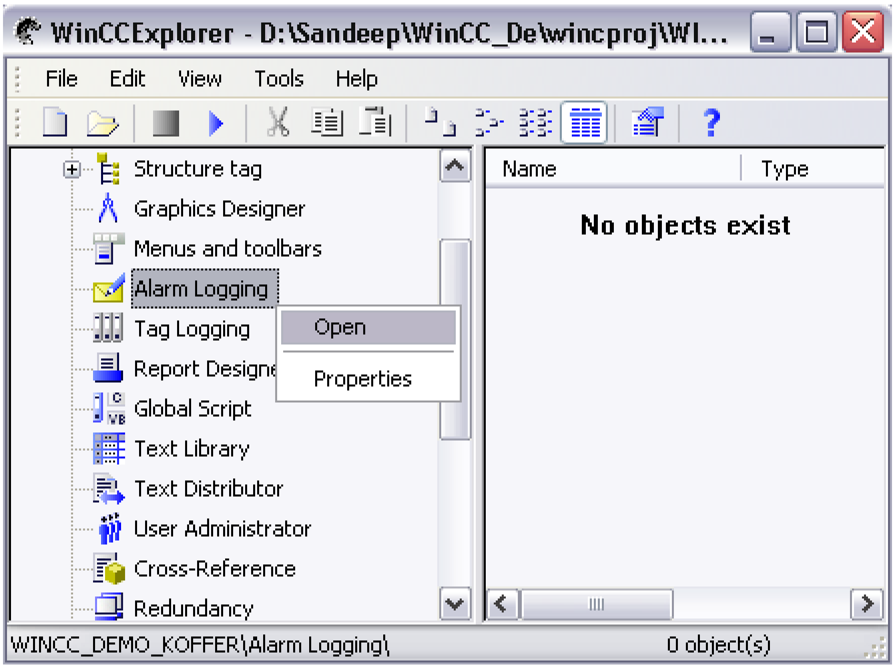
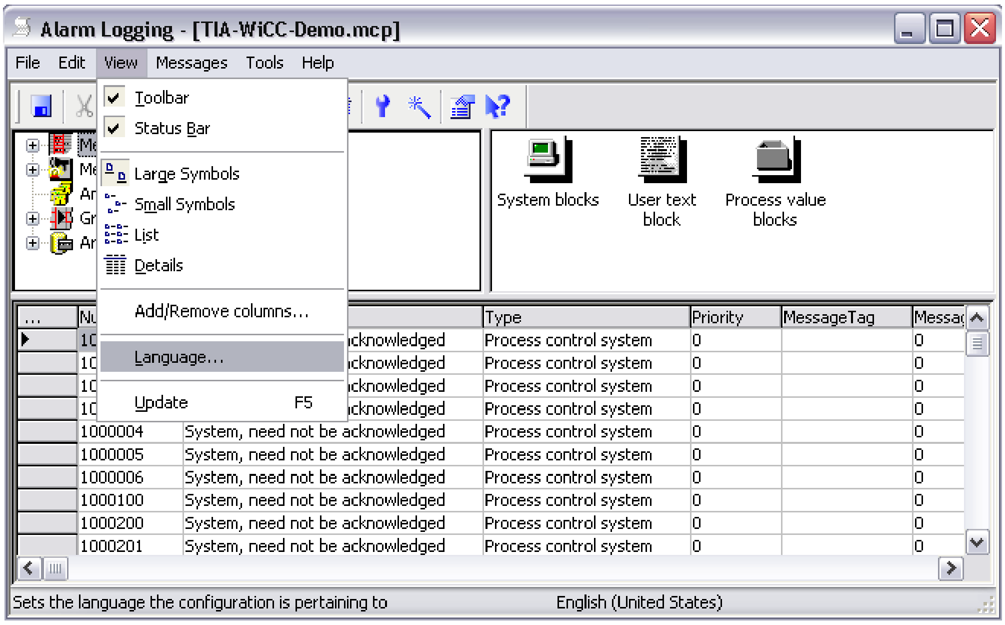
Copyright © Siemens AG Copyright 2009 All rights reserved

Procedure:

Table 5-12

Step	Action
1.	Select "Options > Language for Display Devices...".  SIMATIC Manager - [TIA-WinCC-Demo -- D:\WinCC_De] File Edit Insert PLC View Options Window Help TIA-WinCC-Demo SIMATIC 400(1) CPU 414-3 PN/DP S7 Program(1) Sources Blocks Text Libraries SIMATIC WinCC WinCC Application TIA-WiCC-Demo Customize... Ctrl+Alt+E Access Protection Change Log SIMATIC Logon Service... Text Libraries Language for Display Devices... Manage Multilingual Texts Rewire... Run-Time Properties... Compare Blocks... Reference Data Define Global Data Configure Network
2.	Select a language via the "Set as Default" button.  Add/Delete Language, Set Default Language : TIA-WinCC-Demo Available Languages: Afrikaans Albanian Azeri (Cyrillic) Azeri (Latin) Basque Belarusian Bosnian (Latin, Bosnia and Herzeg Bulgarian Catalan Croatian Croatian (Bosnia and Herzegovina) --> <-- Set as Default OK Apply Cancel Help Installed Languages in Project: English (United States) German (Germany) Default Language German (Germany)

Copyright © Siemens AG Copyright 2009 All rights reserved

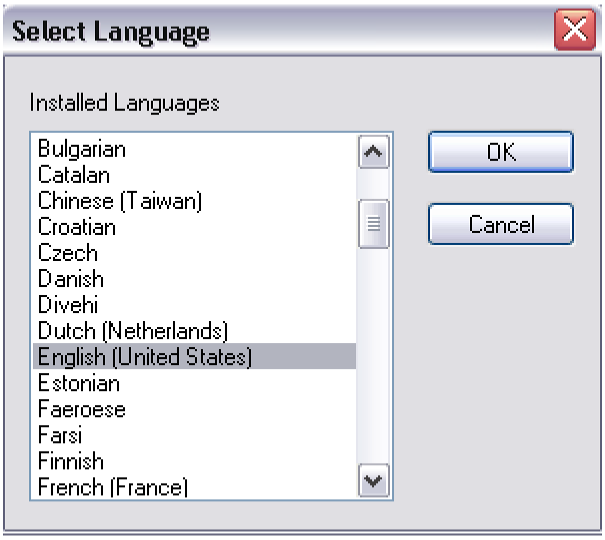
Step	Action
3.	Open "Alarm Logging" in WinCC. 
4.	Open the selection window via "View > Language...". 

No objects exist

WINCC_DEMO_KOFFER\Alarm Logging\ 0 object(s)

...	Nu		Type	Priority	MessageTag	Messa
	10	cknowledged	Process control system	0		0
	10	cknowledged	Process control system	0		0
	10	cknowledged	Process control system	0		0
	10	cknowledged	Process control system	0		0
	1000004	System, need not be acknowledged	Process control system	0		0
	1000005	System, need not be acknowledged	Process control system	0		0
	1000006	System, need not be acknowledged	Process control system	0		0
	1000100	System, need not be acknowledged	Process control system	0		0
	1000200	System, need not be acknowledged	Process control system	0		0
	1000201	System, need not be acknowledged	Process control system	0		0

Sets the language the configuration is pertaining to English (United States)

Step	Action
5.	Select the same language as in STEP 7.  Select Language Installed Languages Bulgarian Catalan Chinese (Taiwan) Croatian Czech Danish Divehi Dutch (Netherlands) English (United States) Estonian Faeroese Farsi Finnish French (France)

5.6.1 Translating and editing user-relevant texts

Texts which are output on display devices during the process execution are usually input in the language in which the automation solution was programmed.

However, it frequently occurs that an operator who has to respond to the messages does not understand this language.

STEP 7 offers the option to translate all operator-relevant texts to any language. For that purpose the desired language must have been installed in your project already.

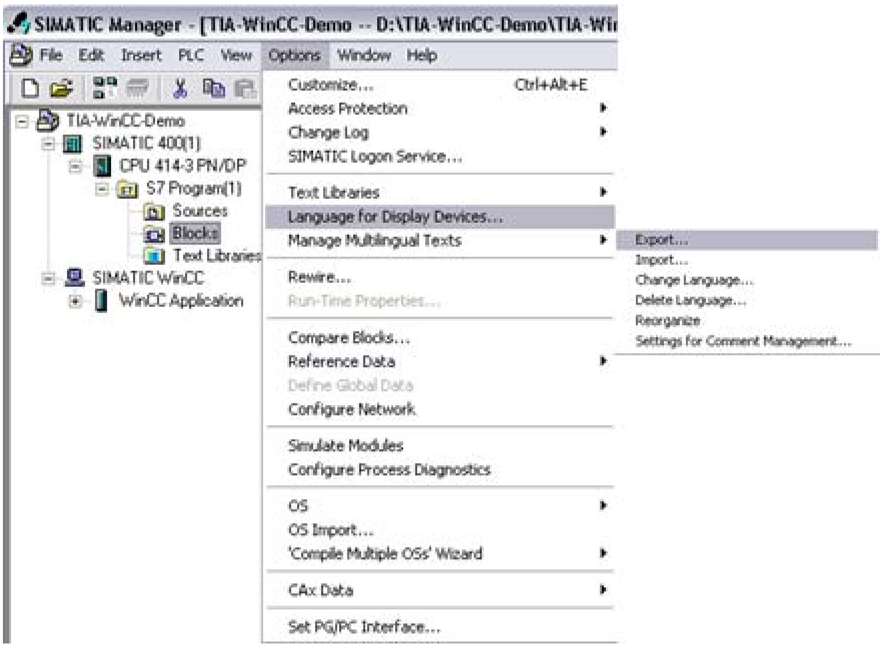
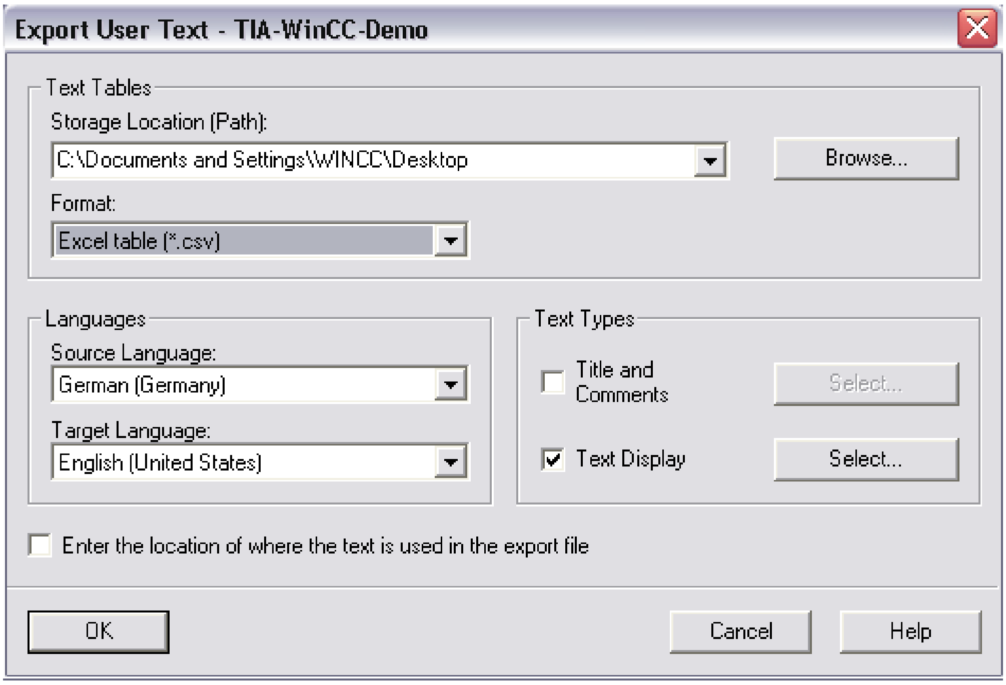
The languages which are available in a project can be selected via "Options > Language for Display Devices" in the SIMATIC Manager. It is also possible to add or delete languages later.

If you want to translate a text library via "Options > Manage Multilingual Texts > Export...", an export file is created which you can edit, for instance, with Microsoft EXCEL. After opening it a table is displayed whose columns give different languages.

After the export file has been processed in Excel you can reimport the revised export file to your project via "Options > Manage Multilingual Texts > Import...".

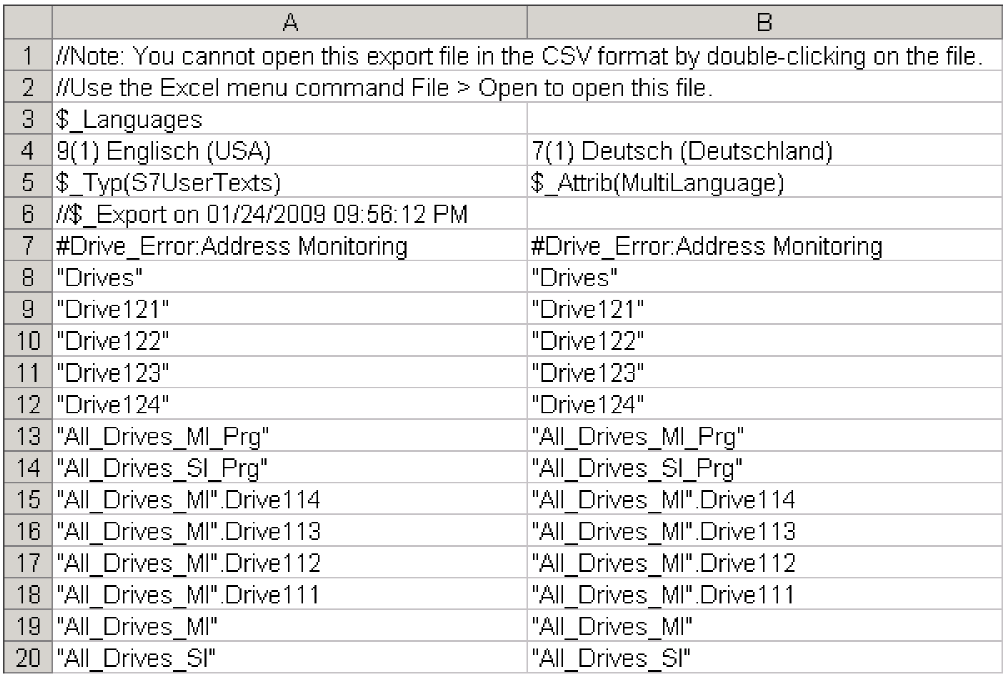
Copyright © Siemens AG Copyright 2009 All rights reserved

Table 5-13

Step	Action
1.	Create an export file via "Options > Manage Multilingual Texts > Export".  SIMATIC Manager - [TIA-WinCC-Demo -- D:\TIA-WinCC-Demo\TIA-Wi File Edit Insert PLC View Options Window Help TIA-WinCC-Demo SIMATIC 400(1) CPU 414-3 PN/DP S7 Program(1) Sources Blocks Text Libraries SIMATIC WinCC WinCC Application Customize... Ctrl+Alt+E Access Protection Change Log SIMATIC Logon Service... Text Libraries Language for Display Devices... Manage Multilingual Texts Rewire... Run-Time Properties... Compare Blocks... Reference Data Define Global Data Configure Network Simulate Modules Configure Process Diagnostics OS OS Import... 'Compile Multiple OSs' Wizard CAx Data Set PG/PC Interface... Export... Import... Change Language... Delete Language... Reorganize Settings for Comment Management...
2.	Select a storage path and a suitable format.  Export User Text - TIA-WinCC-Demo Text Tables Storage Location (Path): C:\Documents and Settings\WINCC\Desktop Format: Excel table (*.csv) Languages Source Language: German (Germany) Target Language: English (United States) Text Types ☐ Title and Comments ☑ Text Display ☐ Enter the location of where the text is used in the export file

Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3.</td><td>Open the file in Excel to edit it.



<table>
<tr><th></th><th>A</th><th>B</th></tr>
<tr><td>1</td><td>//Note: You cannot open this export file in the CSV format by double-clicking on the file.</td><td></td></tr>
<tr><td>2</td><td>//Use the Excel menu command File > Open to open this file.</td><td></td></tr>
<tr><td>3</td><td>$_Languages</td><td></td></tr>
<tr><td>4</td><td>9(1) Englisch (USA)</td><td>7(1) Deutsch (Deutschland)</td></tr>
<tr><td>5</td><td>$_Typ(S7UserTexts)</td><td>$_Attrib(MultiLanguage)</td></tr>
<tr><td>6</td><td>//$_Export on 01/24/2009 09:56:12 PM</td><td></td></tr>
<tr><td>7</td><td>#Drive_Error:Address Monitoring</td><td>#Drive_Error:Address Monitoring</td></tr>
<tr><td>8</td><td>"Drives"</td><td>"Drives"</td></tr>
<tr><td>9</td><td>"Drive121"</td><td>"Drive121"</td></tr>
<tr><td>10</td><td>"Drive122"</td><td>"Drive122"</td></tr>
<tr><td>11</td><td>"Drive123"</td><td>"Drive123"</td></tr>
<tr><td>12</td><td>"Drive124"</td><td>"Drive124"</td></tr>
<tr><td>13</td><td>"All_Drives_MI_Prg"</td><td>"All_Drives_MI_Prg"</td></tr>
<tr><td>14</td><td>"All_Drives_SI_Prg"</td><td>"All_Drives_SI_Prg"</td></tr>
<tr><td>15</td><td>"All_Drives_MI".Drive114</td><td>"All_Drives_MI".Drive114</td></tr>
<tr><td>16</td><td>"All_Drives_MI".Drive113</td><td>"All_Drives_MI".Drive113</td></tr>
<tr><td>17</td><td>"All_Drives_MI".Drive112</td><td>"All_Drives_MI".Drive112</td></tr>
<tr><td>18</td><td>"All_Drives_MI".Drive111</td><td>"All_Drives_MI".Drive111</td></tr>
<tr><td>19</td><td>"All_Drives_MI"</td><td>"All_Drives_MI"</td></tr>
<tr><td>20</td><td>"All_Drives_SI"</td><td>"All_Drives_SI"</td></tr>
</table>
</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

5.7 Further reading

Bibliographic references

This list is not complete and only represents a selection of relevant literature.

Table 5-14

	Topic	Title
/1/	STEP7 V5.4 Documentation Basic Knowledge	6ES7810-4CA08-8AW0
/2/	Documentation of WinCC V7.0	http://support.automation.siemens.com/WW/view/en/29489481

Internet links

This list is not complete and only represents a selection of relevant literature.

Table 5-15

	Topic	Title
\1\	Using message classes	http://support.automation.siemens.com/WW/view/de/31622970
\2\	Using associated values	http://support.automation.siemens.com/WW/view/de/24013249
\3\	Buffering of messages	http://support.automation.siemens.com/WW/view/de/20614217
\4\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

Copyright © Siemens AG Copyright 2009 All rights reserved

6 Diagnostics

6.1 Introduction

To stay internationally competitive in the industry, the continuous minimization of the production costs is decisive for the operators of plants and processes. Downtimes of production plants will lead to production losses and consequently they are an important cost factor.

The purpose of diagnostics is to reduce this cost factor decisively.

Types of diagnostics

Principally, two different origins are distinguished for the occurrence of faults and, accordingly, for the diagnostics:

- System diagnostics
  Detection, signalling and evaluation of faults within the automation system (e.g. wire break, module failure, program error, etc.)
- Process diagnostics
  Detection, signalling and evaluation of faults outside the automation system (e.g. movement disturbed, locking not effected, pressure too high, etc.).

Here it must be taken into account that a system error can usually lead to several process errors.

Display of the diagnostics

In runtime and during service the operator or service personnel must be able to determine and remove the error cause without a programming device and without programming knowledge.

Note

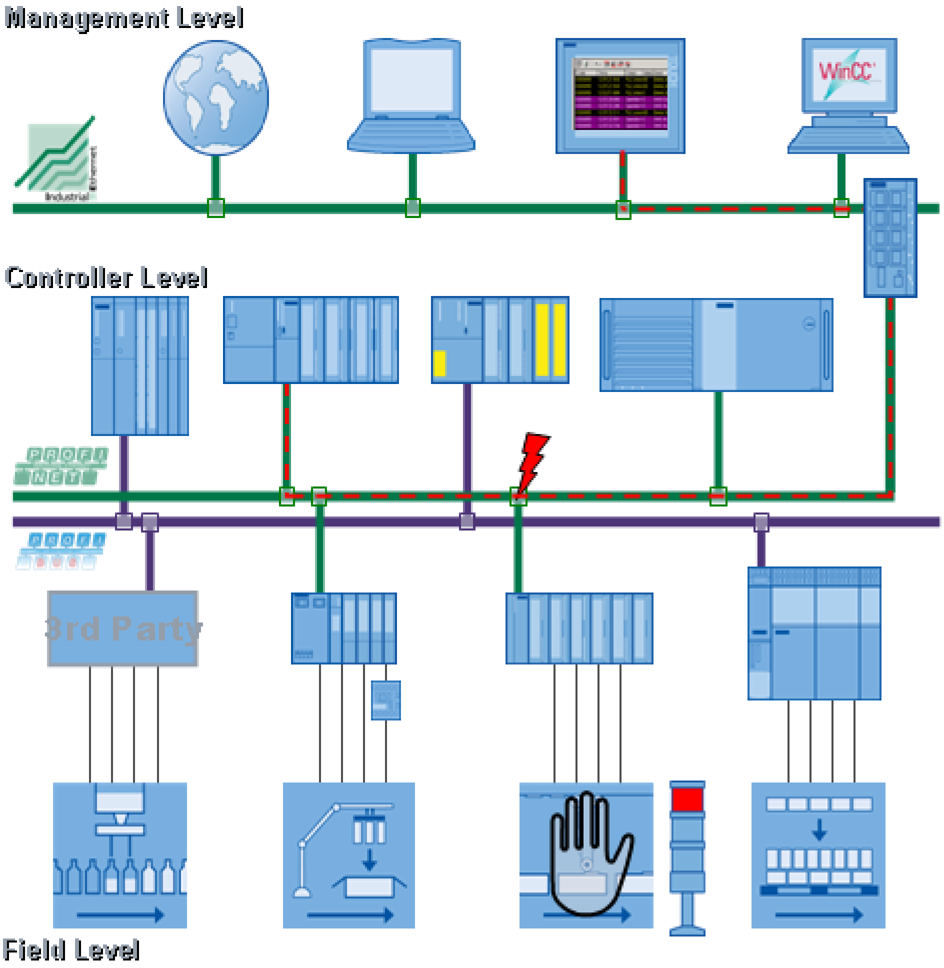
> As an alternative to the local in-situ diagnostics the WinCC/WebNavigator provides the option to get an overview over the plant with access via the internet.
>
> A WinCC diagnostics licence permits to perform management and remote maintenance services sequentially for many WinCC plants via a WinCC webserver from a small number of central remote maintenance computers.
>
> The licensing is performed on each diagnostics client instead of the WinCC/WebNavigator server.

Copyright © Siemens AG Copyright 2009 All rights reserved

Overview of the diagnostics

The following figure schematically shows the structure of the components involved in the diagnostics:

Figure 6-1



Copyright © Siemens AG Copyright 2009 All rights reserved

6.2 System diagnostics

Diagnostics with organisation blocks

Organisation blocks (OBs) are the interface between the operating system and the user program. They are invoked by the operating system and they control the cyclic and interrupt-driven program execution, the start response of the automation system and the error handling. You can program the organisation blocks and determine the response of the CPU in this way.

The errors which the S7 CPUs detect and to which you can respond with the help of organisation blocks can be divided into two categories:

- Asynchronous error OBs
- Synchronous error OBs

6.2.1 Asynchronous error OBs

Theses errors cannot be assigned directly to the processed user program. They are priority class errors, errors in the automation system (e.g. defective modules) or redundancy errors. If the respective asynchronous error OB has not been loaded, the CPU proceeds to STOP when the error occurs (exceptions: OB 70, OB 72, OB 81, OB 87).

Using the OBs for asynchronous errors

When the CPU operating system detects an asynchronous error, it starts the respective error OB (OB 70 to OB 73 and OB 80 to OB 87). The OBs for asynchronous errors have the highest priority preset for them: They cannot be interrupted by other OBs when all asynchronous error OBs have the same priority. If several asynchronous error OBs with the same priority occur simultaneously, they are processed in the order in which they occurred.

Note

To ignore alarms it is more efficient to lock them with SFC in the start instead of loading an empty OB (with the content BE).

For more information on this and on the individual organisation blocks refer to the reference manual "System Software for S7-300/400 System and Standard Functions":

http://support.automation.siemens.com/WW/view/en/1214574

Copyright © Siemens AG Copyright 2009 All rights reserved

Overview of the asynchronous errors

Table 6-1

OB	Triggering event
70	Peripheral redundancy error (only H-CPUs)
72	CPU redundancy error (only in H-CPUs, e.g. CPU failure)
80	Time error (e.g. cycle time exceeded)
81	Power supply error (e.g. battery fault)
82	Diagnostic alarm (e.g. short circuit in the input module)
83	Pull / plug alarm (e.g. pulling an input module)
84	CPU hardware error (error at the interface to the MPI network)
85	Program sequence error (e.g. OB not loaded)
86	Module rack failure
87	Communication error (e.g. wrong message identification in global data communication)

Delaying or locking start events

You can use the system functions (SFC) to delay or lock start events for some error OBs.

Table 6-2

SFC	Function
39	Locking alarm and asynchronous error events in general. Locked error events will not start in any of the subsequent CPU cycles, error OBs and will not lead to the programmed alternative reaction.
40	Enabling alarm and asynchronous error events.
41	Delaying alarm and asynchronous error events with a higher priority up to the OB end.
42	Enabling alarm and asynchronous error events with a higher priority.

Copyright © Siemens AG Copyright 2009 All rights reserved

6.2.2 Synchronous error OBs

Theses errors can be assigned to a certain part of the user program. The error is triggered by a certain operation during the processing. If the respective synchronous error OB has not been loaded, the CPU proceeds to STOP when the error occurs.

Using the OBs for synchronous errors

Synchronous errors are caused during the processing of a certain operation. When these errors occur, the operating system creates an entry in the U-stack and starts the OB for synchronous errors.

The error OBs which are invoked by synchronous errors are processed as part of the program in the same priority class as the block which is processed when the error is detected. The details of the error which triggered the OB call are given in the start information of the OB. You can use this information to respond to the error condition and return to the processing of your program (e.g. specify a substitute value with SFC 44 RPL_VAL in the case of access errors to an analog input module in OB 122). However, this also means an extra load on the L-stack of this priority class from the local data of the error OBs.

When S7-400 CPUs are used another synchronous error OB can be started from out of a synchronous error OB. With S7-300 CPUs this is not possible.

Copyright © Siemens AG Copyright 2009 All rights reserved

Note To ignore alarms it is more efficient to lock them with SFC in the start instead of loading an empty OB (with the content BE).

For more information on this and on the individual organisation blocks refer to the reference manual "System Software for S7-300/400 System and Standard Functions".

Overview of the synchronous errors

Table 6-3

OB	Triggering event
121	Programming error (e.g. DB not loaded)
122	Peripheral access error (e.g. access to a signal module which does not exist)

Masking of start events

You can mask the start events with system functions (SFC).

Table 6-4

SFC	Function
36	Masking individual synchronous error events. Masked error events do not start any error OBs and do not lead to any programmed alternative reaction.
37	Demasking synchronous error events.

6.2.3 Bus diagnostics in the control

Internally available diagnostic information

Table 6-5

OB / SFC	Application
OB82	Diagnostic alarm
OB86	Module rack failure
SFC13	Reading the diagnostic data (Slave diagnostics) of a DP slave
SFC49	Determines the slot of a logic address
SFC5	Determining the logic base address of a module
SFC51	Evaluation of the diagnostic buffer (reading out an SSL part list)

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

S7 standard blocks

The diagnostics package PNIODiag was created to simplify the diagnostics evaluation of distributed I/O modules in connection with S7 SIMATIC. The diagnostics evaluation is done both for PROFIBUS DP systems and also for PROFINET IO systems.

At present there are two variants:

- S7 block for CPUs with a storage capacity of S7 blocks > 16 KB
- S7 block for CPUs with a storage capacity of S7 blocks <= 16 KB

The operation and evaluation of the diagnostics is done entirely via the visualization.

The FB126 provides the following functions:

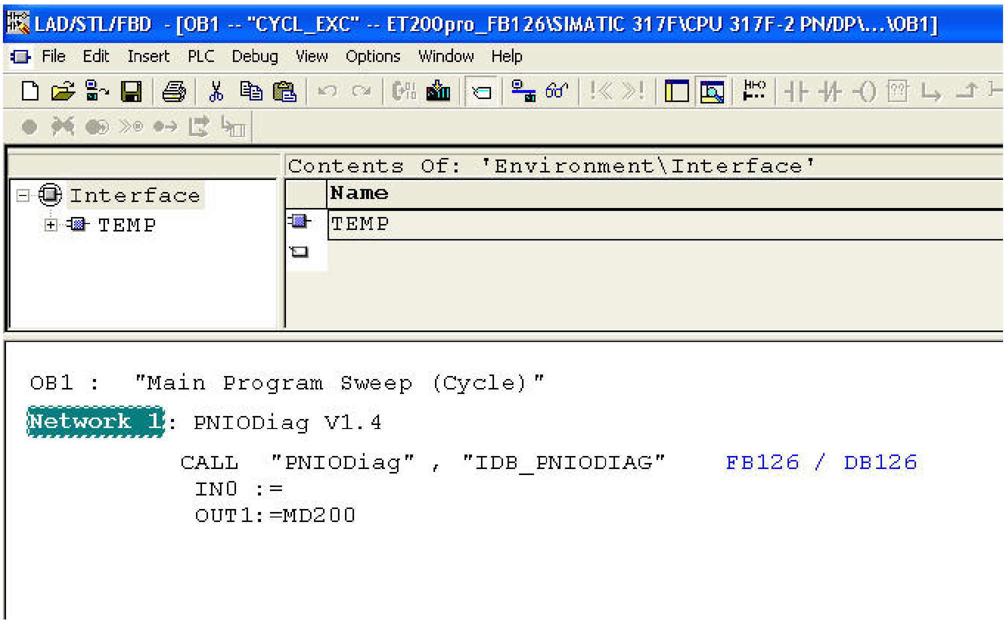
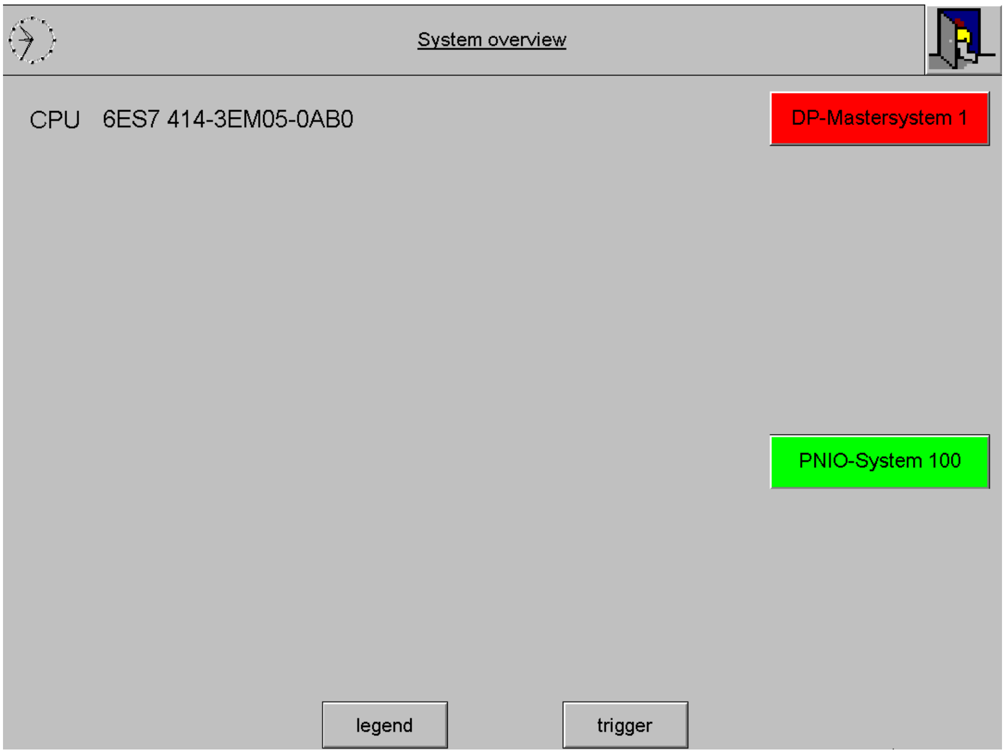
- Overview over the statuses of the connected I/O systems
- Overview over the station statuses of an I/O system
- Diagnostics display for diagnostics repeaters
- Detailed display of the station status - deactivating / activating stations.
- Triggering diagnostic events of a station
- Event memory

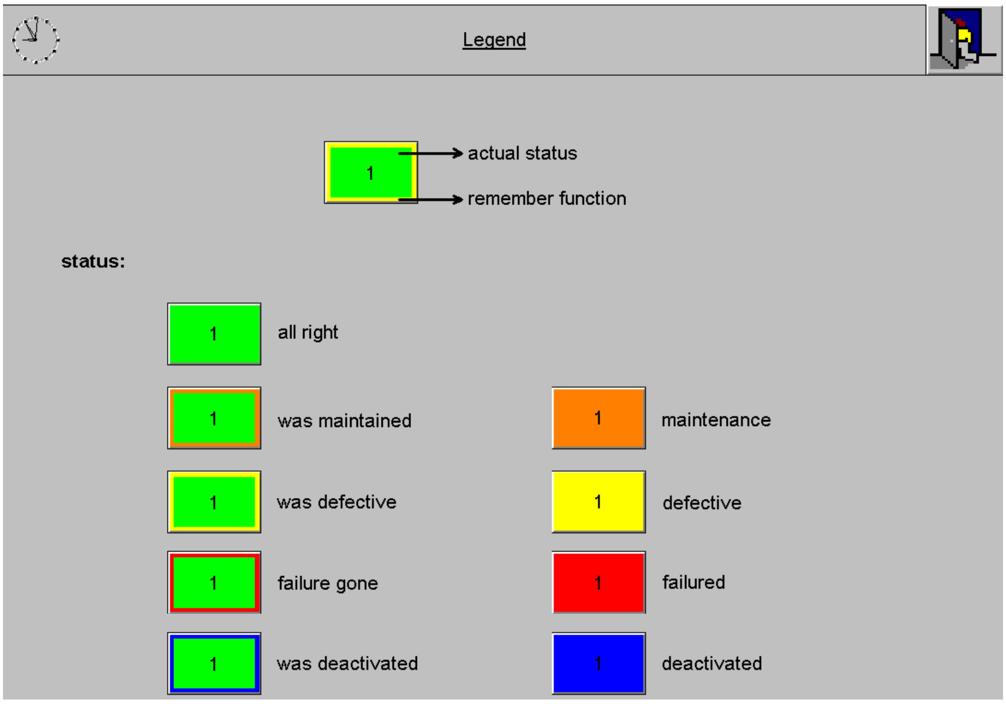
A sample project including the function block and the corresponding documentation are given at this link:

http://support.automation.siemens.com/WW/view/en/26996747

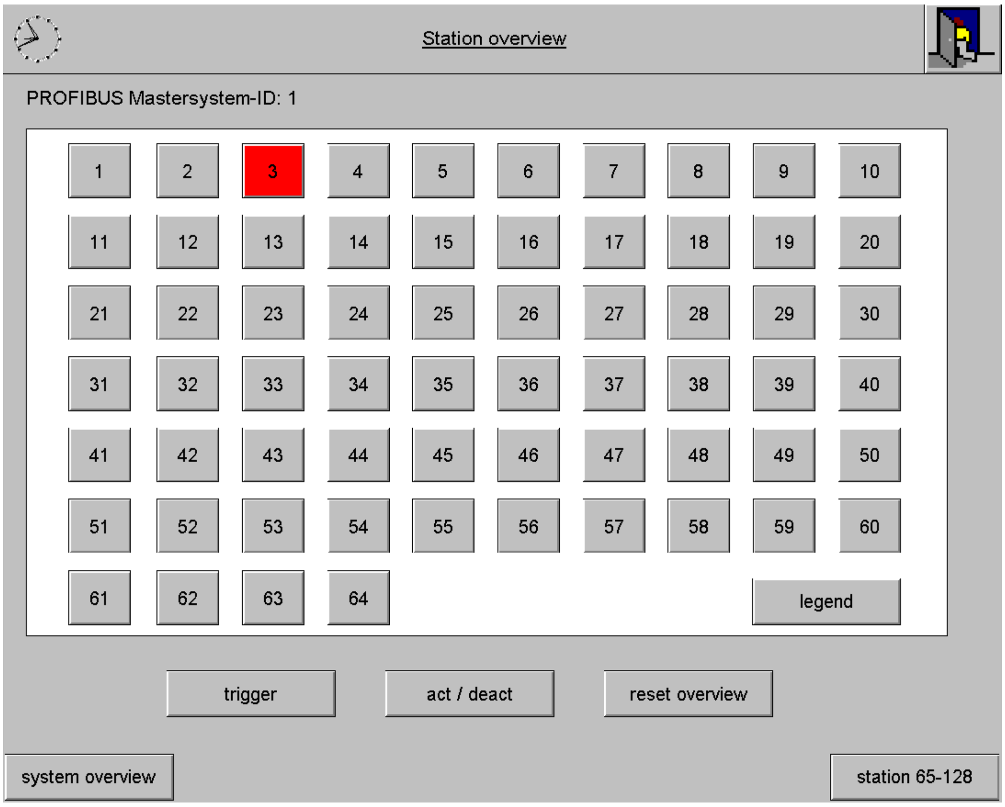
Copyright © Siemens AG Copyright 2009 All rights reserved

Table 6-6

Step	Action
1.	Call the function block in your program.  LAD/STL/FBD - [OB1 -- "CYCL_EXC" -- ET200pro_FB126\SIMATIC 317F\CPU 317F-2 PN/DP\...\OB1] Interface TEMP Contents Of: 'Environment\Interface' Name TEMP OB1 : "Main Program Sweep (Cycle)" Network 1: PNIODiag V1.4 CALL "PNIODiag" , "IDB_PNIODIAG" FB126 / DB126 IN0 := OUT1:=MD200
2.	Start the WinCC project. With the "legend" and "trigger" buttons you can open the respective screens. In this example the DP master system 1 and the PNIO system 100 are used.  System overview CPU 6ES7 414-3EM05-0AB0 DP-Mastersystem 1 PNIO-System 100 legend trigger

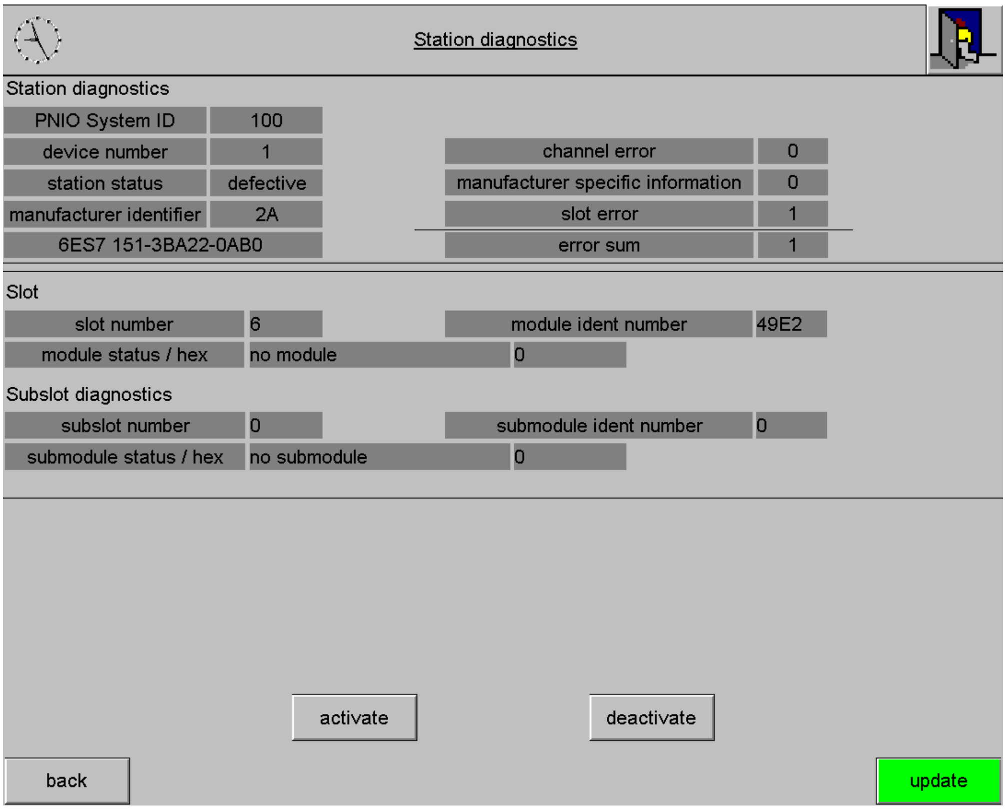
Step	Action
3.	You can select the screen "Legend" from the screens "Station Overview", "Activate / Deactivate" and "System Overview". The screen "Legend" shows the different statuses of the stations. The screen "System Overview" shows the same view, only the status "deactivated" is not displayed. By clicking the "back" button you can return to the previous screen.  Legend 1 actual status remember function status: 1 all right 1 was maintained 1 maintenance 1 was defective 1 defective 1 failure gone 1 failured 1 was deactivated 1 deactivated

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
4.	In the screen "Station Overview" you can see the status of each station of the selected system. There is a separate button for each station. Each button has an inner and an outer zone. The inner zone shows the actual status of the station, the outer zone has a storage function. If the station is faultless, the outer zone shows whether an event has taken place since the station overview was reset last. The meaning of the colours and the displayed information is given in the screen "Legend". The current system ID is displayed at the upper screen edge.  Station overview PROFIBUS Mastersystem-ID: 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 legend trigger act / deact reset overview system overview station 65-128

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
5.	General information about the station is displayed in the upper part of the screen "Station Diagnostics". The information includes: • ID of the system • Station number • Status of the station • Manufacturer ID • Station ID • Number of pending error, sorted by error type and number of errors Detailed information about the station is given in the lower part of the screen. 

Station diagnostics

Station diagnostics

PNIO System ID	100		
device number	1	channel error	0
station status	defective	manufacturer specific information	0
manufacturer identifier	2A	slot error	1
6ES7 151-3BA22-0AB0		error sum	1

Slot

slot number	6	module ident number	49E2
module status / hex	no module	0	

Subslot diagnostics

subslot number	0	submodule ident number	0
submodule status / hex	no submodule	0	

6.2.4 Diagnostic tools

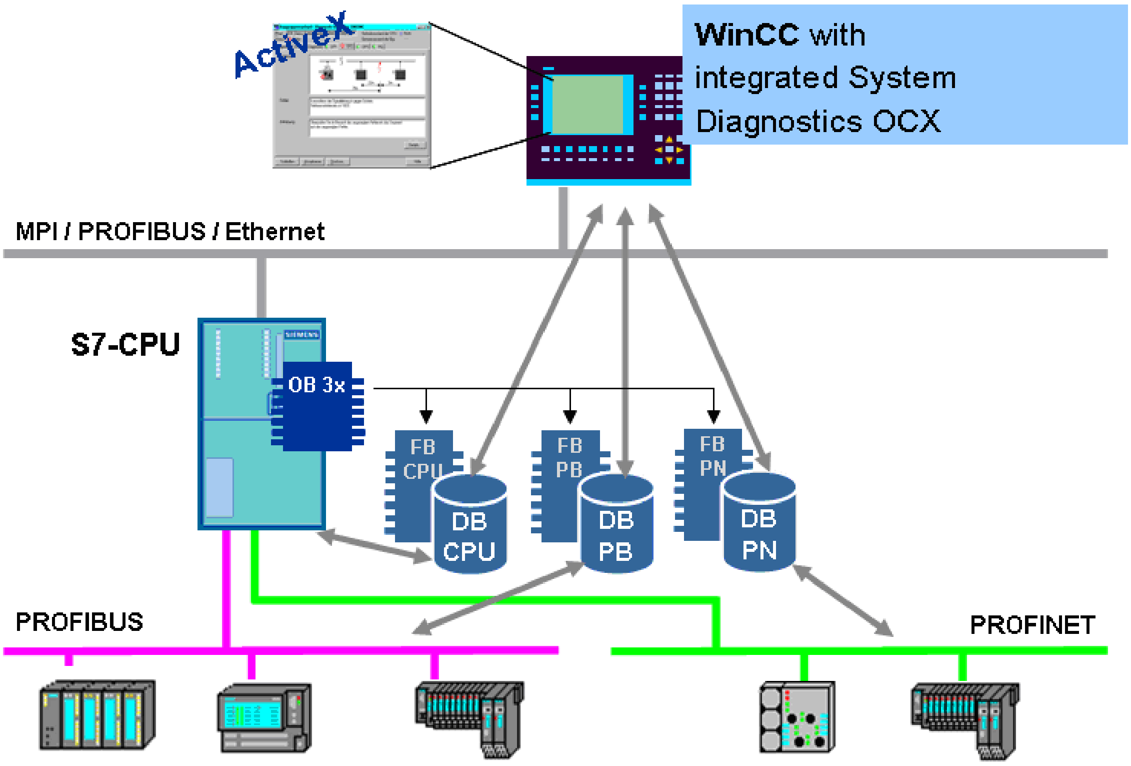
System diagnostics

This WinCC premium add-on can be used to configure a diagnostic environment for your Operator Station. This station will then be capable of providing detailed information about PROFIBUS DP slaves, PROFINET IO devices and S7 400 CPUs.

Overview of the system diagnostics

The following figure schematically shows the principle of operation of the premium add-on in WinCC:

Figure 6-2


ActiveX
WinCC with integrated System Diagnostics OCX
MPI / PROFIBUS / Ethernet
S7-CPU
OB 3x
FB CPU
FB PB
FB PN
DB CPU
DB PB
DB PN
PROFIBUS
PROFINET

- Configuration in STEP 7:
  - Calling the diagnostic block in the S7 program
  - Export of the hardware configuration (cfg file)
  - Transfer of the block variables to WinCC (AS-OS transfer)
- Configuration in WinCC:
  - Entering the diagnostics OCX in the WinCC screen
  - Binding the transferred block variables to the diagnostics OCX
  - Specifying the storage path of the exported HW configuration (cfg file)

Principle of operation

The add-on consists of maximally five STEP 7 blocks and one ActiveX-Control (faceplate). The STEP 7 blocks acquire the information of the configured master system and send these data to WinCC.

http://www.siemens.de/systemdiagnose

Copyright © Siemens AG Copyright 2009 All rights reserved

6.2.5 Report System Error

With the function "Report System Error" (SFM) STEP 7 provides a convenient option to display diagnostic information in the form of messages. The blocks and message texts required for this are generated automatically by STEP 7. The user merely has to load the created blocks to the CPU and transfer the messages into the WinCC-project.

Features

- Report System Error is a block-based S7 mechanism for diagnosing and reporting system errors of an S7 automation system
- Report System Error is an integral part of STEP 7
- No additional licence (apart from the STEP 7 licence) is required
- SFM is based on the following system functions:

- Diagnosis:	SFC 13, 51, 59	SFB 52, 54
- Report:	SFC 17&18, 107&108	Alarm_S&D

- SFM was integrated in STEP 7 with V5.1 in August 2000
- Since then the SFM has been extended and improved gradually:

- STEP 7 V5.3:	Support of PROFINET
- STEP 7 V5.4 SP2:	Optimization of the required cycle time
- STEP 7 V5.4 SP4:	Support of the CPU web server (DB 127)

Required steps

Table 6-7

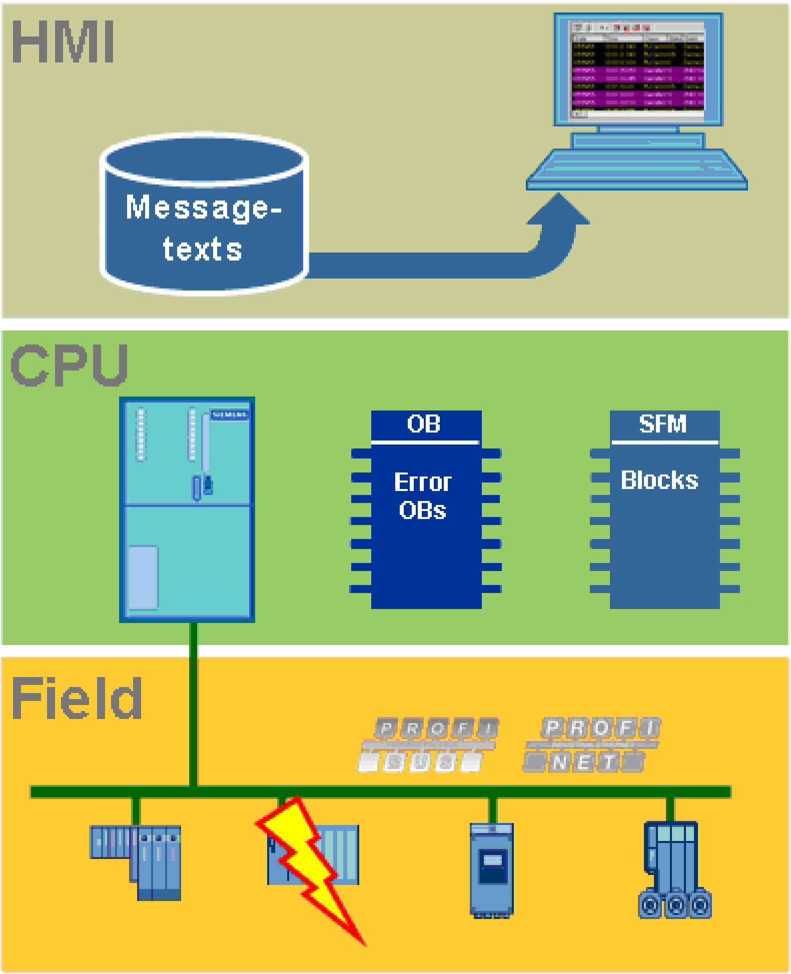
Step	Action
1.	Configure hardware as usual
2.	Select CPU
3.	Open “Report System Error”
4.	Create messages
5.	Determine program integration (OBs)
6.	Start SFM generation
7.	Load S7 data into the CPU
8.	Transfer HMI data into the HMI device

Copyright © Siemens AG Copyright 2009 All rights reserved

Overview of the system diagnostics

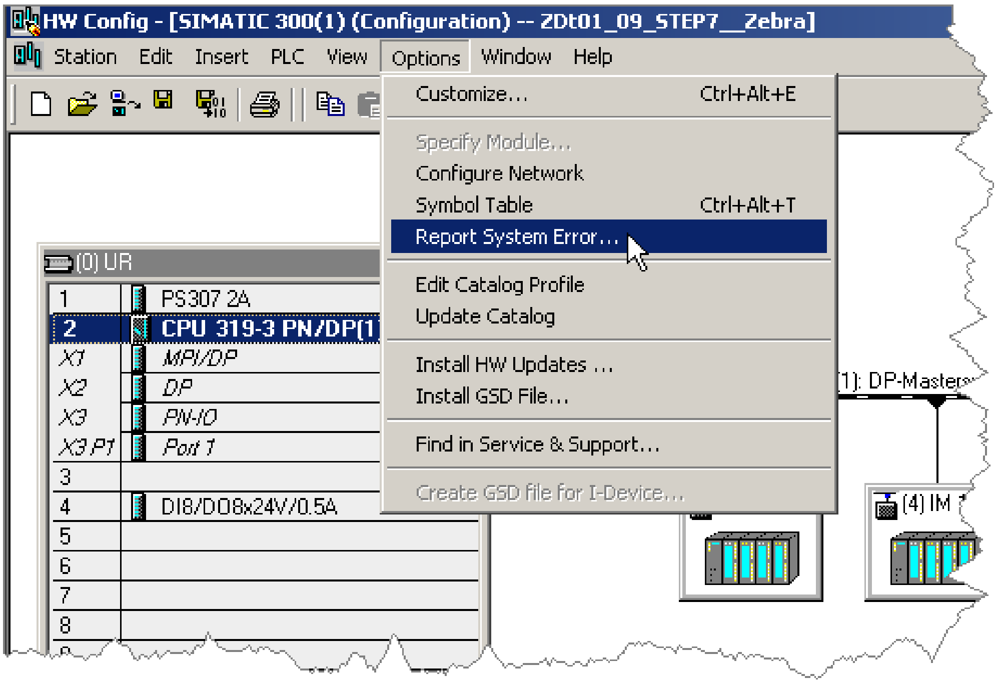
The following figure schematically shows the principle of operation of "Report System Error" (SFM):

Figure 6-3

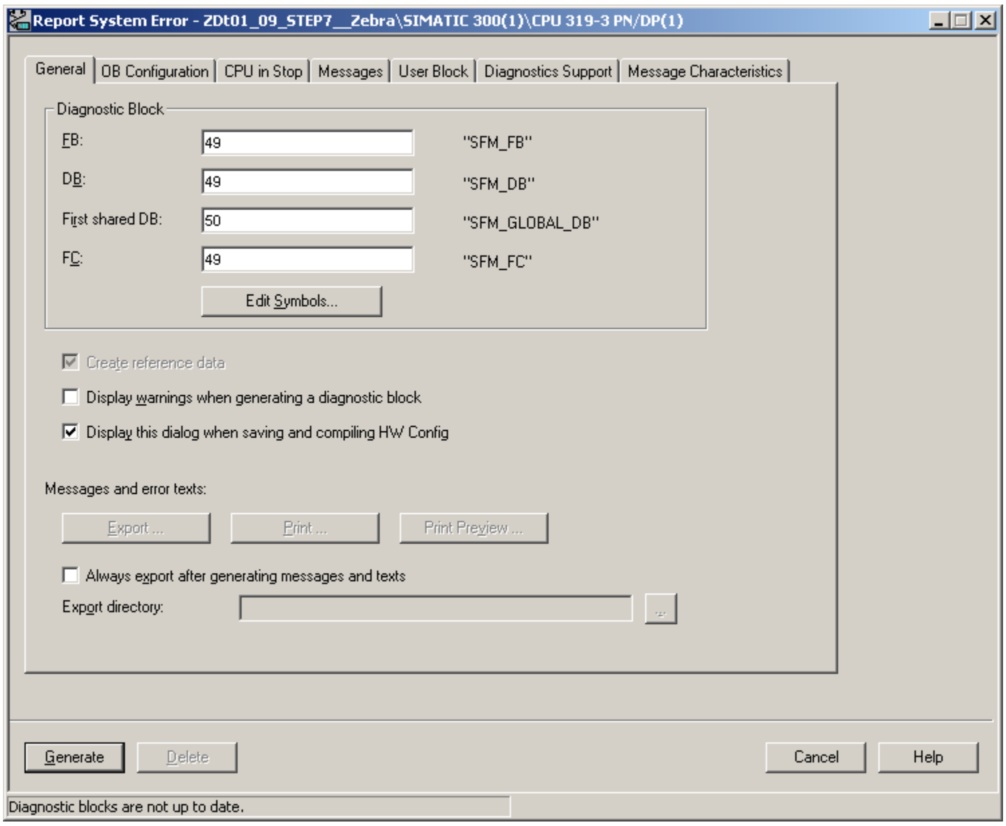


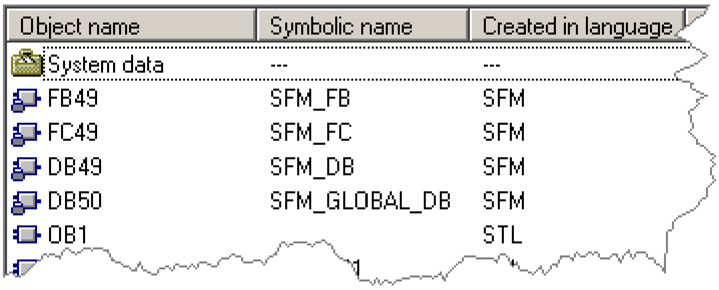
Copyright © Siemens AG Copyright 2009 All rights reserved

Table 6-8

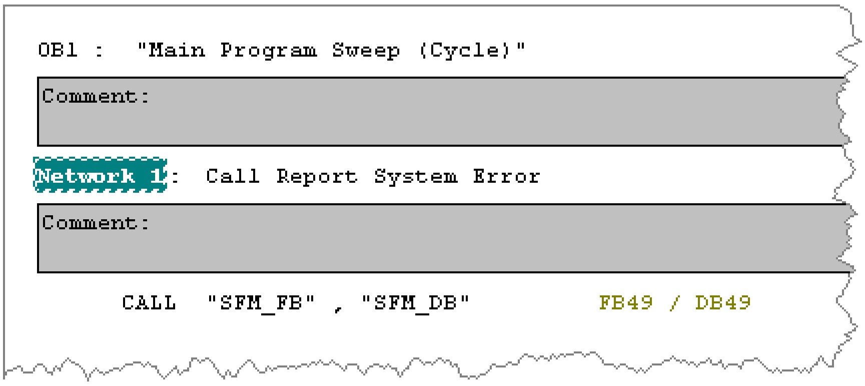
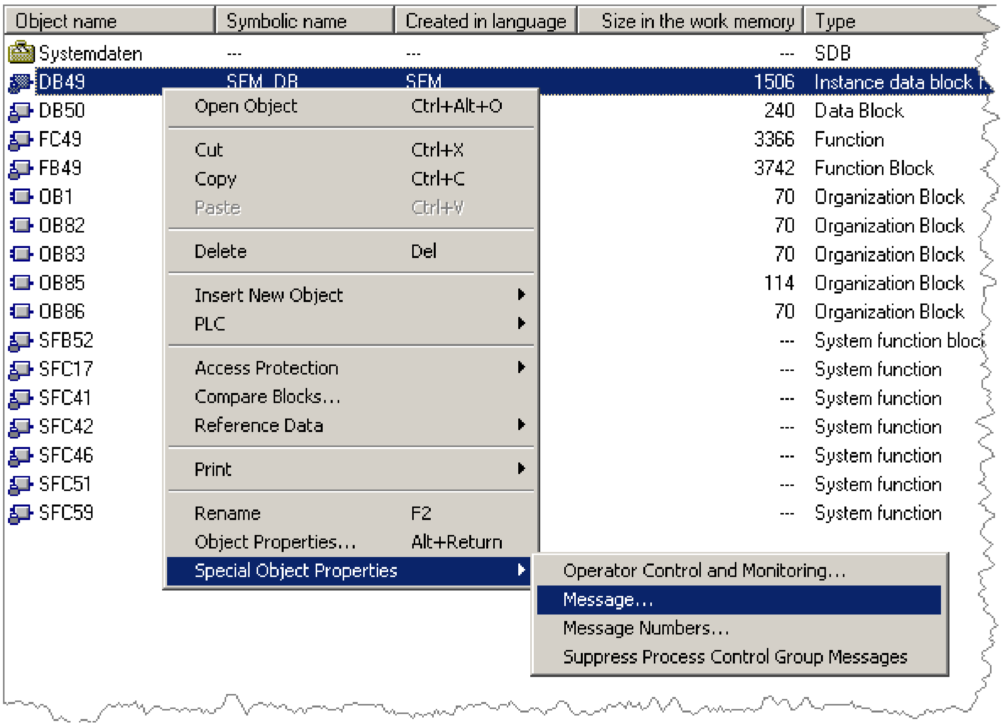
Step	Action
1.	Open HW Config of the CPU, select the CPU and open the menu "Options > Report System Error…".  HW Config - [SIMATIC 300(1) (Configuration) -- ZDt01_09_STEP7__Zebra] Station Edit Insert PLC View Options Window Help Customize... Ctrl+Alt+E Specify Module... Configure Network Symbol Table Ctrl+Alt+T Report System Error... Edit Catalog Profile Update Catalog Install HW Updates ... Install GSD File... Find in Service & Support... Create GSD file for I-Device... (0) UR 1 PS307 2A 2 CPU 319-3 PN/DP(1 X1 MPI/DP X2 DP X3 PN-IO X3 P1 Port 1 3 4 DI8/DO8x24V/0.5A 5 6 7 8 (1): DP-Master (4) IM

Copyright © Siemens AG Copyright 2009 All rights reserved

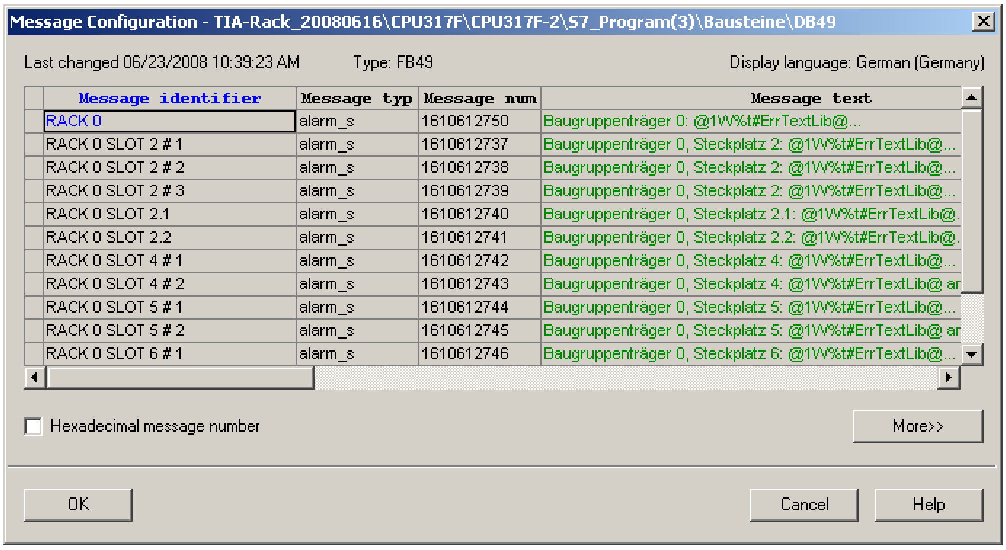
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2.</td><td>Adjust the settings of SFM (in general the default values are specific enough). Start the generation of SFM by pressing the "Generate" button.

General
OB Configuration
CPU in Stop
Messages
User Block
Diagnostics Support
Message Characteristics
Edit Symbols...
Export ...
Print ...
Print Preview ...
Generate
Delete
Cancel
Help

Report System Error - ZDt01_09_STEP7__Zebra\SIMATIC 300(1)\CPU 319-3 PN/DP(1)
Diagnostic Block
FB: 49 "SFM_FB"
DB: 49 "SFM_DB"
First shared DB: 50 "SFM_GLOBAL_DB"
FC: 49 "SFM_FC"
☑ Create reference data
☐ Display warnings when generating a diagnostic block
☑ Display this dialog when saving and compiling HW Config
Messages and error texts:
☐ Always export after generating messages and texts
Export directory:
Diagnostic blocks are not up to date.</td></tr>
<tr><td>3.</td><td>SFM creates the blocks "FB49", FC49, DB49" and "DB50".
These blocks have to be reloaded to the CPU after every generation and the CPU has to be switched from "STOP" to "RUN" then.

<table>
<tr><th>Object name</th><th>Symbolic name</th><th>Created in language</th></tr>
<tr><td>System data</td><td>---</td><td>---</td></tr>
<tr><td>FB49</td><td>SFM_FB</td><td>SFM</td></tr>
<tr><td>FC49</td><td>SFM_FC</td><td>SFM</td></tr>
<tr><td>DB49</td><td>SFM_DB</td><td>SFM</td></tr>
<tr><td>DB50</td><td>SFM_GLOBAL_DB</td><td>SFM</td></tr>
<tr><td>OB1</td><td></td><td>STL</td></tr>
</table></td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
4.	Integrate the SFM blocks "FB49" and "DB49" into your program.  OB1 : "Main Program Sweep (Cycle)" Comment: Network 1: Call Report System Error Comment: CALL "SFM_FB" , "SFM_DB" FB49 / DB49
5.	Further the SFM creates all necessary messages which contain the information that is supplied by the system. These messages can either be exported in the SFM settings dialog...  Object name · Symbolic name · Created in language · Size in the work memory · Type Systemdaten · --- · --- · --- · SDB DB49 · SFM_DB · SFM · 1506 · Instance data block DB50 · 240 · Data Block FC49 · 3366 · Function FB49 · 3742 · Function Block OB1 · 70 · Organization Block OB82 · 70 · Organization Block OB83 · 70 · Organization Block OB85 · 114 · Organization Block OB86 · 70 · Organization Block SFB52 · --- · System function bloc SFC17 · --- · System function SFC41 · --- · System function SFC42 · --- · System function SFC46 · --- · System function SFC51 · --- · System function SFC59 · --- · System function Open Object Ctrl+Alt+O Cut Ctrl+X Copy Ctrl+C Paste Ctrl+V Delete Del Insert New Object PLC Access Protection Compare Blocks... Reference Data Print Rename F2 Object Properties... Alt+Return Special Object Properties Operator Control and Monitoring... Message... Message Numbers... Suppress Process Control Group Messages

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
6.	...or checked in DB 49 via "Special Object Properties > Message...". 

Message Configuration - TIA-Rack_20080616\CPU317F\CPU317F-2\S7_Program(3)\Bausteine\DB49

Last changed 06/23/2008 10:39:23 AM Type: FB49 Display language: German (Germany)

Message identifier	Message typ	Message num	Message text
RACK 0	alarm_s	1610612750	Baugruppenträger 0: @1W%t#ErrTextLib@...
RACK 0 SLOT 2 # 1	alarm_s	1610612737	Baugruppenträger 0, Steckplatz 2: @1W%t#ErrTextLib@...
RACK 0 SLOT 2 # 2	alarm_s	1610612738	Baugruppenträger 0, Steckplatz 2: @1W%t#ErrTextLib@...
RACK 0 SLOT 2 # 3	alarm_s	1610612739	Baugruppenträger 0, Steckplatz 2: @1W%t#ErrTextLib@...
RACK 0 SLOT 2.1	alarm_s	1610612740	Baugruppenträger 0, Steckplatz 2.1: @1W%t#ErrTextLib@.
RACK 0 SLOT 2.2	alarm_s	1610612741	Baugruppenträger 0, Steckplatz 2.2: @1W%t#ErrTextLib@.
RACK 0 SLOT 4 # 1	alarm_s	1610612742	Baugruppenträger 0, Steckplatz 4: @1W%t#ErrTextLib@...
RACK 0 SLOT 4 # 2	alarm_s	1610612743	Baugruppenträger 0, Steckplatz 4: @1W%t#ErrTextLib@ ar
RACK 0 SLOT 5 # 1	alarm_s	1610612744	Baugruppenträger 0, Steckplatz 5: @1W%t#ErrTextLib@...
RACK 0 SLOT 5 # 2	alarm_s	1610612745	Baugruppenträger 0, Steckplatz 5: @1W%t#ErrTextLib@ ar
RACK 0 SLOT 6 # 1	alarm_s	1610612746	Baugruppenträger 0, Steckplatz 6: @1W%t#ErrTextLib@...

☐ Hexadecimal message number

Note The DB125 is updated by the SFM blocks, therefore the FB125 may be dropped. The blocks FB/DB125 created for the diagnostics screens for Profibus DP are compatible with it.

NOTE **The DB126 which is generated by SFM cannot be used with the diagnostics screens for Profinet IO (FB/DB126).**

Note The DB127 which is generated by SFM contains the diagnostics data for the CPU web server.

6.2.6 Compiling

To transfer the changes to WinCC a compilation must be started. For more information refer to the Chapter 3.6.

Copyright © Siemens AG Copyright 2009 All rights reserved

6.2.7 SIMATIC Maintenance Station

The SIMATIC Maintenance Station is an option package for WinCC and facilitates a unique diagnostics of the plant components, the so-called assets, for the maintenance field. Another benefit of the Maintenance Station is the plant automation and maintenance combined in one system. This also simplifies the handling as only one system is used for configuration and the operator control and monitoring of the plant.

Note Note in this connection also the extended diagnostics options of the Basic Process Control in Chapter 7.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

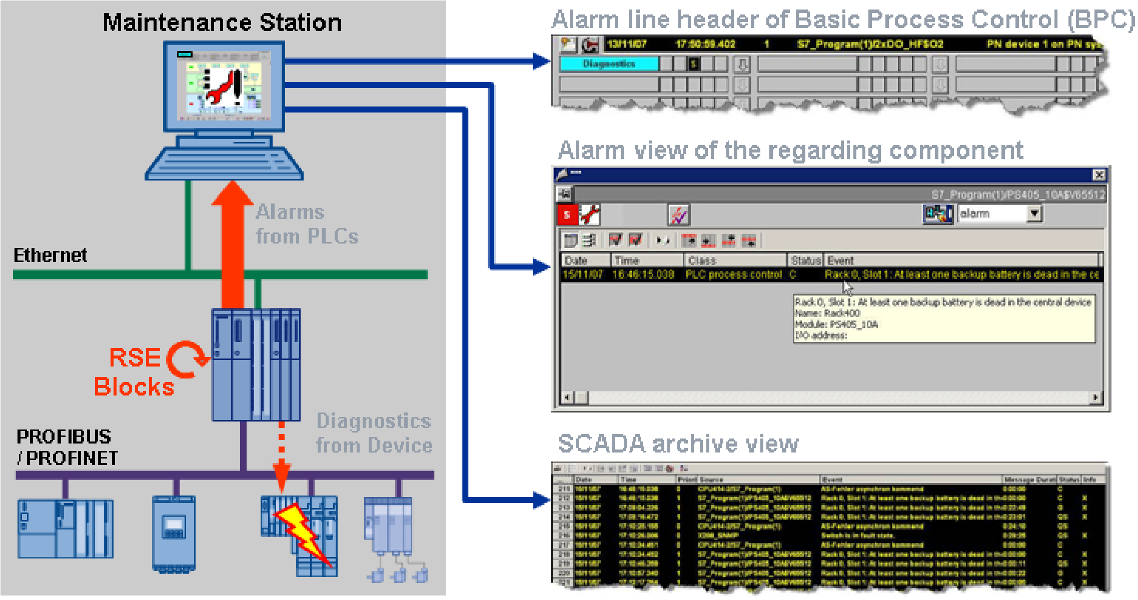
Terms

- Asset
  Assets are the individual components of a company. The term "plant-oriented assets" describes components or devices of the plant or machines on which maintenance is carried out.
- Asset Management
  The term asset management summarizes general activities and measures which maintain or increase the value of a plant. These measures do not only include the production management and plant automation and their optimization but, in particular, also the value-maintaining or value-increasing maintenance.
- Plant-oriented Asset Management
  The value-maintaining or value-increasing maintenance is also called plant-oriented asset management. What is particularly important is the relationship, which is to be as optimal as possible, between the efforts for value-increasing maintenance and the availability of the plant.
  The plant-oriented asset management does not only comprise the collection of information so that the technical plant condition can be assessed but also the decision and execution of maintenance measures.
- Plant-oriented asset management system
  A plant-oriented asset management system is an EDP system which has the following functions:
  - Collecting online information for assessment of the plant and component conditions
  - Support of decision about maintenance measures
  - Preparation and execution of maintenance measures
  - Interfaces to other systems for asset management, e.g. EAM/CMMS or business management

Overview of SIMATIC Maintenance Station

The following figure schematically shows the structure of the components involved in the diagnostics:

Figure 6-4


Maintenance Station
Alarms from PLCs
Ethernet
RSE Blocks
PROFIBUS / PROFINET
Diagnostics from Device
Alarm line header of Basic Process Control (BPC)
13/11/07 17:50:59.402 1 S7_Program(1)/2xDO_HFSO2 PN device 1 on PN sys
Diagnostics
Alarm view of the regarding component
S7_Program(1)/PS405_10A$V65512
alarm
SCADA archive view

Date	Time	Class	Status	Event
15/11/07	16:46:15.038	PLC process control	C	Rack 0, Slot 1: At least one backup battery is dead in the ce

Rack 0, Slot 1: At least one backup battery is dead in the central device
Name: Rack400
Module: PS405_10A
I/O address:

Principle of operation

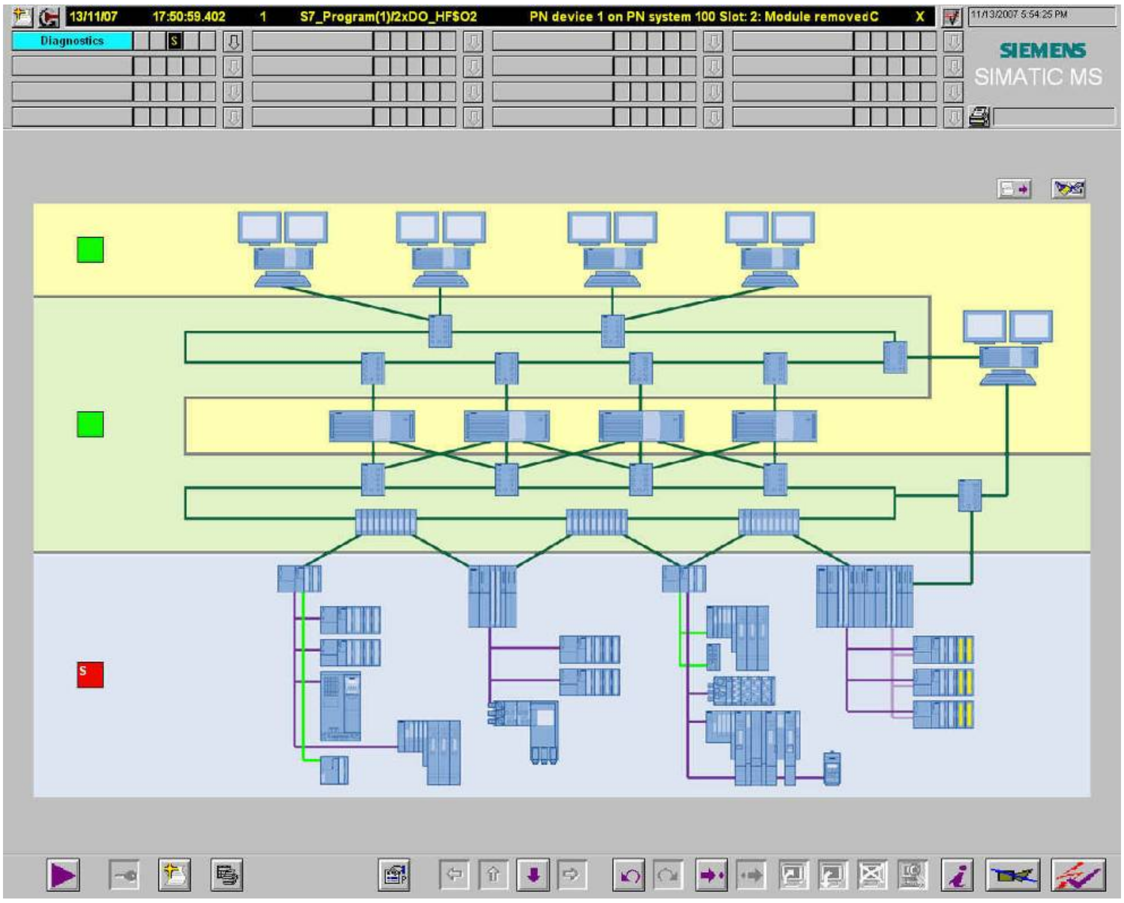
The PLC alarms are created by the CPU as a system functionality based on STEP 7 "Report System Error". They are available for central SIMATIC control components and for PROFIBUS and PROFINET IO standard devices.

The user configures the Maintenance Station by selecting in STEP 7 the automation systems to be imaged in the hardware configuration. Based on this configuration the Maintenance Station recognizes the devices which belong to the plant and it creates an image for maintenance in WinCC. The project automatically creates itself in the form of hierarchically structured and completely interconnected WinCC images and it will be subsequently automatically transferred to the Maintenance Station. New hardware components are added to the hardware configuration of STEP 7 and they will be also automatically available for the Maintenance Station then.

Copyright © Siemens AG Copyright 2009 All rights reserved

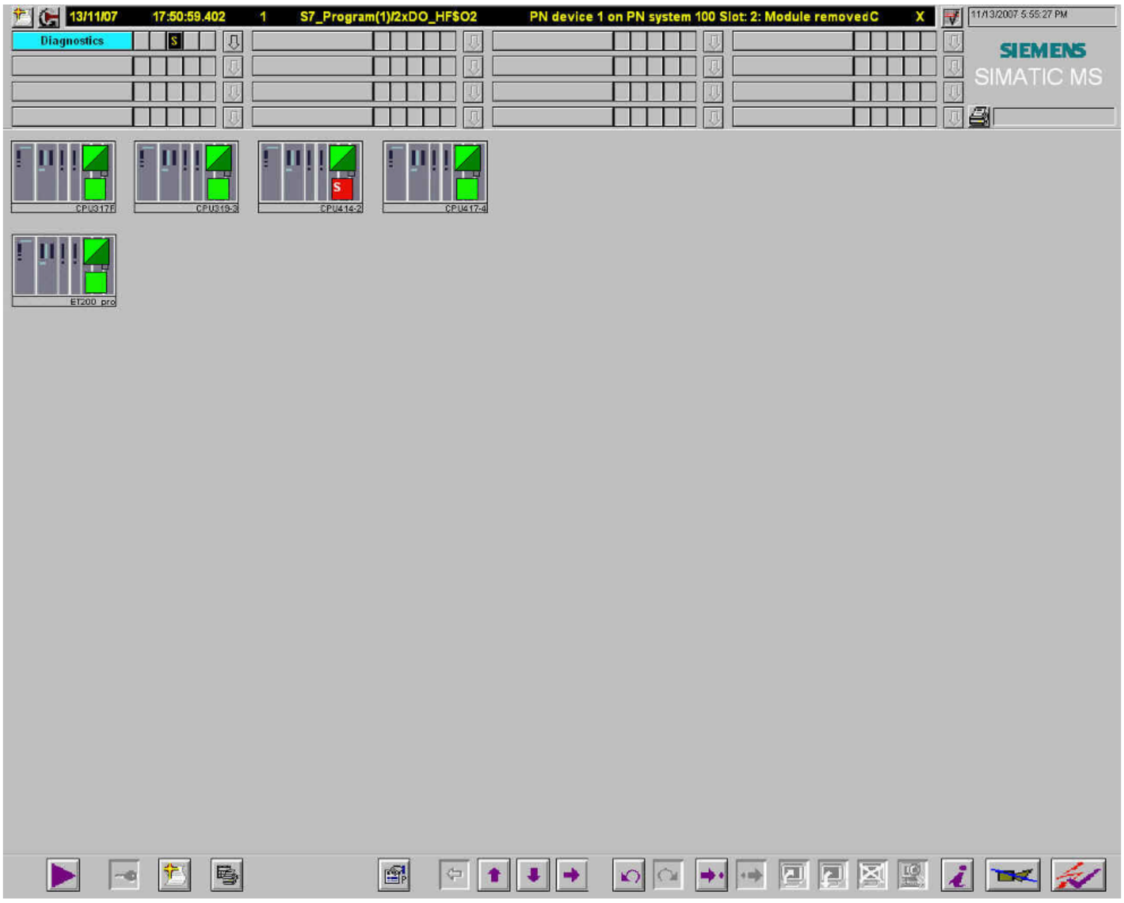
Copyright © Siemens AG Copyright 2009 All rights reserved

Table 6-9

Hierarchical plant structure
Plant overview  13/11/07 17:50:59.402 1 S7_Program(1)/2xDO_HF$O2 PN device 1 on PN system 100 Slot: 2: Module removedC X 11/13/2007 5:54:25 PM Diagnostics S SIEMENS SIMATIC MS

Hierarchical plant structure

Overview of AS stations



13/11/07 17:50:59.402 1 S7_Program(1)/2xDO_HF$O2 PN device 1 on PN system 100 Slot: 2: Module removedC X

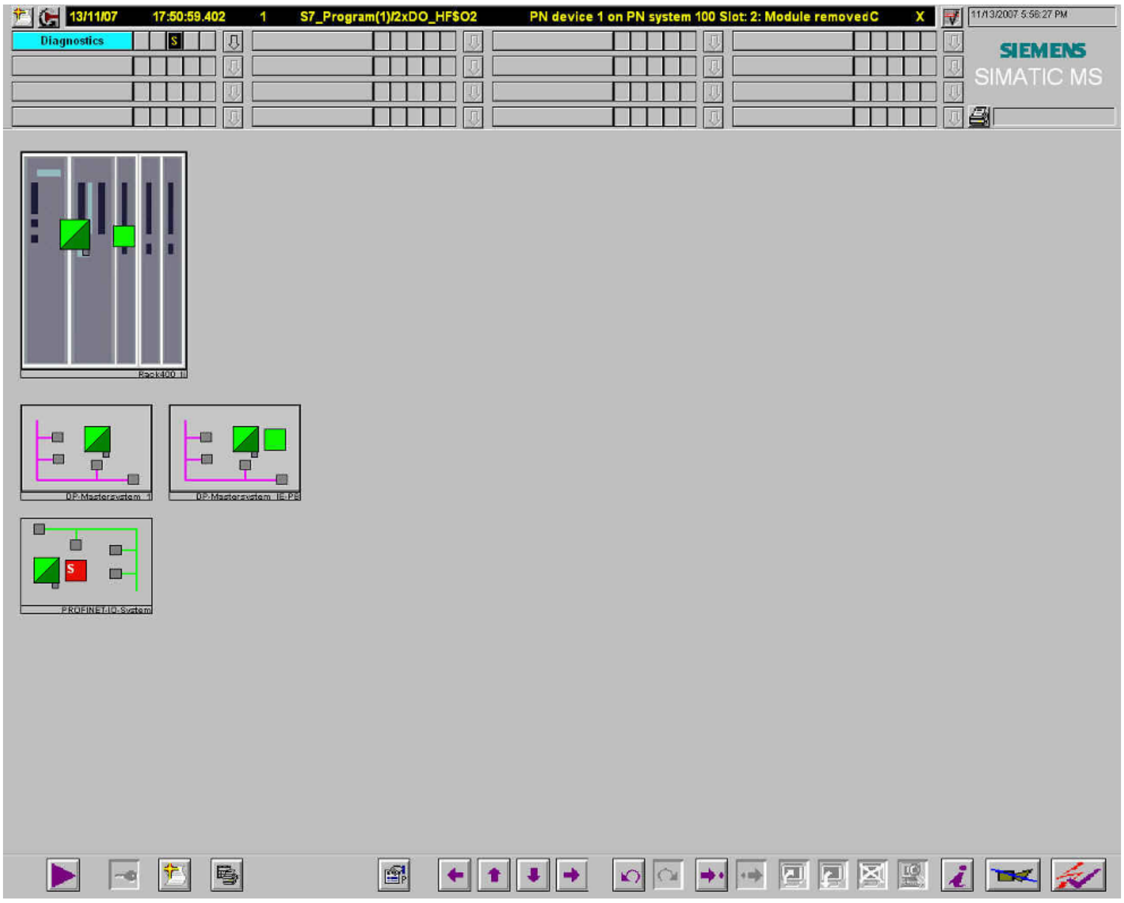
11/13/2007 5:55:27 PM

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Hierarchical plant structure

AS-Station

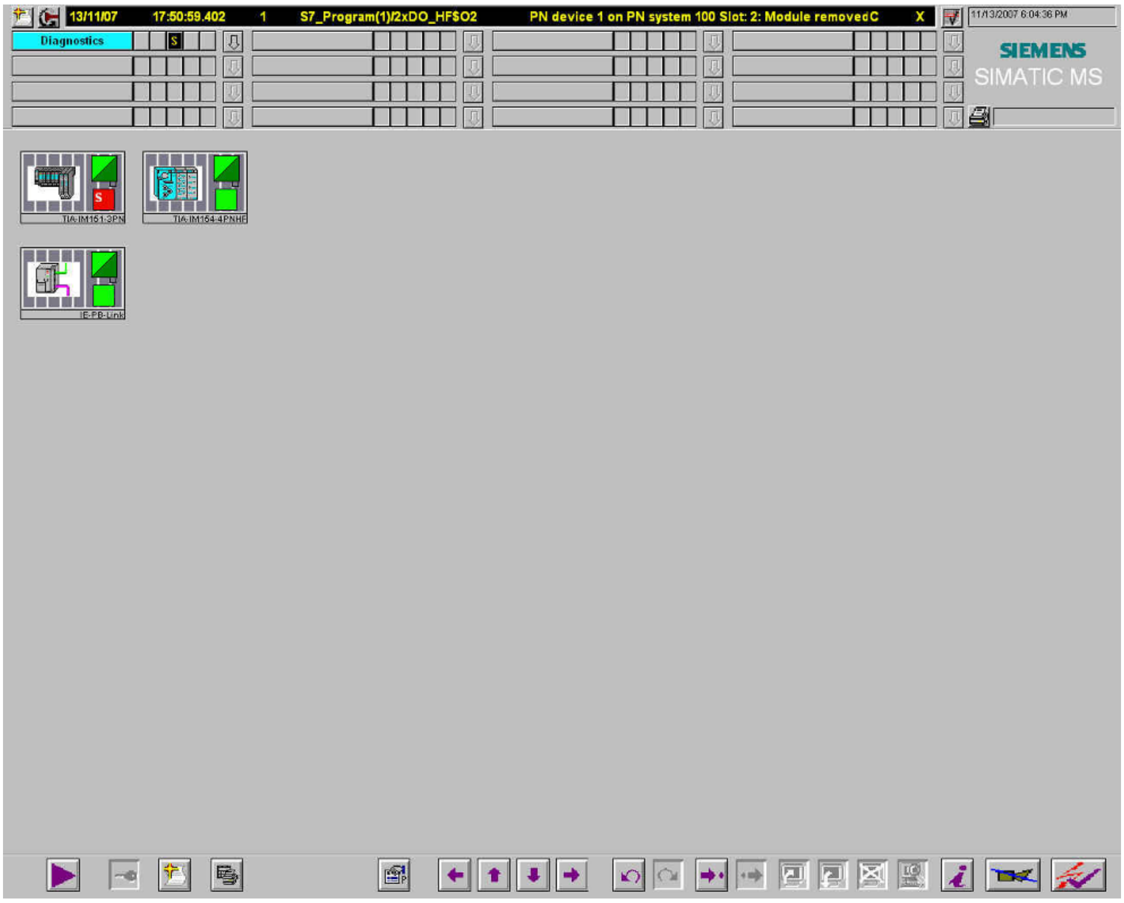


13/11/07 17:50:59.402 1 S7_Program(1)/2xDO_HF$O2 PN device 1 on PN system 100 Slot: 2: Module removedC X

11/13/2007 5:56:27 PM

Hierarchical plant structure

Field bus



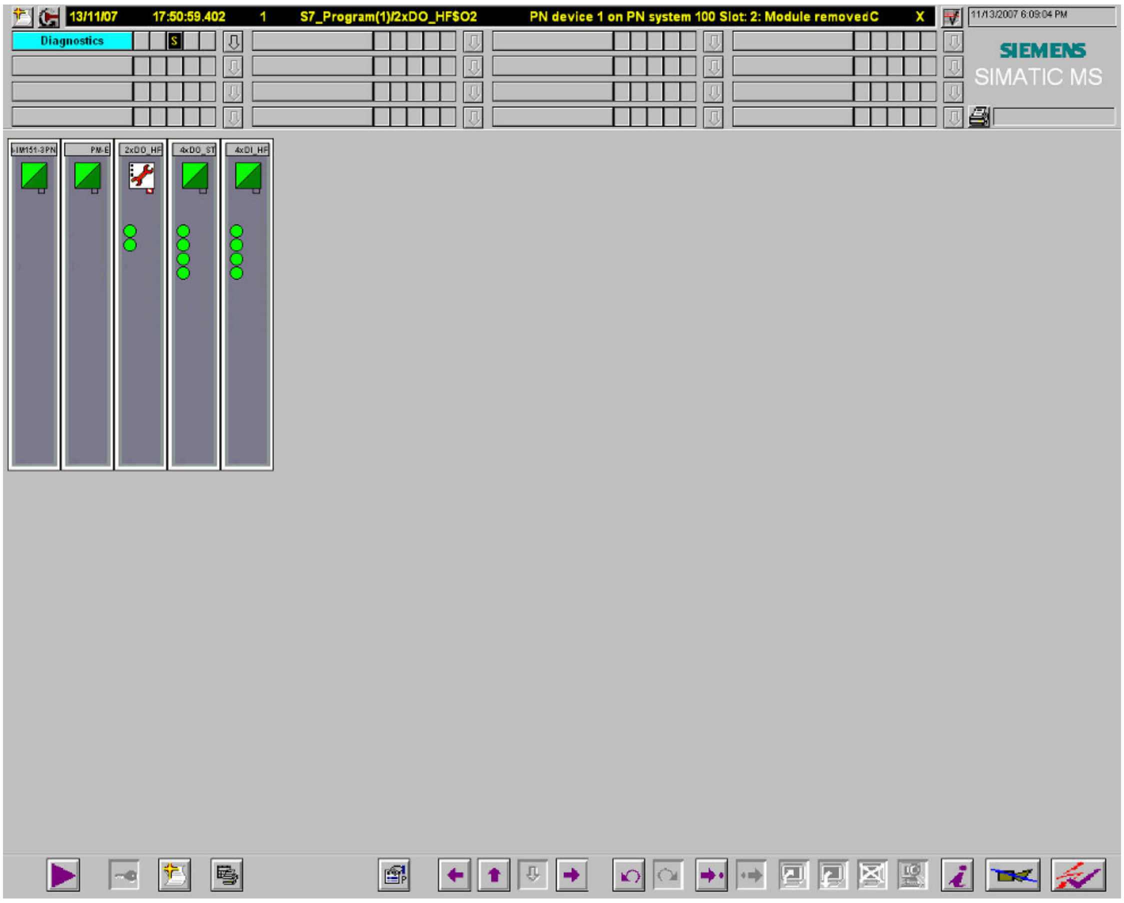
13/11/07 17:50:59.402 1 S7_Program(1)/2xDO_HF$O2 PN device 1 on PN system 100 Slot: 2: Module removedC X

11/13/2007 6:04:36 PM

Copyright © Siemens AG Copyright 2009 All rights reserved

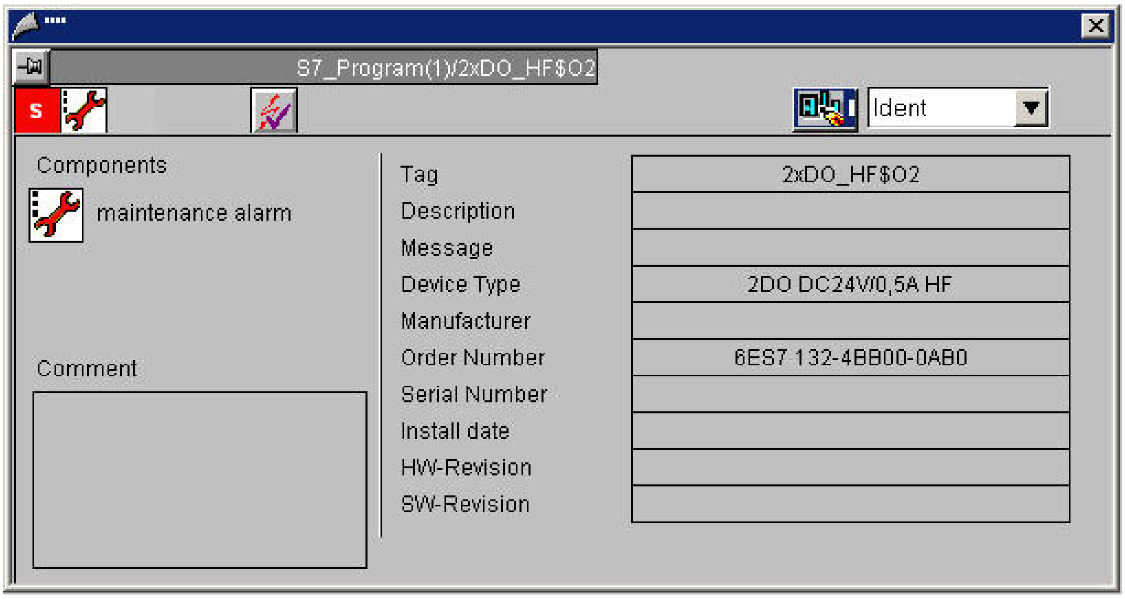
Hierarchical plant structure

Modules of a slave



13/11/07 17:50:59.402 1 S7_Program(1)/2xDO_HF$O2 PN device 1 on PN system 100 Slot: 2: Module removedC X

Details of a component



S7_Program(1)/2xDO_HF$O2

Components

maintenance alarm

Comment

Tag	2xDO_HF$O2
Description	
Message	
Device Type	2DO DC24V/0,5A HF
Manufacturer	
Order Number	6ES7 132-4BB00-0AB0
Serial Number	
Install date	
HW-Revision	
SW-Revision	

Copyright © Siemens AG Copyright 2009 All rights reserved

6.2.8 Ladder rung jump

The ladder rung jump can be used to directly jump from WinCC runtime to the respective LAD / FBD / STL program editor of STEP 7 with a focus on the STEP 7-symbol which belongs to the process tag. This makes the diagnostics of failures faster and simpler.

You can configure the ladder rung jump with or without authorization verification:

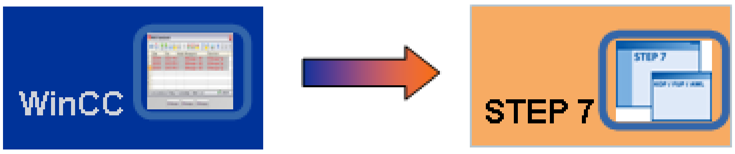
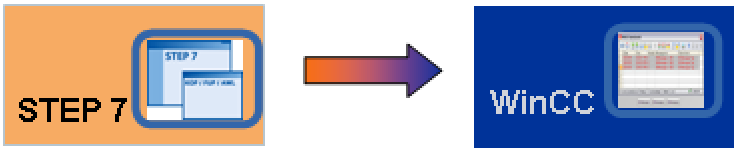
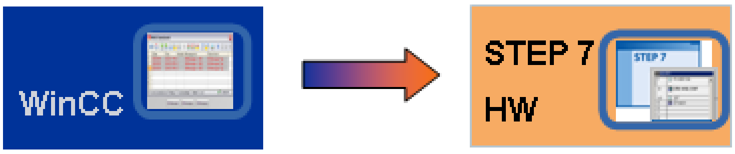
- With authorization verification
  The full access to the STEP 7 program editor requires that you as the logged-in user have the proper authorization for the ladder rung jump in runtime. If you do not have this authorization, you will only have reading access to the blocks in the program editor.
- Without authorization verification
  You have reading and writing access to all blocks in the program editor.

For faster and simpler error diagnostics the user can also directly jump to the hardware diagnostics.

A jump is also possible from the program editor to the images of WinCC where the process tag is displayed.

The table shows the three jump variants

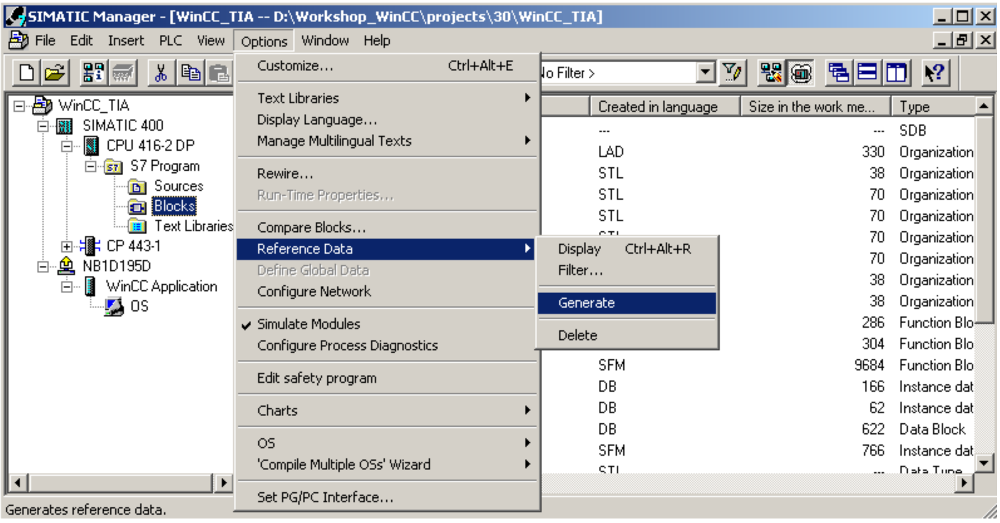
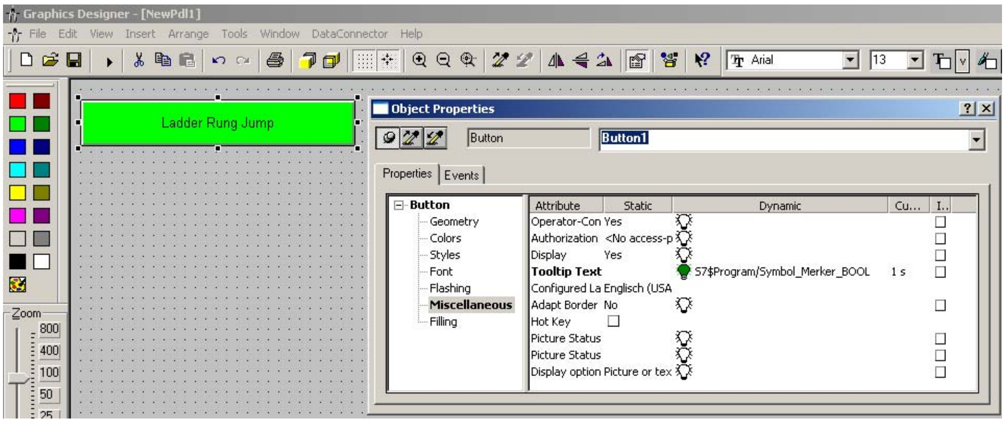
Table 6-10

Jump variants
Ladder rung jump from WinCC runtime to the respective LAD / FBD / STL program editor of STEP 7. 
Jump from the LAD / FBD / STL program editor of STEP to the WinCC runtime picture where the process tag is displayed. 
Jump from WinCC runtime to the hardware diagnostics of the control. 

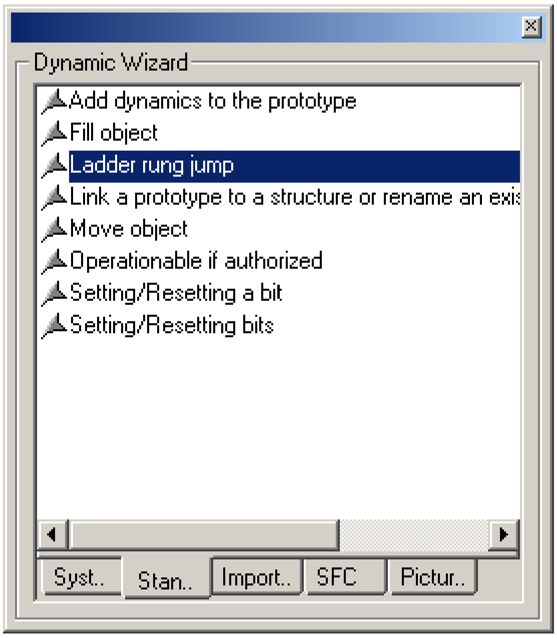
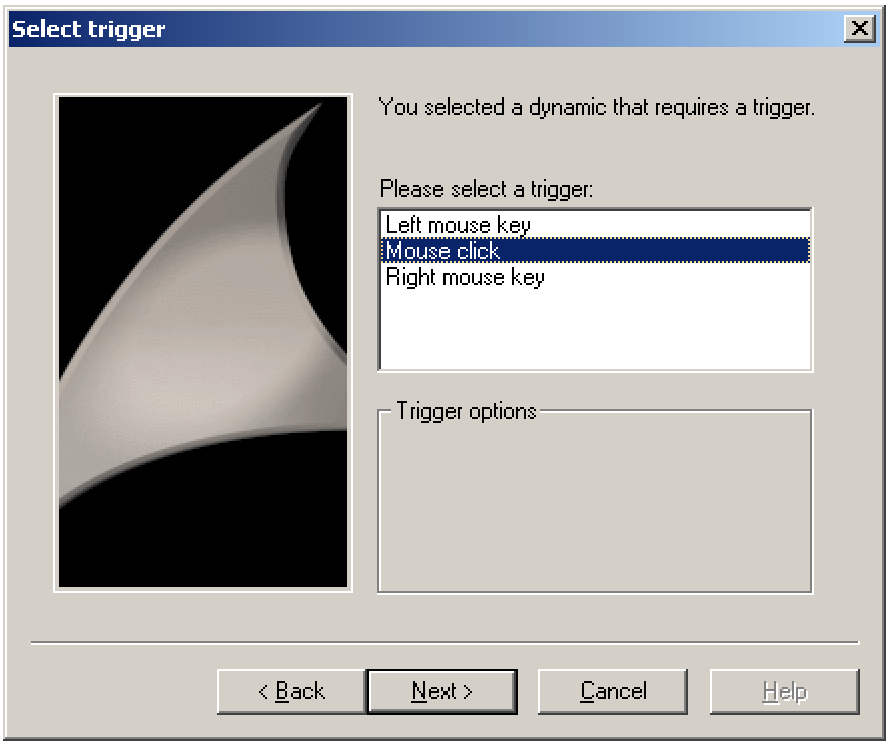
Copyright © Siemens AG Copyright 2009 All rights reserved

Ladder rung jump acc. to WinCC

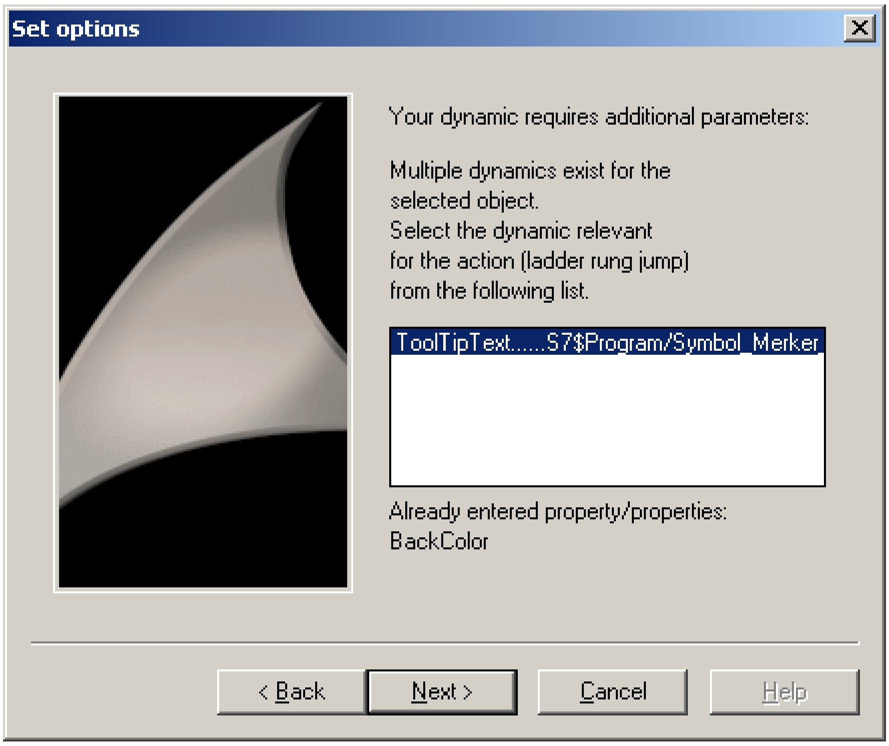
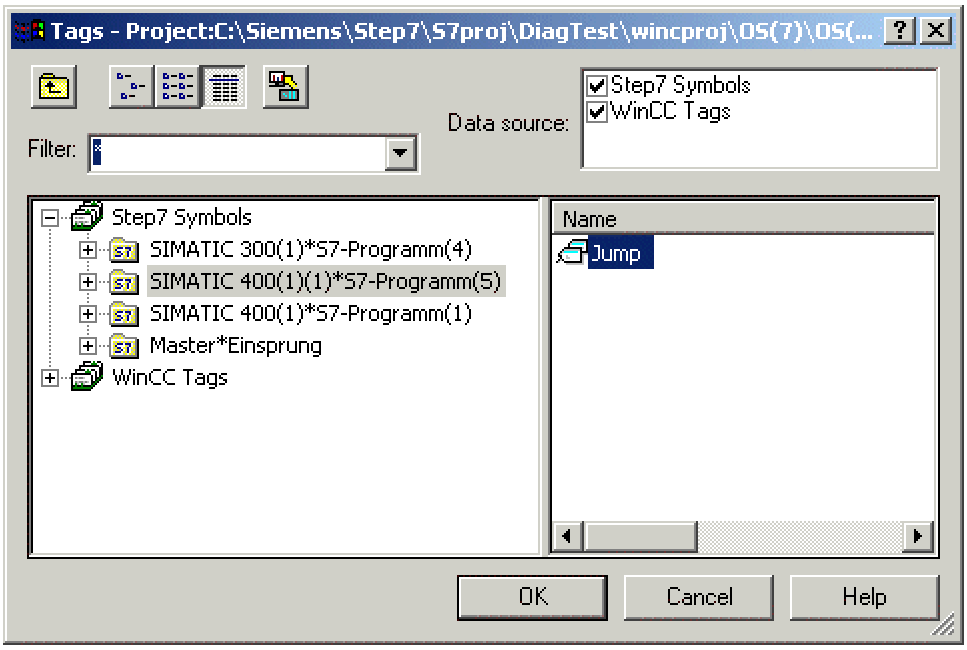
Table 6-11

Step	Action
1.	Create the current reference data.  SIMATIC Manager - [WinCC_TIA -- D:\Workshop_WinCC\projects\30\WinCC_TIA] File Edit Insert PLC View Options Window Help WinCC_TIA SIMATIC 400 CPU 416-2 DP S7 Program Sources Blocks Text Libraries CP 443-1 NB1D195D WinCC Application OS Customize... Ctrl+Alt+E Text Libraries Display Language... Manage Multilingual Texts Rewire... Run-Time Properties... Compare Blocks... Reference Data Define Global Data Configure Network Simulate Modules Configure Process Diagnostics Edit safety program Charts OS 'Compile Multiple OSs' Wizard Set PG/PC Interface... Display Ctrl+Alt+R Filter... Generate Delete No Filter > Created in language Size in the work me... Type Generates reference data.
2.	Insert in the picture a graphic object, e.g. a "button" and select the object.  Graphics Designer - [NewPdl1] File Edit View Insert Arrange Tools Window DataConnector Help Arial 13 Zoom 800 400 100 50 25 Ladder Rung Jump Object Properties Button Button1 Properties Events Button Geometry Colors Styles Font Flashing Miscellaneous Filling Attribute Static Dynamic Cu... I.. Operator-Con Yes Authorization <No access-p Display Yes Tooltip Text S7$Program/Symbol_Merker_BOOL 1 s Configured La Englisch (USA Adapt Border No Hot Key □ Picture Status Picture Status Display option Picture or tex

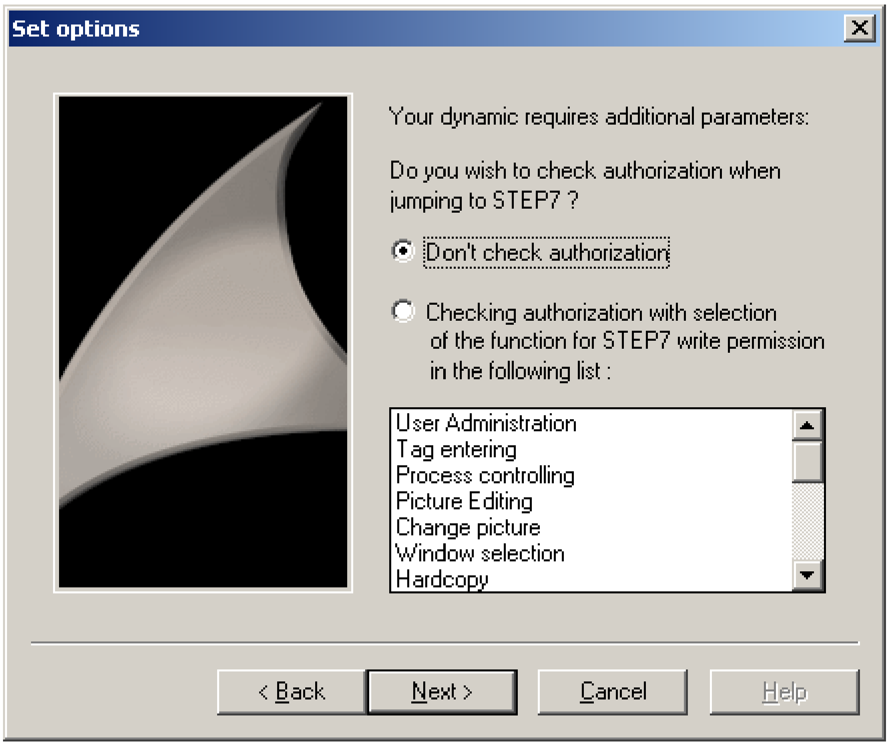
Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	Start the Dynamic Wizard via the menu option "View > Toolbars". Go to the tab "Standard Dynamics" and open the Wizard "Ladder rung jump" with a double-click.  Dynamic Wizard Add dynamics to the prototype Fill object Ladder rung jump Link a prototype to a structure or rename an exis Move object Operationable if authorized Setting/Resetting a bit Setting/Resetting bits Syst.. Stan.. Import.. SFC Pictur..
4.	The Wizard will take you through the configuration steps. Select the trigger at which the ladder rung jump shall be executed. Click "Next" then.  Select trigger You selected a dynamic that requires a trigger. Please select a trigger: Left mouse key Mouse click Right mouse key Trigger options < Back Next > Cancel Help

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
5.	Select an attribute of the object, e.g. "ToolTipText". This attribute will be linked with the subsequently selected tag.  Set options Your dynamic requires additional parameters: Multiple dynamics exist for the selected object. Select the dynamic relevant for the action (ladder rung jump) from the following list. ToolTipText......S7$Program/Symbol_Merker Already entered property/properties: BackColor
6.	Determine the tag now to which the ladder rung jump is to take place. Click the selection button for opening the tag selection dialog. Select a tag and close the dialog with "OK". Click "Next" then.  Tags - Project:C:\Siemens\Step7\S7proj\DiagTest\wincproj\OS(7)\OS(... Filter: * Data source: ☑ Step7 Symbols ☑ WinCC Tags Step7 Symbols SIMATIC 300(1)*S7-Programm(4) SIMATIC 400(1)(1)*S7-Programm(5) SIMATIC 400(1)*S7-Programm(1) Master*Einsprung WinCC Tags Name Jump

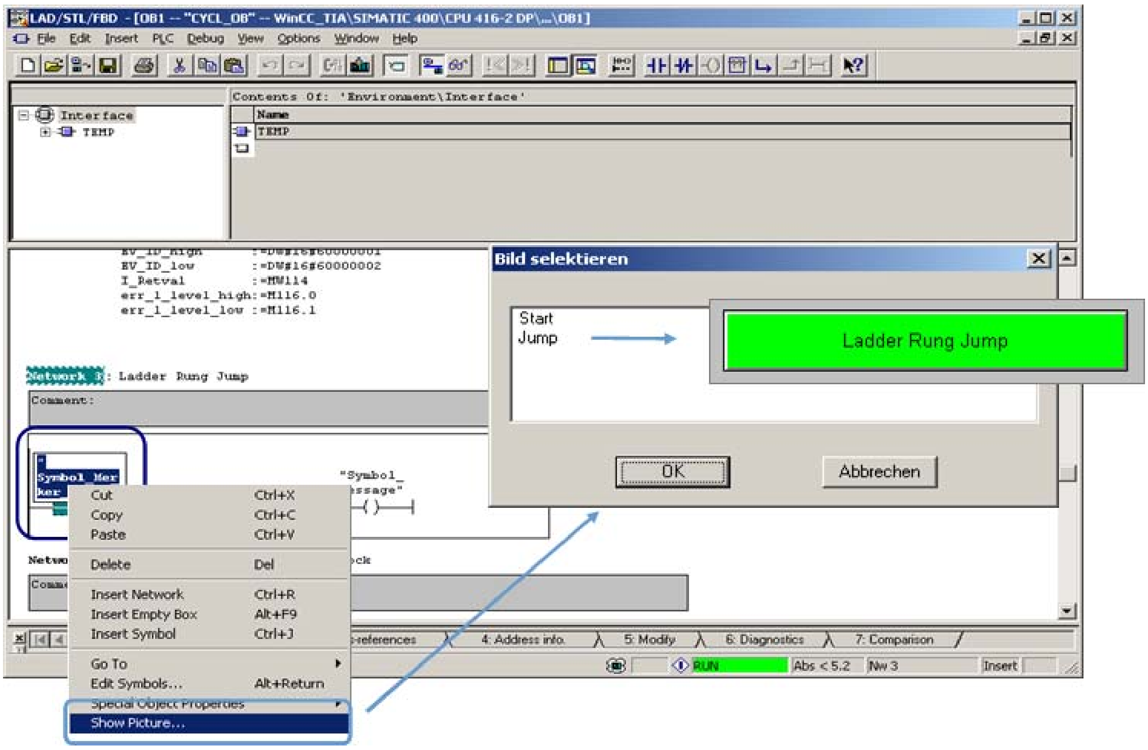
Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
7.	Determine whether the STEP 7 write authorization verification shall take place at the ladder rung jump. If you want this verification be performed you have to determine the authorization level. Click "Next" then.  Set options Your dynamic requires additional parameters: Do you wish to check authorization when jumping to STEP7 ? ● Don't check authorization ○ Checking authorization with selection of the function for STEP7 write permission in the following list : User Administration Tag entering Process controlling Picture Editing Change picture Window selection Hardcopy
8.	You will get another overview of the options which you selected. Check them and click "Finish".

Copyright © Siemens AG Copyright 2009 All rights reserved

Jump to WinCC (Show Picture)

Figure 6-5



LAD/STL/FBD - [OB1 -- "CYCL_OB" -- WinCC_TIA\SIMATIC 400\CPU 416-2 DP\...\OB1]

Contents Of: 'Environment\Interface'

```
EV_ID_high        :=DW#16#60000001
EV_ID_low         :=DW#16#60000002
I_Retval          :=MW114
err_1_level_high:=M116.0
err_1_level_low :=M116.1
```

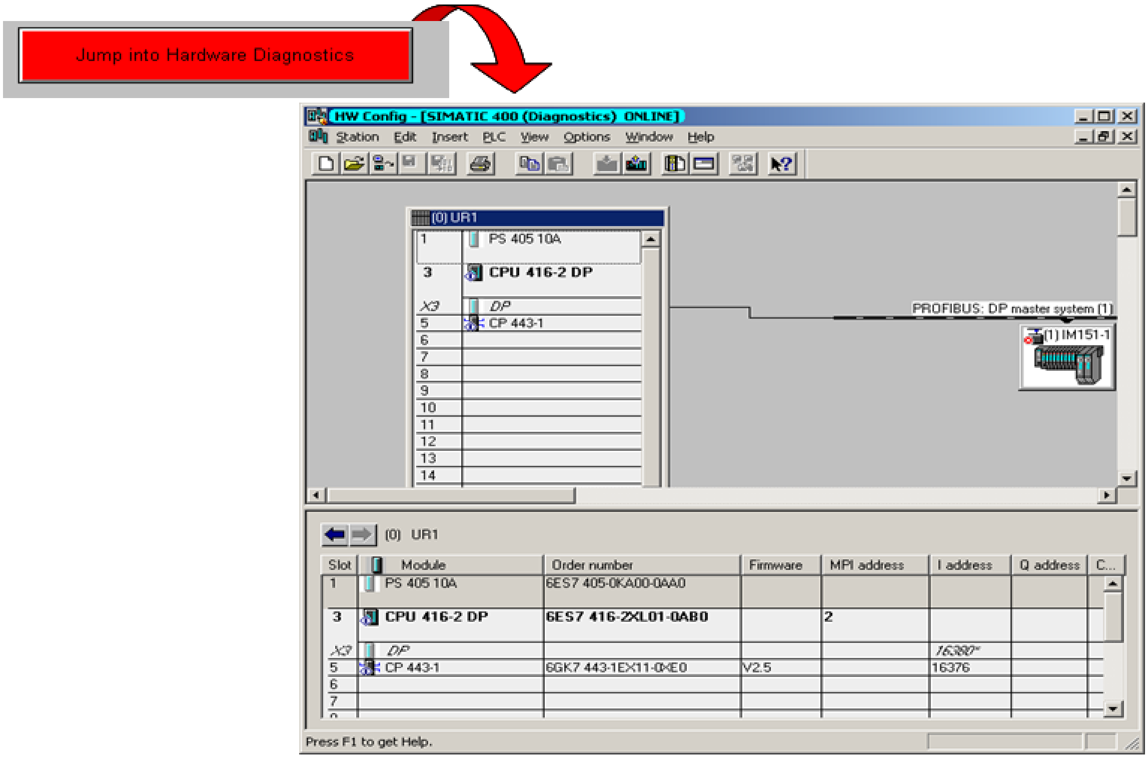
Network 3: Ladder Rung Jump

Comment:

Copyright © Siemens AG Copyright 2009 All rights reserved

Jump into Hardware Diagnostics

Figure 6-6



(0) UR1

Slot	Module	Order number	Firmware	MPI address	I address	Q address	C...
1	PS 405 10A	6ES7 405-0KA00-0AA0					
3	**CPU 416-2 DP**	**6ES7 416-2XL01-0AB0**		**2**			
X3	*DP*				*16380**		
5	CP 443-1	6GK7 443-1EX11-0XE0	V2.5		16376		
6							
7							

Press F1 to get Help.

Copyright © Siemens AG Copyright 2009 All rights reserved

6.3 Process diagnostics

The process diagnostics with **S7-PDIAG** can only be carried out in connection with an output device (HMI) and the corresponding software as, for instance, **ProAgent** for **WinCC**.

S7-PDIAG

S7-PDIAG facilitates the configuration of the process diagnostics for SIMATIC with the LAD, FBD or STL programming languages.

The process diagnostics is used to detect faulty statuses outside the automation system (e.g. limit switch not reached).

Application:

- for failure display with user-defined text.
- for display of the causing signal (criteria analysis) at the logic level.
- for remedy of process errors.

Functions:

- Signal monitoring (incl. criteria analysis) and the corresponding message texts within the LAD / FBD / STL editor.
- Configured FB call (optional) upon diagnostic event.
- Online changes of monitoring times.
- Option to control or change motions and modes directly from WinCC.

Copyright © Siemens AG Copyright 2009 All rights reserved

ProAgent

The option package ProAgent provides the following important functionality on the WinCC side on the basis of a standardized user interface (uniform for **S7-PDIAG** and **S7-GRAPH**):

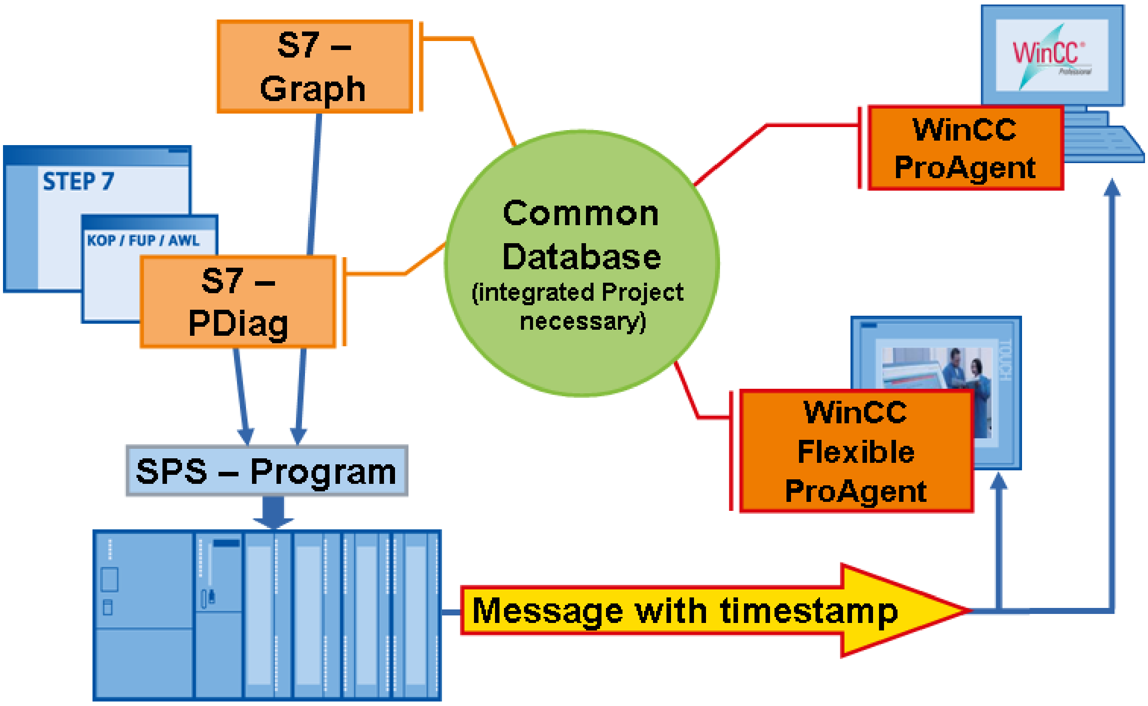
- Error display with time stamp and message status (e.g. coming).
- Error detection, criteria analysis and display of the causing process signals.
- Supporting error removal through motion pictures and mode switches with which machine parts can be moved so that errors can be remedied (e.g. left-right motion).

Copyright © Siemens AG Copyright 2009 All rights reserved

6.3.1 Overview of the process diagnostics

The following figure schematically shows the process diagnostics structure in connection with WinCC:

Figure 6-7



6.3.2 Configuration procedure

Configuration of the PLC functions

- Programming of control function with LAD / FBD / STL
- Defining / programming of the monitoring function with S7-PDIAG
- Compilation of the control program and generation of the diagnostic functions
- Loading the blocks into AS

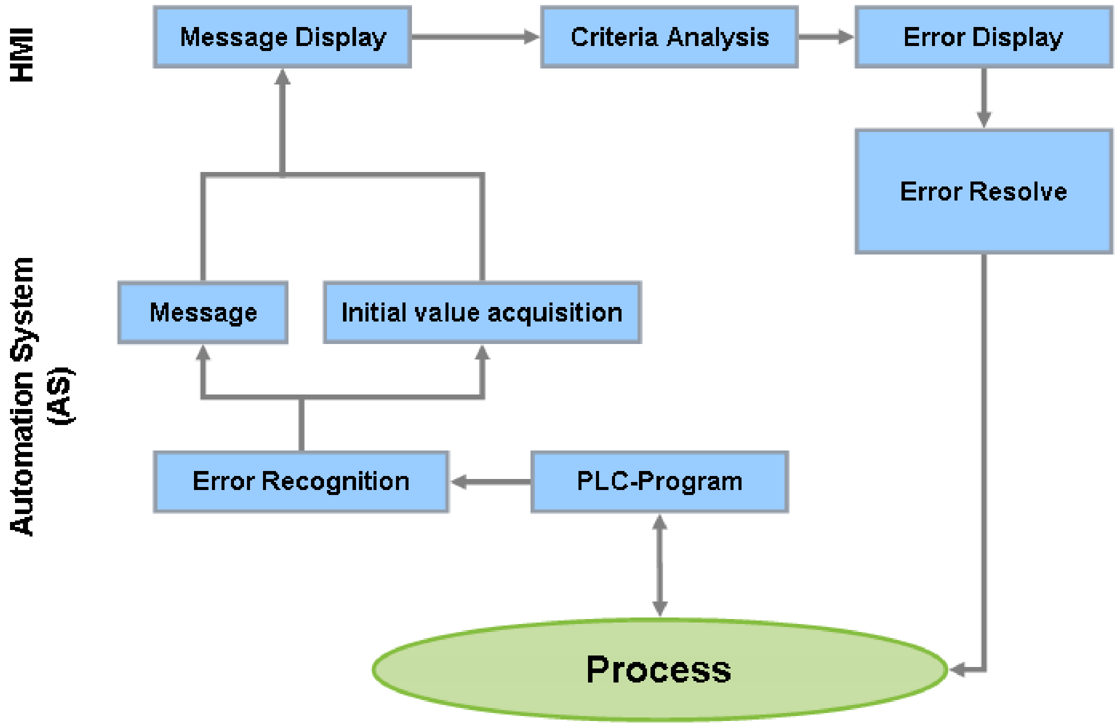
Configuration or parameterization of the HMI functions

- Selection of the standard pictures provided by ProAgent
- Selection of the control whose signals shall be displayed by the HMI system
- Selection of the technological units to be displayed

- Generation of the HMI project and loading of the generated data into the output device (HMI)

6.3.3 Functional procedure of the process diagnostics

Figure 6-8



Copyright © Siemens AG Copyright 2009 All rights reserved

Error recognition

The error recognition proceeds via the blocks which are generated by S7-PDIAG / S7-Graph on an S7 CPU. At the time an error occurs the signal statuses of the involved operands are acquired and stored (initial value acquisition) so that they can be displayed and analyzed later. The number which is assigned to the error is reported to the connected HMI devices together with any associated values (e.g. reached temperature).

Message display

Both, the coming and going of a process error, is recognized by S7-PDIAG / S7-Graph and displayed as a coming or going message on the output device (HMI). There are two options for display on the HMI device:

- The message is displayed with clear text and date and time in a message window.
- If the user needs more information the involved signals and the gating logic can be displayed in the ladder diagram or statement list in a detail window. The triggering signals are determined and marked in a criteria analysis.

Criteria analysis

In the event of process errors the criteria analysis can be used to detect the error-causing operand based on the initial values and with it the cause of the process error can be detected with S7-PDIAG / S7-Graph in connection with the output devices (with Boolean program logic).

Error recovery

The error recovery can be carried out via manual intervention into the process and / or via manual control of the process (at the output device). Since error recovery usually requires moving of the units in manual mode, this is also supported by a standardized motion picture. The switchover between manual mode and automatic mode can also be carried out via the HMI device.

6.3.4 Monitoring types

Operand monitoring

With operand monitoring you monitor whether the diagnostics entry operand (DEO) has a certain level after a certain time (monitoring time). If that is the case, the error is signalled as coming. The error is going when the operand changes its level again. Depending on the selection of level or edge monitoring the delay time will start immediately or after the next active edge only.

Motion monitoring

In S7-PDIAG you have four predefined monitoring types which are specifically provided for motion monitoring in their process. The motion monitoring types are preassigned by the logic and all that you have to do is completing them. When entering the motion monitoring you utilize a predefined monitoring logic which you have to complete and which you can change. The error status occurs when the defined conditions are fulfilled.

General monitoring

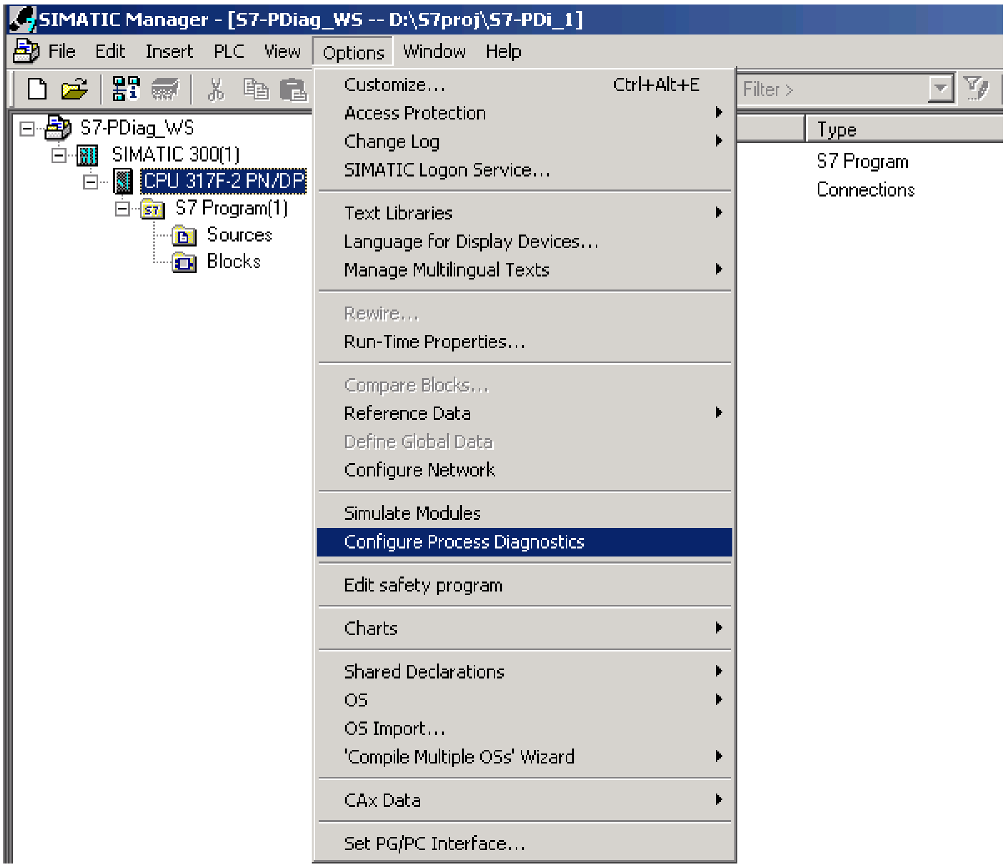
When you use general monitoring you can specify your own monitoring logic as a sequence of logic expressions. Use the language elements in S7-PDIAG to create a monitoring logic by which a complex error monitoring is possible. The error status occurs when the defined conditions are fulfilled (logic = TRUE). The diagnostics entry operand only serves as entry for the criteria analysis. If this operand is to become part of the monitoring (i.e. triggering the error), you have to specify it explicitly.

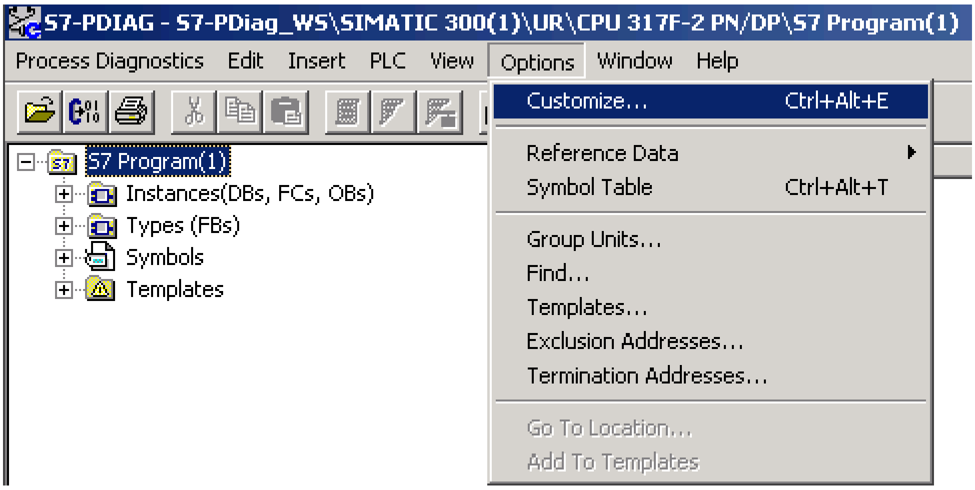
Copyright © Siemens AG Copyright 2009 All rights reserved

6.3.5 Parameterization of PDiag

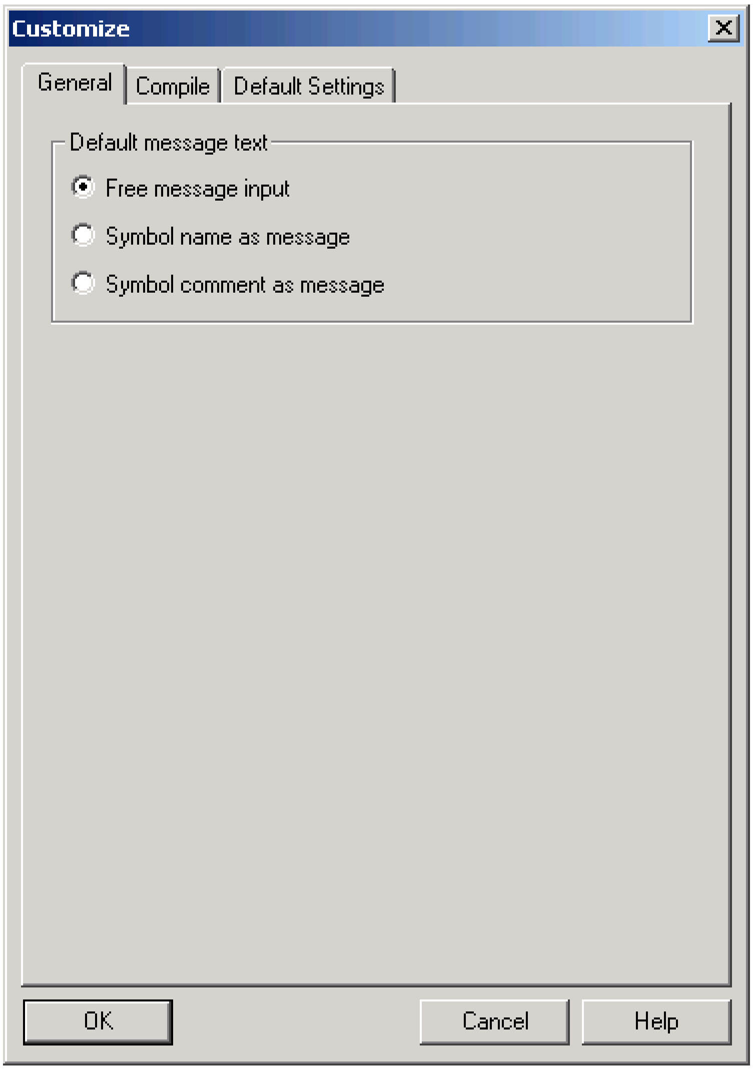
Table 6-12

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>Select the CPU and start the process diagnostics dialog via "Options > Configure Process Diagnostics".

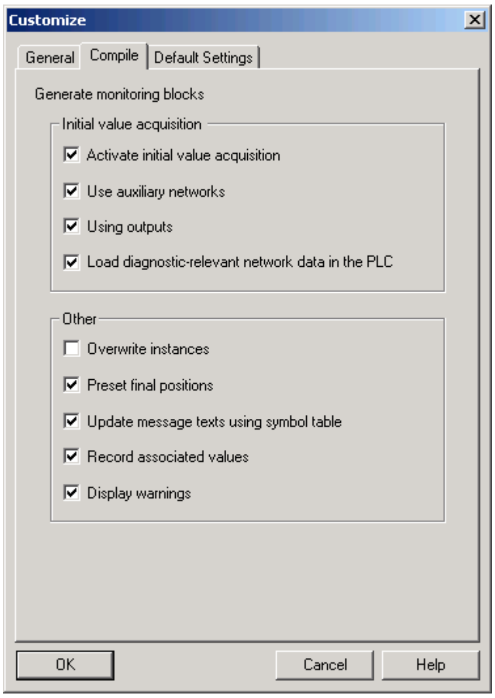

</td></tr>
<tr><td>2.</td><td>Customize the settings via "Options > Customize...".


</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

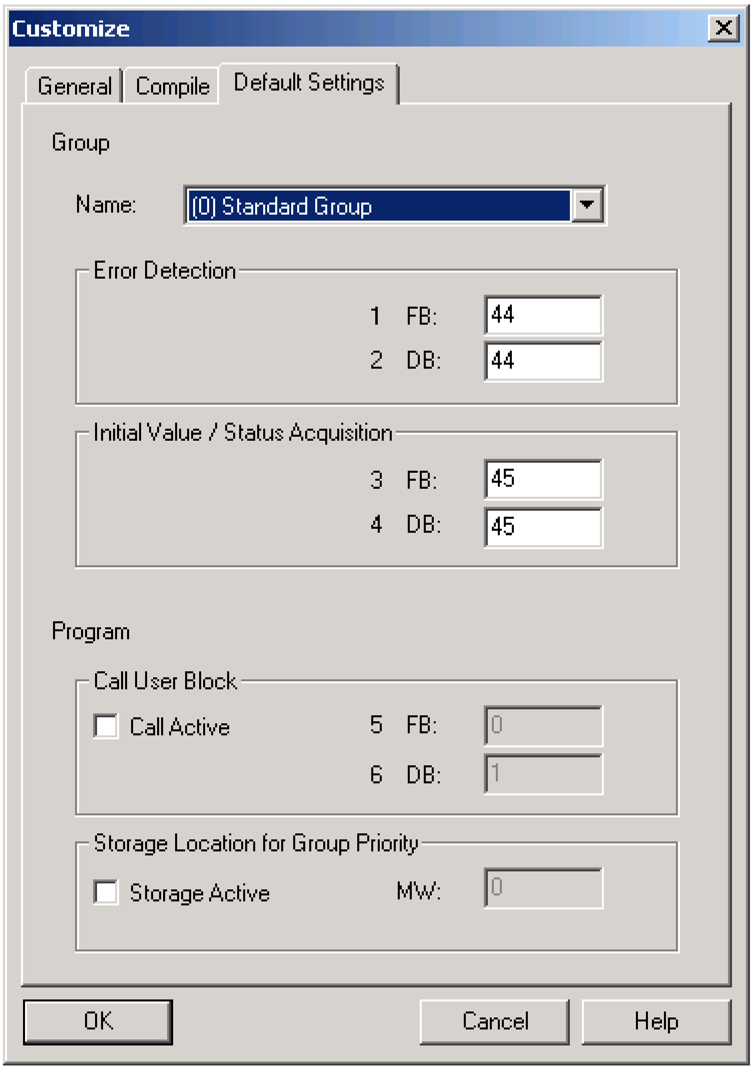
Step	Action
3.	**Free message input** The message text for the error definition can be freely defined. **Symbol name as message** The symbolic name of the DEO is taken from the symbol table and used as message text. **Symbol comment as message** The symbol comment on the DEO is taken from the symbol table and used as message text.  Customize General | Compile | Default Settings Default message text ● Free message input ○ Symbol name as message ○ Symbol comment as message OK Cancel Help

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
4.	**Activate initial value acquisition** The initial value acquisition for all error definitions is deactivated. Thus the settings for the initial value acquisition at the individual error definitions are ineffective. **Use auxiliary networks** The outputs and memory bits are substituted by S7-PDIAG if used in a network as far as a setting network is known for these operands. (important for criteria analysis) **Using outputs** The outputs are also substituted when the auxiliary networks are created. **Load diagnostic-relevant network data in the AS** The diagnostic-relevant network data are directly transferred to the automation system in order to reduce the generation times. **Overwrite instances** If you have made changes to instances, you can force inheritance through the type again during the activation. **Preset final positions** The final position names of motions are automatically preset with the symbolic names of the operands configured at the block call. **Update message texts using symbol table** If you have made changes in the symbol table after configuring the message texts, they will be updated in the message texts. **Record associated values** The configured associated values are transferred to the message blocks. There are 8 bytes available in the data block of the corresponding error detection block per error definition. **Display warnings** Warnings during the generation are displayed.  Customize General | Compile | Default Settings Generate monitoring blocks Initial value acquisition ☑ Activate initial value acquisition ☑ Use auxiliary networks ☑ Using outputs ☑ Load diagnostic-relevant network data in the PLC Other ☐ Overwrite instances ☑ Preset final positions ☑ Update message texts using symbol table ☑ Record associated values ☑ Display warnings OK Cancel Help

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

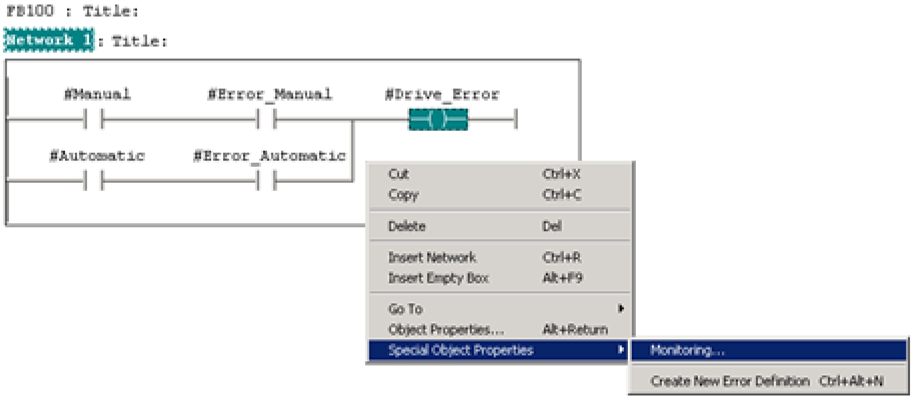
Step	Action
5.	**Default settings** The numbers of the blocks for monitoring and for the initial value acquisition are determined. **Call User Block** The user block (FB with DB) is called for every coming and going error message in the error case. **Storage Location for Group Priority** A memory bit word can be assigned per program. The bit "0" corresponds to the priority 1, the bit "15" to the priority 16.  Customize Default Settings Group Name: (0) Standard Group Error Detection 1 FB: 44 2 DB: 44 Initial Value / Status Acquisition 3 FB: 45 4 DB: 45 Program Call User Block ☐ Call Active 5 FB: 0 6 DB: 1 Storage Location for Group Priority ☐ Storage Active MW: 0

Copyright © Siemens AG Copyright 2009 All rights reserved

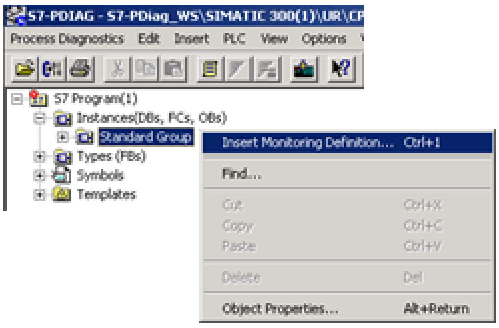
Step	Action
6.	**Configuring error definitions**

Before you can create a monitoring feature you have to select the diagnostics entry operand first. There are the following three options for this, depending on whether you want to select the DEO in the LAD / STL / FBD editor, in the unit overview of S7-PDIAG or in the symbol table.

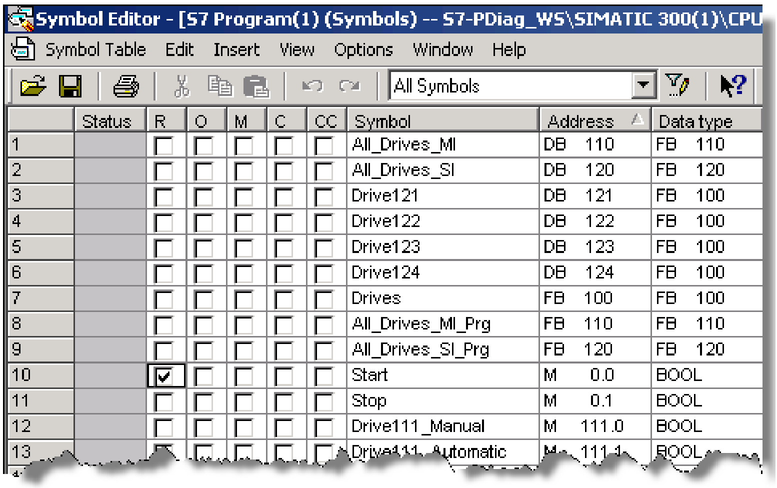
LAD/STL/FBD



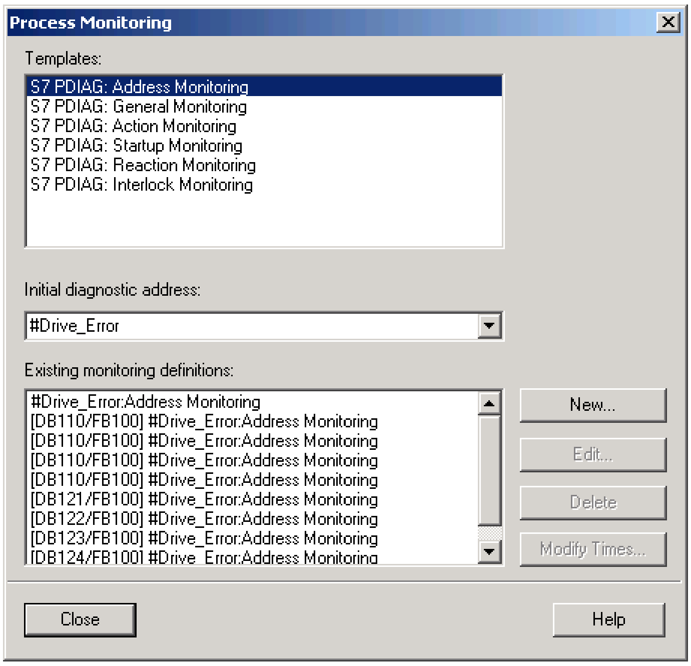
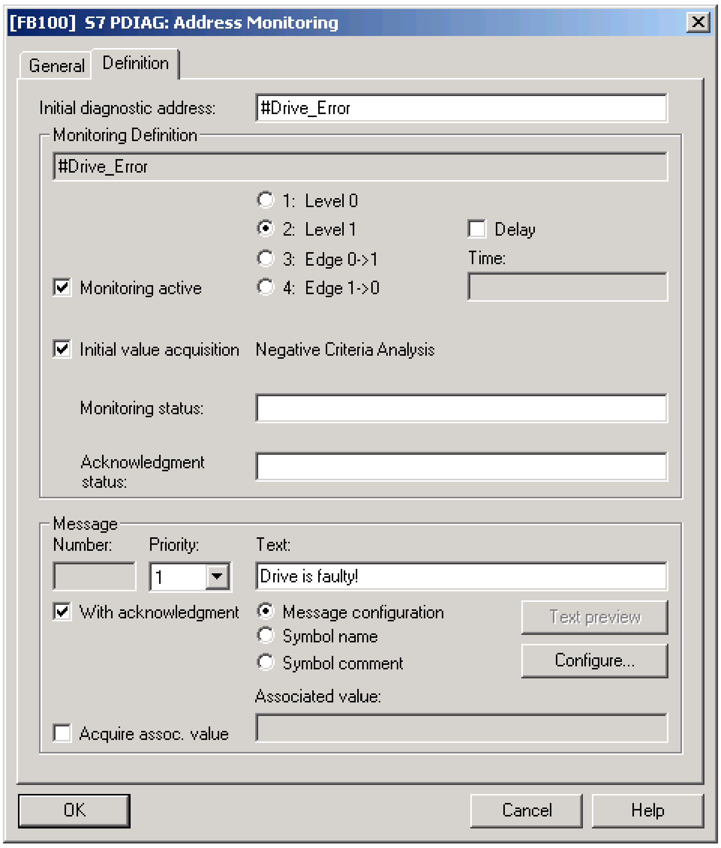
Unit overview of S7-PDIAG


S7-PDIAG - S7-PDiag_WS\SIMATIC 300(1)\UR\CP
Process Diagnostics Edit Insert PLC View Options
S7 Program(1)
Instances(DBs, FCs, OBs)
Standard Group
Types (FBs)
Symbols
Templates
Insert Monitoring Definition... Ctrl+I
Find...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Object Properties... Alt+Return

Symbol table


Symbol Editor - [S7 Program(1) (Symbols) -- S7-PDiag_WS\SIMATIC 300(1)\CPU
Symbol Table Edit Insert View Options Window Help
All Symbols

	Status	R	O	M	C	CC	Symbol	Address		Data type	
1		□	□	□	□	□	All_Drives_MI	DB	110	FB	110
2		□	□	□	□	□	All_Drives_SI	DB	120	FB	120
3		□	□	□	□	□	Drive121	DB	121	FB	100
4		□	□	□	□	□	Drive122	DB	122	FB	100
5		□	□	□	□	□	Drive123	DB	123	FB	100
6		□	□	□	□	□	Drive124	DB	124	FB	100
7		□	□	□	□	□	Drives	FB	100	FB	100
8		□	□	□	□	□	All_Drives_MI_Prg	FB	110	FB	110
9		□	□	□	□	□	All_Drives_SI_Prg	FB	120	FB	120
10		☑	□	□	□	□	Start	M	0.0	BOOL	
11		□	□	□	□	□	Stop	M	0.1	BOOL	
12		□	□	□	□	□	Drive111_Manual	M	111.0	BOOL	
13		□	□	□	□	□	Drive111_Automatic	M	111.1	BOOL	

Step	Action
7.	Select the monitoring type and add a definition for it then.  Process Monitoring Templates: S7 PDIAG: Address Monitoring S7 PDIAG: General Monitoring S7 PDIAG: Action Monitoring S7 PDIAG: Startup Monitoring S7 PDIAG: Reaction Monitoring S7 PDIAG: Interlock Monitoring Initial diagnostic address: #Drive_Error Existing monitoring definitions: #Drive_Error:Address Monitoring [DB110/FB100] #Drive_Error:Address Monitoring [DB110/FB100] #Drive_Error:Address Monitoring [DB110/FB100] #Drive_Error:Address Monitoring [DB110/FB100] #Drive_Error:Address Monitoring [DB121/FB100] #Drive_Error:Address Monitoring [DB122/FB100] #Drive_Error:Address Monitoring [DB123/FB100] #Drive_Error:Address Monitoring [DB124/FB100] #Drive_Error:Address Monitoring New... Edit... Delete Modify Times... Close Help **Example of message text**  [FB100] S7 PDIAG: Address Monitoring General | Definition Initial diagnostic address: #Drive_Error Monitoring Definition #Drive_Error ○ 1: Level 0 ● 2: Level 1 ○ 3: Edge 0->1 ○ 4: Edge 1->0 ☐ Delay Time: ☑ Monitoring active ☑ Initial value acquisition Negative Criteria Analysis Monitoring status: Acknowledgment status: Message Number: Priority: 1 Text: Drive is faulty! ☑ With acknowledgment ● Message configuration ○ Symbol name ○ Symbol comment Associated value: ☐ Acquire assoc. value

Copyright © Siemens AG Copyright 2009 All rights reserved

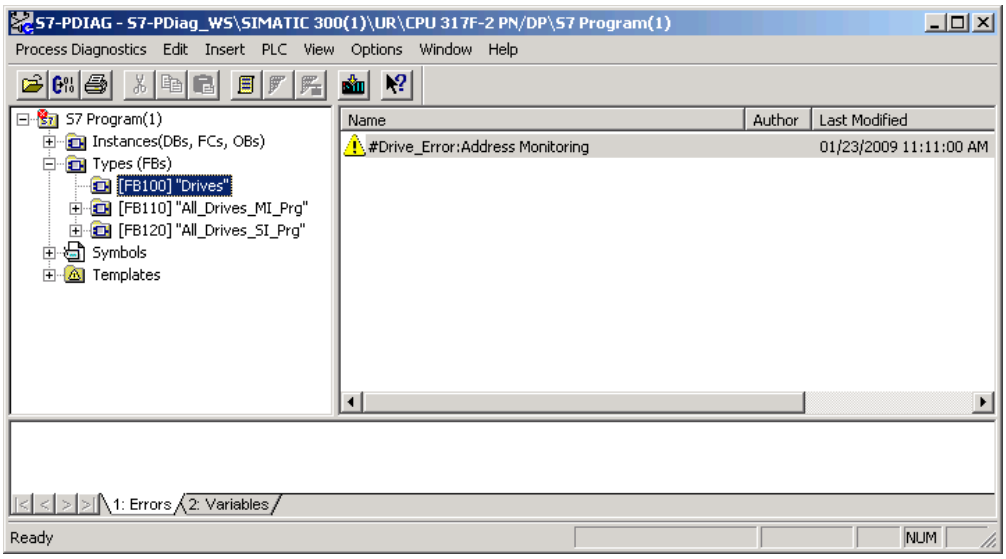
Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>8.</td><td>

Support of the type/instances concept

S7-PDIAG supports the type/instances concept of SIMATIC S7. This means that error definitions can be entirely configured at the respective block type, i.e. at the FB. S7-PDIAG will then automatically create the instances of the error definitions including the corresponding different messages analogously to the instance data block in your user program.

Error definition types

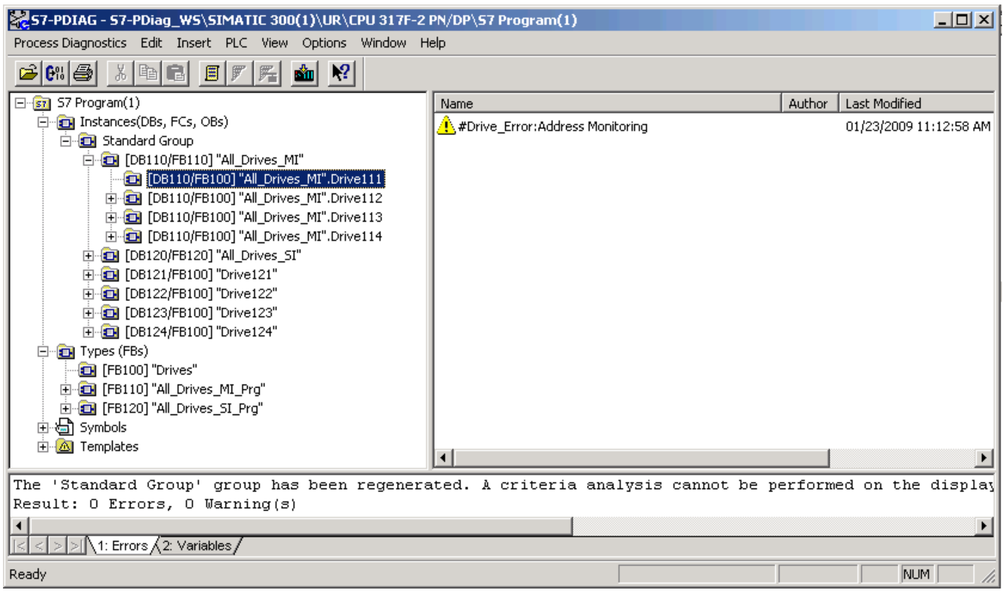


S7-PDIAG - S7-PDiag_WS\SIMATIC 300(1)\UR\CPU 317F-2 PN/DP\S7 Program(1)
Process Diagnostics Edit Insert PLC View Options Window Help
1: Errors
2: Variables
Ready
NUM

S7 Program(1)
Instances(DBs, FCs, OBs)
Types (FBs)
[FB100] "Drives"
[FB110] "All_Drives_MI_Prg"
[FB120] "All_Drives_SI_Prg"
Symbols
Templates

Name	Author	Last Modified
#Drive_Error:Address Monitoring		01/23/2009 11:11:00 AM

Instances of the error definition



S7-PDIAG - S7-PDiag_WS\SIMATIC 300(1)\UR\CPU 317F-2 PN/DP\S7 Program(1)
Process Diagnostics Edit Insert PLC View Options Window Help
1: Errors
2: Variables
Ready
NUM

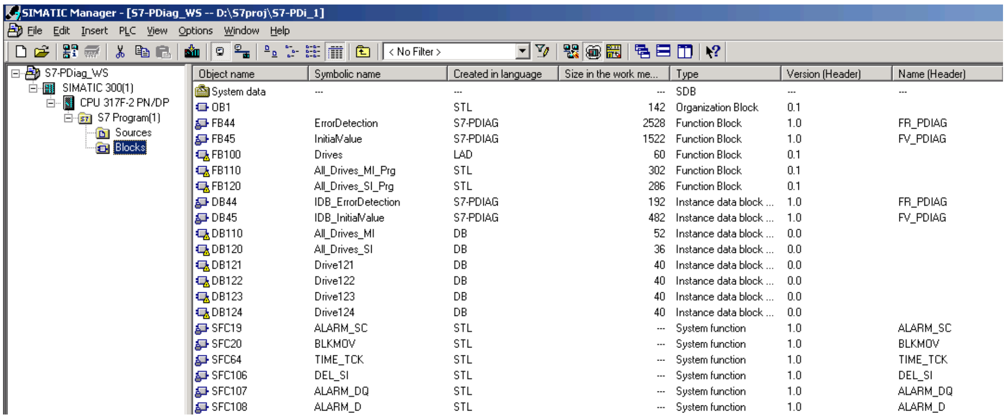
S7 Program(1)
Instances(DBs, FCs, OBs)
Standard Group
[DB110/FB110] "All_Drives_MI"
[DB110/FB100] "All_Drives_MI".Drive111
[DB110/FB100] "All_Drives_MI".Drive112
[DB110/FB100] "All_Drives_MI".Drive113
[DB110/FB100] "All_Drives_MI".Drive114
[DB120/FB120] "All_Drives_SI"
[DB121/FB100] "Drive121"
[DB122/FB100] "Drive122"
[DB123/FB100] "Drive123"
[DB124/FB100] "Drive124"
Types (FBs)
[FB100] "Drives"
[FB110] "All_Drives_MI_Prg"
[FB120] "All_Drives_SI_Prg"
Symbols
Templates

Name	Author	Last Modified
#Drive_Error:Address Monitoring		01/23/2009 11:12:58 AM

```
The 'Standard Group' group has been regenerated. A criteria analysis cannot be performed on the display
Result: 0 Errors, 0 Warning(s)
```

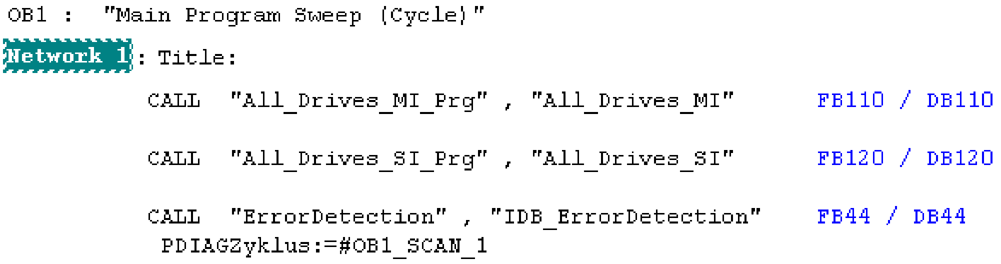
</td></tr>
</table>

Step	Action
9.	**Call Error Detection** In order that the compiled monitoring blocks will be edited in the process and the defined errors will be reported, you have to link them in the cycle; for this purpose you should insert the call of the monitoring blocks at the end of OB1.



SIMATIC Manager - [S7-PDiag_WS -- D:\S7proj\S7-PDi_1]

Object name	Symbolic name	Created in language	Size in the work me...	Type	Version (Header)	Name (Header)
System data	---	---	---	SDB	---	---
OB1		STL	142	Organization Block	0.1	
FB44	ErrorDetection	S7-PDIAG	2528	Function Block	1.0	FR_PDIAG
FB45	InitialValue	S7-PDIAG	1522	Function Block	1.0	FV_PDIAG
FB100	Drives	LAD	60	Function Block	0.1	
FB110	All_Drives_MI_Prg	STL	302	Function Block	0.1	
FB120	All_Drives_SI_Prg	STL	286	Function Block	0.1	
DB44	IDB_ErrorDetection	S7-PDIAG	192	Instance data block ...	1.0	FR_PDIAG
DB45	IDB_InitialValue	S7-PDIAG	482	Instance data block ...	1.0	FV_PDIAG
DB110	All_Drives_MI	DB	52	Instance data block ...	0.0	
DB120	All_Drives_SI	DB	36	Instance data block ...	0.0	
DB121	Drive121	DB	40	Instance data block ...	0.0	
DB122	Drive122	DB	40	Instance data block ...	0.0	
DB123	Drive123	DB	40	Instance data block ...	0.0	
DB124	Drive124	DB	40	Instance data block ...	0.0	
SFC19	ALARM_SC	STL	---	System function	1.0	ALARM_SC
SFC20	BLKMOV	STL	---	System function	1.0	BLKMOV
SFC64	TIME_TCK	STL	---	System function	1.0	TIME_TCK
SFC106	DEL_SI	STL	---	System function	1.0	DEL_SI
SFC107	ALARM_DQ	STL	---	System function	1.0	ALARM_DQ
SFC108	ALARM_D	STL	---	System function	1.0	ALARM_D



```
OB1 :  "Main Program Sweep (Cycle)"
Network 1: Title:
          CALL  "All_Drives_MI_Prg" , "All_Drives_MI"      FB110 / DB110

          CALL  "All_Drives_SI_Prg" , "All_Drives_SI"      FB120 / DB120

          CALL  "ErrorDetection" , "IDB_ErrorDetection"    FB44 / DB44
           PDIAGZyklus:=#OB1_SCAN_1
```

Copyright © Siemens AG Copyright 2009 All rights reserved

6.3.6 Monitoring with ProAgent in WinCC

Prerequisites

- WinCC must have been installed integrated in STEP7 (integrated project)
- The option ProAgent must have been installed
- Connection between CPU and SCADA
- Control program with error definitions must have been created and compiled
- Runtime licence for ProAgent

Configuration

- PC station with WinCC application
- ProAgent standard pictures are created when the units are generated

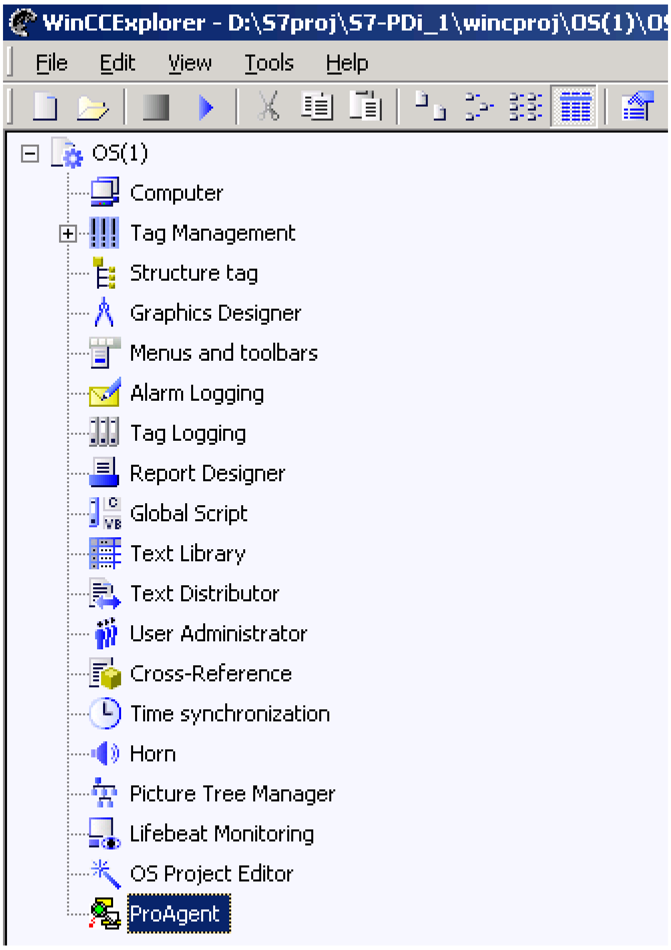
Copyright © Siemens AG Copyright 2009 All rights reserved

Selecting units

In WinCC you can determine what controls and units you wish to monitor with a certain OS. If your plant has several OS it is desirable, of course, to perform the diagnostics on every OS only for such units which are actually controlled with this OS. The units which are monitored with an OS can be located in different STEP 7 projects if they have been combined in a STEP 7 multi-project.

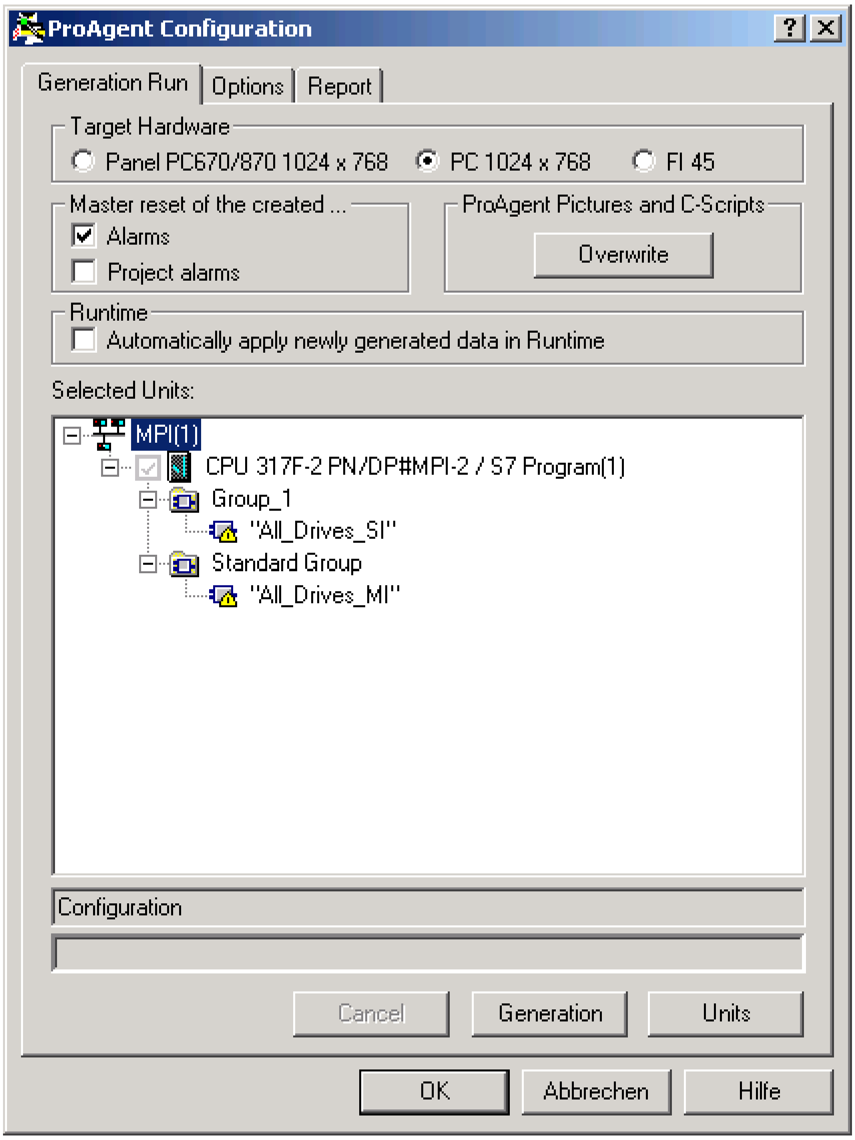
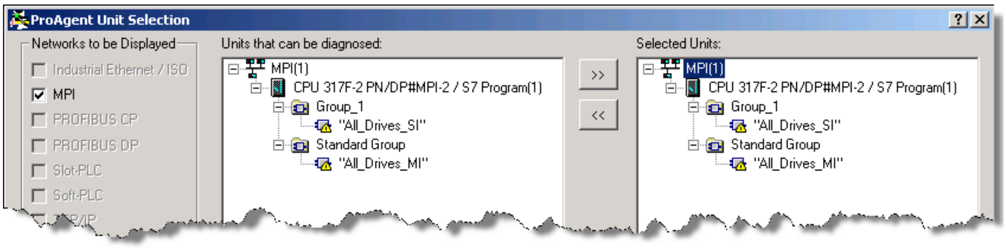
When ProAgent was installed, there is a new editor by the name of "ProAgent" in WinCC Explorer. It contains the completely configured diagnostic screens for the different versions of the WinCC applications. The names of the pictures of the process diagnostics all start with the prefix "@Diag".

Table 6-13

Step	Action
1.	Mark the editor "ProAgent" and open it via the properties dialog. 

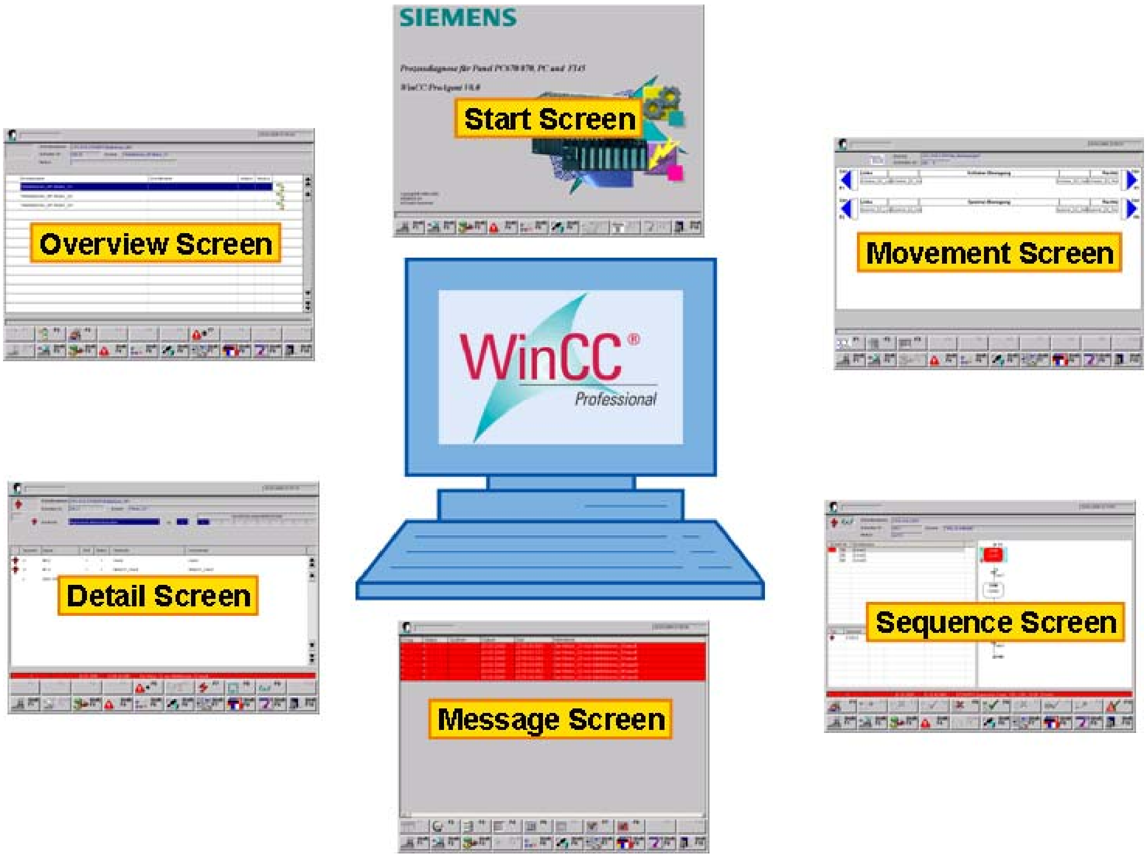
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
2.	You can see all selected units in the configuration dialog which are taken into consideration during the generation.  ProAgent Configuration Generation Run | Options | Report Target Hardware: ○ Panel PC670/870 1024 x 768 ● PC 1024 x 768 ○ FI 45 Master reset of the created ...: ☑ Alarms ☐ Project alarms ProAgent Pictures and C-Scripts: Overwrite Runtime: ☐ Automatically apply newly generated data in Runtime Selected Units: MPI(1) CPU 317F-2 PN/DP#MPI-2 / S7 Program(1) Group_1 "All_Drives_SI" Standard Group "All_Drives_MI" Configuration Cancel | Generation | Units OK | Abbrechen | Hilfe
3.	Via the "Units" button this list can be edited.  ProAgent Unit Selection Networks to be Displayed: ☐ Industrial Ethernet / ISO ☑ MPI ☐ PROFIBUS CP ☐ PROFIBUS DP ☐ Slot-PLC ☐ Soft-PLC ☐ TCP/IP Units that can be diagnosed: MPI(1) CPU 317F-2 PN/DP#MPI-2 / S7 Program(1) Group_1 "All_Drives_SI" Standard Group "All_Drives_MI" >> | << Selected Units: MPI(1) CPU 317F-2 PN/DP#MPI-2 / S7 Program(1) Group_1 "All_Drives_SI" Standard Group "All_Drives_MI"

6.3.7 Overview of the diagnostic screens

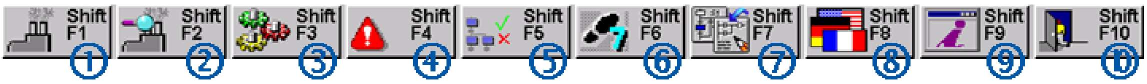
Figure 6-9



Copyright © Siemens AG Copyright 2009 All rights reserved

Global keyset of the diagnostic screens

Figure 6-10



1. Overview
2. Detailed picture
3. Motion picture
4. Message display
5. Sequence chart diagram
6. Simatic Manager
7. Status / Control
8. Change language
9. Screen information
10. Back

Note The global keyset is available for all diagnostic screens.

Overview

The overview shows all units of your plant. Here you can see of each unit:

- whether it is disturbed.
- in what mode it is (manual, automatic, etc.).
- in the case of S7-GRAPH chains what step of the step sequence is currently active.

When a fault occurs in several units you can see at what unit the fault occurred first. This shows you immediately where the actual cause rests and what faults are actually secondary faults.

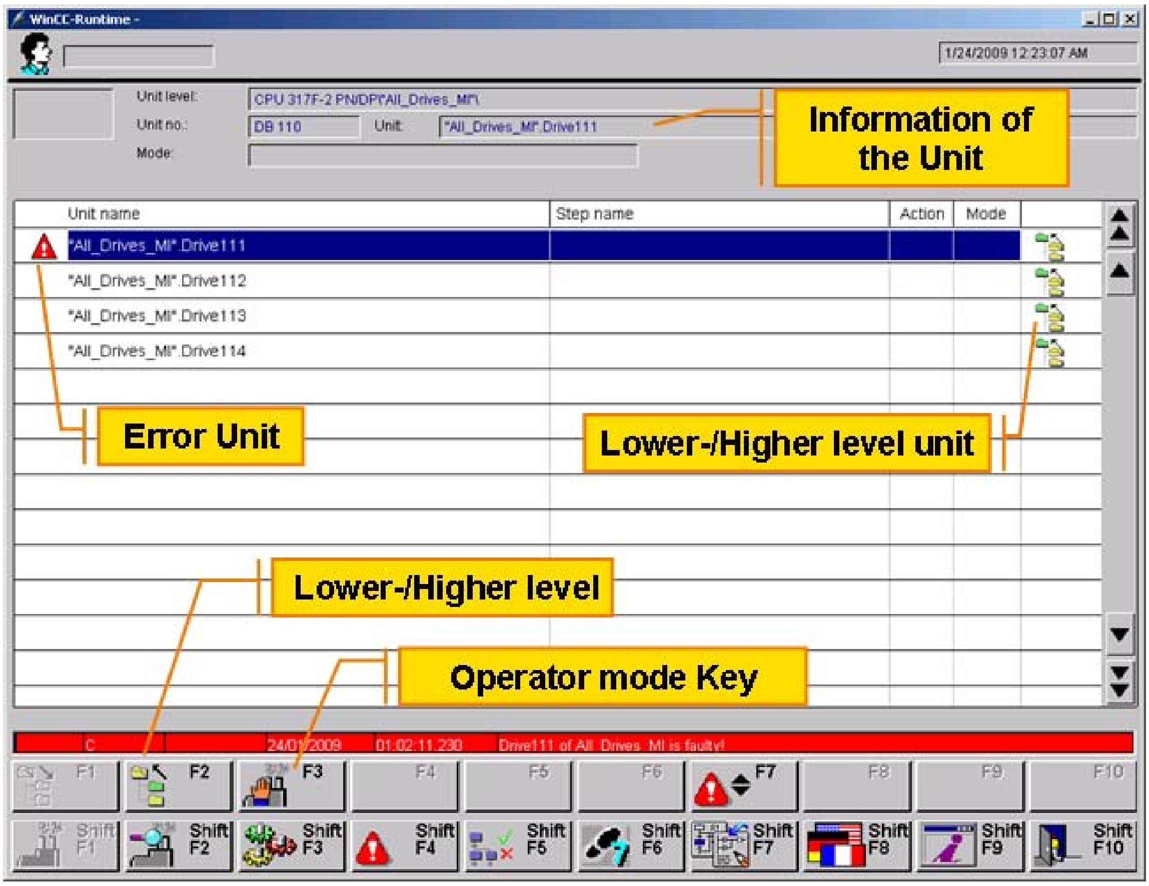
Functions

A unit can be selected from the list and its mode can be set. For example, you can switch over from automatic mode to manual mode to remove a fault manually. After having selected a unit you can analyse it in detail in the detail screen and manually move single units in the motion screen to remove the fault. If the unit is based on an S7-GRAPH step sequence, you can activate or deactivate single steps or the entire sequence in the step sequence screen.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Figure 6-11



WinCC-Runtime -

1/24/2009 12:23:07 AM

Unit level: CPU 317F-2 PN/DP\"All_Drives_MI"\

Unit no.: DB 110 Unit: "All_Drives_MI".Drive111

Mode:

Unit name	Step name	Action	Mode
"All_Drives_MI".Drive111			
"All_Drives_MI".Drive112			
"All_Drives_MI".Drive113			
"All_Drives_MI".Drive114			

C 24/01/2009 01:02:11.230 Drive111 of All Drives MI is faulty!

Detailed picture

Displayed error

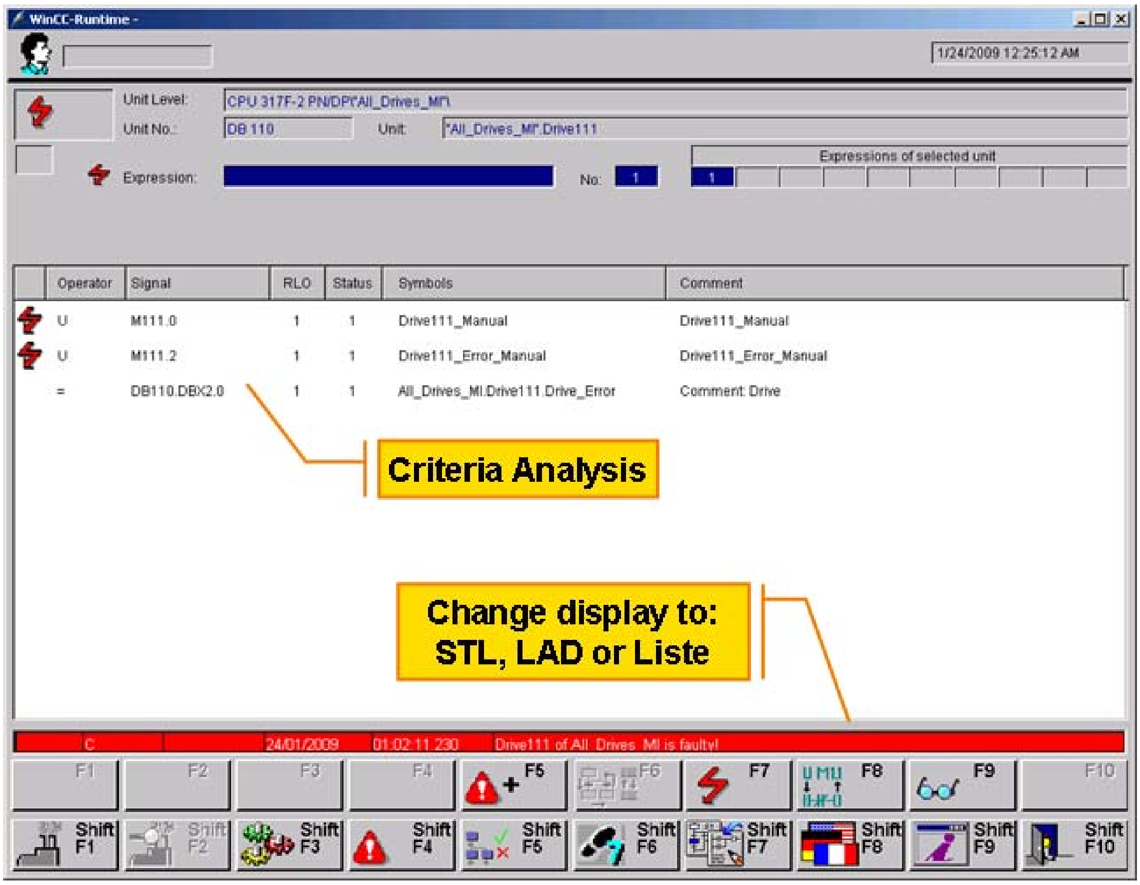
What error is displayed when the detail screen is opened depends on the location from which you called the detail screen:

- If you called the detail screen from out of the message screen, you had selected a message there. The detail screen shows the error now which triggered this message.
- If you called the detail screen from out of the overview screen, you had selected a unit there. The detail screen shows the error of the first faulty action of this unit now.

General setup

As all diagnostic screens the detail screen has a standardized structure. Changing the display between signal list, STL and LAD will only change the central part of the detail screen. The information about the unit (in the upper part) and the key assignment will remain unchanged.

Figure 6-12



WinCC-Runtime -

1/24/2009 12:25:12 AM

Unit Level: CPU 317F-2 PN/DP\"All_Drives_MI"\

Unit No.: DB 110 Unit: "All_Drives_MI".Drive111

Expression: No: 1

Expressions of selected unit: 1

	Operator	Signal	RLO	Status	Symbols	Comment
ϟ	U	M111.0	1	1	Drive111_Manual	Drive111_Manual
ϟ	U	M111.2	1	1	Drive111_Error_Manual	Drive111_Error_Manual
	=	DB110.DBX2.0	1	1	All_Drives_MI.Drive111.Drive_Error	Comment: Drive

Criteria Analysis

Change display to: STL, LAD or Liste

C 24/01/2009 01:02:11.230 Drive111 of All_Drives_MI is faulty!

Copyright © Siemens AG Copyright 2009 All rights reserved

Alarms screen

In the alarms screen, all pending process indications are displayed. The messages are output in a chronological order on the screen. The alarms screen is frequently used as the entry to the diagnostics. Here you can monitor whether and what faults occur and then you can access all further diagnostic screens.

Additional functions

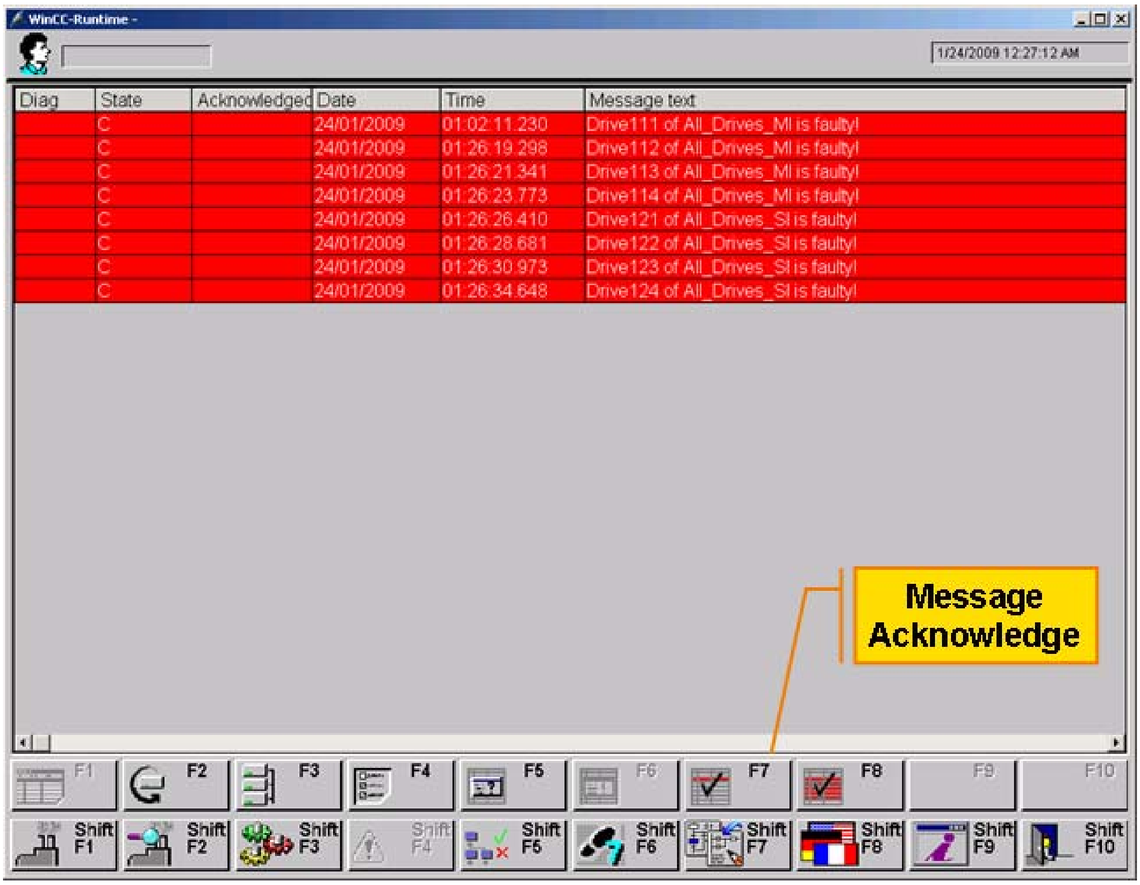
The alarms screen is structured quite similar to a common message page. However there are some additional information and functions available. You can see at a glance from an asterisk in front of the message number what messages are diagnosable. You can perform process diagnostics for these messages then. You can select a certain message and open other diagnostic screens context-sensitively with a button:

- Detail screen
  There you can see an extract of the program code whose monitoring feature triggered the selected fault message.
- Overview screen
  There you get an overview over the different units of your plant.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Figure 6-13



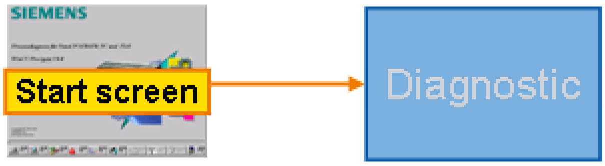
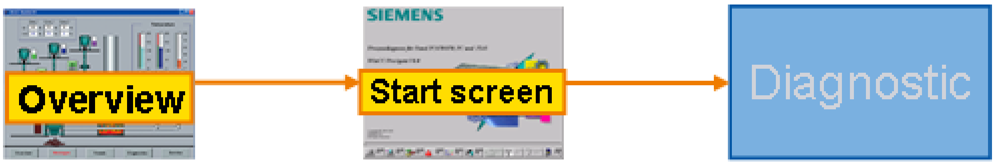
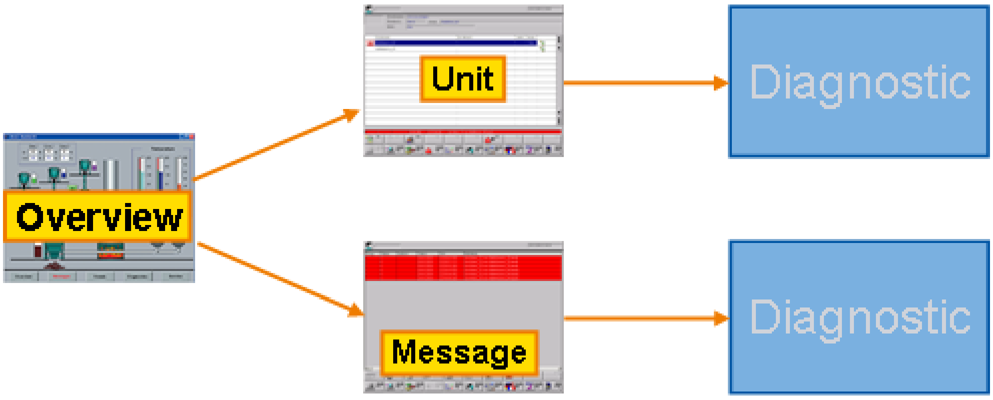
Diag	State	Acknowledged	Date	Time	Message text
	C		24/01/2009	01:02:11.230	Drive111 of All_Drives_MI is faulty!
	C		24/01/2009	01:26:19.298	Drive112 of All_Drives_MI is faulty!
	C		24/01/2009	01:26:21.341	Drive113 of All_Drives_MI is faulty!
	C		24/01/2009	01:26:23.773	Drive114 of All_Drives_MI is faulty!
	C		24/01/2009	01:26:26.410	Drive121 of All_Drives_SI is faulty!
	C		24/01/2009	01:26:28.681	Drive122 of All_Drives_SI is faulty!
	C		24/01/2009	01:26:30.973	Drive123 of All_Drives_SI is faulty!
	C		24/01/2009	01:26:34.648	Drive124 of All_Drives_SI is faulty!

Linking the diagnostic screens

After the diagnostic screens have been linked, you have to give the operator access to them. Depending on the type of your project there are several options for linking the diagnostic screens:

- The project exclusively serves for process diagnostics. It only contains diagnostic screens and no further plant screens. In that case your project should start with the supplied diagnostic start screen in runtime.
- The project contains further plant-specific screens apart from the diagnostic screens. In that case it is advisable to make one of these screens your start screen or to create a general start screen.
- The process diagnostics shall not be started with a start screen but with a diagnostic screen (e.g. directly with the detail screen). In that case you have to define in your configuration what unit shall be displayed in the diagnostic screen.

Table 6-14

<table>
<tr><th>Linking the diagnostic screens</th></tr>
<tr><td>Diagnostic start screen is the start screen of the project:

</td></tr>
<tr><td>Calling the diagnostic start screen:

</td></tr>
<tr><td>Calling any diagnostic screen:

</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

6.3.8 Criteria analysis

Initial value / status acquisition

If the initial value acquisition is activated for an error definition, all binary statuses of the operands will be recorded in the cycle in which an error is detected which were used for the creation of the operand (DEO) which is to be monitored. In this way you can perform a criteria analysis which will make error recovery easier. Analogously these values can be acquired in every cycle; they are designated as status values then.

Auxiliary networks

The auxiliary networks which are created by S7-PDIAG are networks which describe the used preceding logic operations. These preceding logic operations are used further in a network which is to be analyzed. S7-PDIAG uses the auxiliary networks for criteria analysis.

Copyright © Siemens AG Copyright 2009 All rights reserved

Criteria analysis

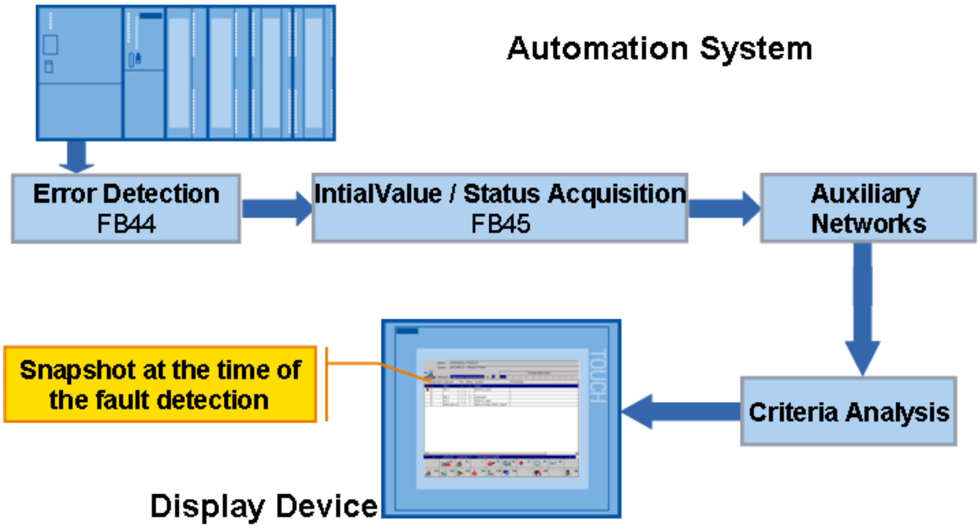
The criteria analysis determines the cause of the error from the logic of the user program. The criteria analysis is performed on the output device. It serves for tracing the error cause. A criteria analysis starts at the diagnostics entry operand and analyzes the initial values of all networks which determine the value of the diagnostics entry operand.

The criteria analysis proceeds in two steps:

- first all RLO values are determined from the initial values for all operands of the network in which the error occurred.
- then the individual lines are checked starting at the network end and marked as faulty or not.

Copyright © Siemens AG Copyright 2009 All rights reserved

Figure 6-14



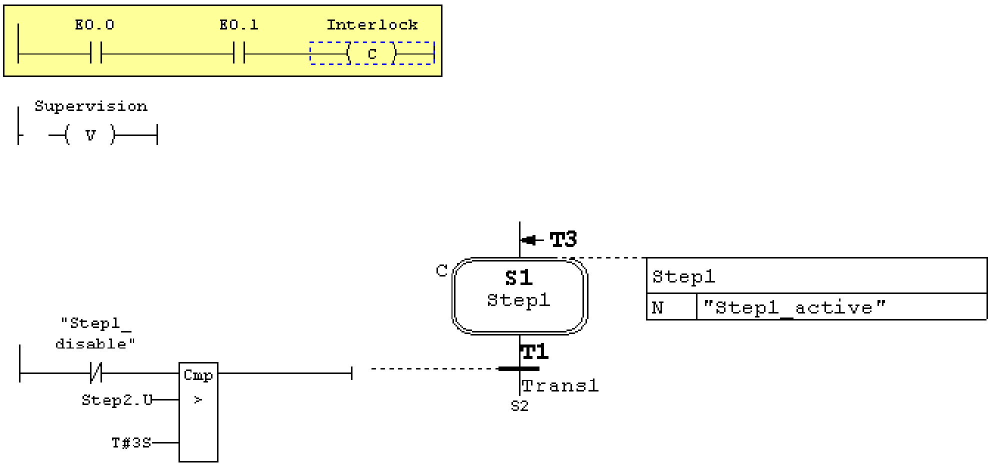
6.3.9 Monitoring types

Interlock

is a programmable condition for step locking which has an influence on the execution of individual actions

- fulfilled interlock => no fault
- not fulfilled interlock => fault
- "C" - identifier of interlock

Figure 6-15



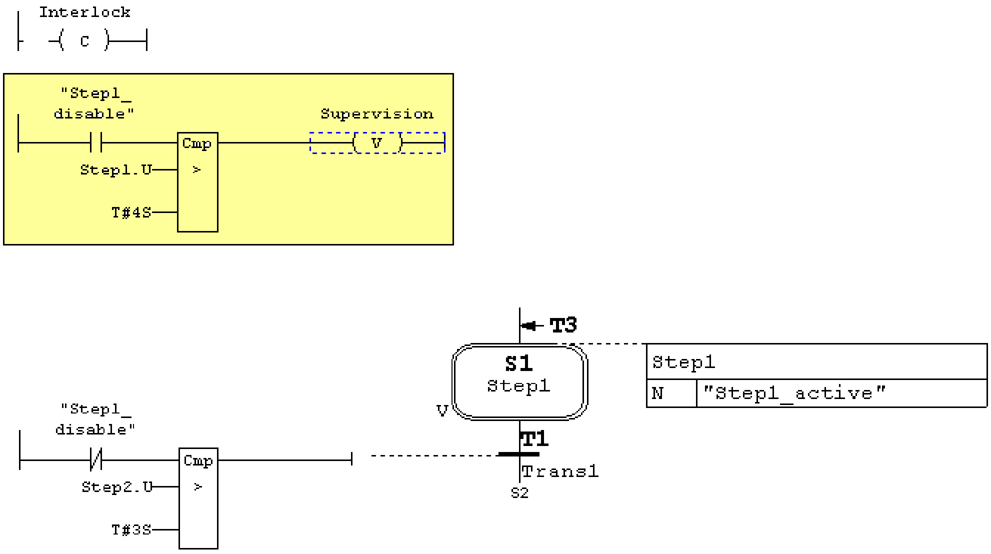
Copyright © Siemens AG Copyright 2009 All rights reserved

Supervision

is a programmable condition for step supervision which has an effect on the switchover from one step to the next

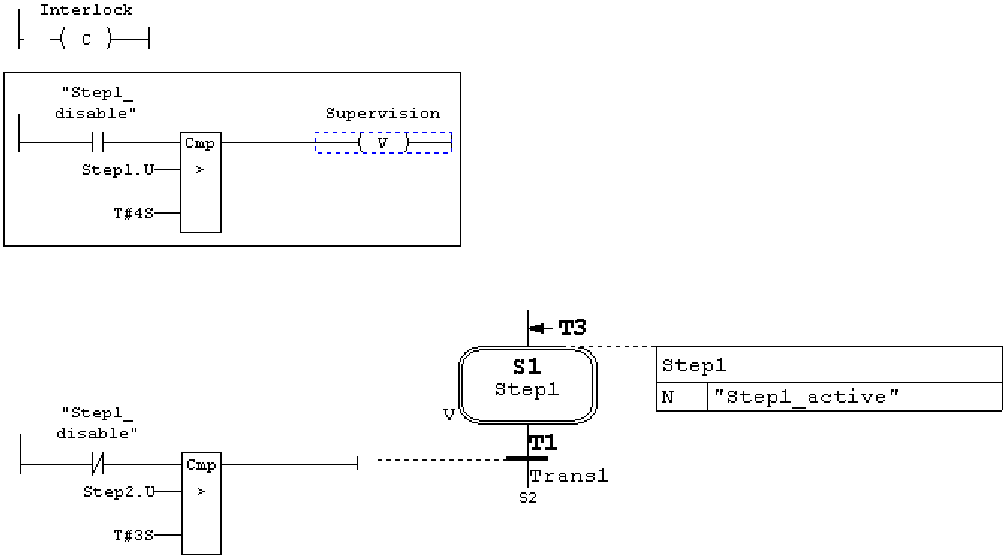
- not fulfilled supervision => no fault
- fulfilled supervision => fault
- "V" - identifier of supervision

Figure 6-16

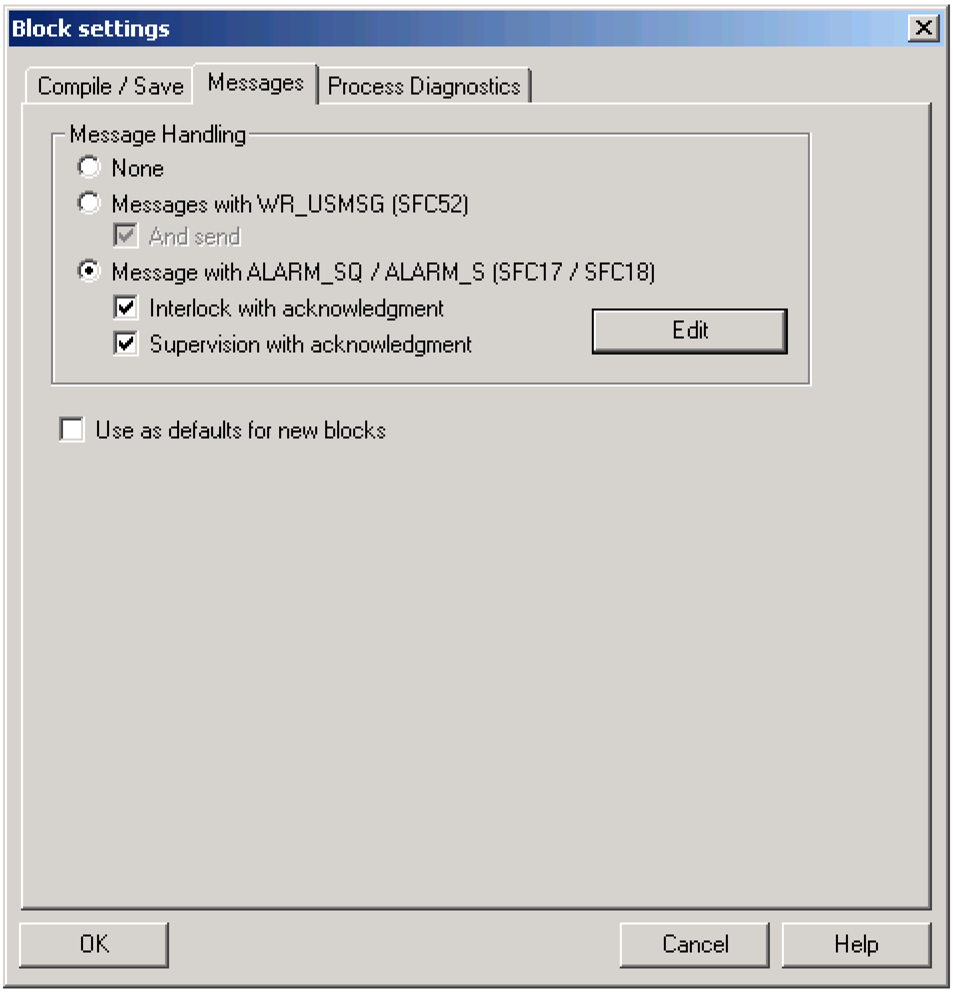
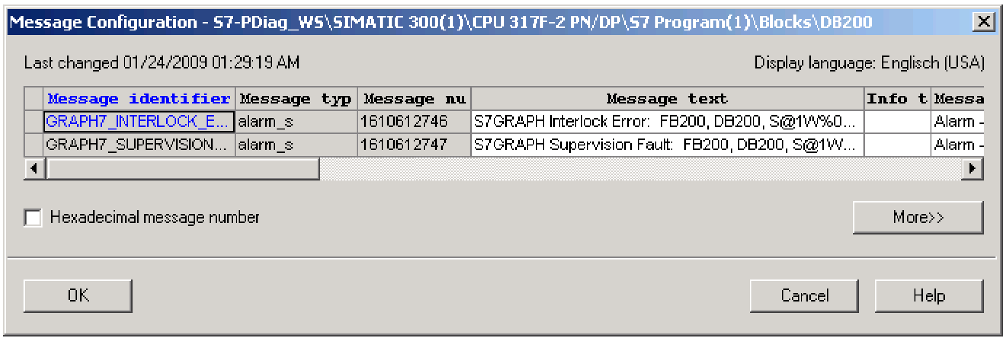


6.3.10 Configuring error definitions

Table 6-15

Step	Action
1.	Define a monitoring type.  Interlock C "Step1_ disable" Supervision Cmp > V Step1.U T#4S T3 S1 Step1 Step1 N "Step1_active" V T1 Trans1 S2 "Step1_ disable" Cmp > Step2.U T#3S

Copyright © Siemens AG Copyright 2009 All rights reserved

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2.</td><td>Activate the message channel.

Block settings
Compile / Save | Messages | Process Diagnostics
Message Handling
○ None
○ Messages with WR_USMSG (SFC52)
☑ And send
● Message with ALARM_SQ / ALARM_S (SFC17 / SFC18)
☑ Interlock with acknowledgment
☑ Supervision with acknowledgment
□ Use as defaults for new blocks
 </td></tr>
<tr><td>3.</td><td>Check the predefined message texts with step number and step name.

Message Configuration - S7-PDiag_WS\SIMATIC 300(1)\CPU 317F-2 PN/DP\S7 Program(1)\Blocks\DB200
Last changed 01/24/2009 01:29:19 AM
Display language: Englisch (USA)
<table>
<tr><th>Message identifier</th><th>Message typ</th><th>Message nu</th><th>Message text</th><th>Info t</th><th>Messa</th></tr>
<tr><td>GRAPH7_INTERLOCK_E...</td><td>alarm_s</td><td>1610612746</td><td>S7GRAPH Interlock Error: FB200, DB200, S@1W%0...</td><td></td><td>Alarm -</td></tr>
<tr><td>GRAPH7_SUPERVISION...</td><td>alarm_s</td><td>1610612747</td><td>S7GRAPH Supervision Fault: FB200, DB200, S@1W...</td><td></td><td>Alarm -</td></tr>
</table>
□ Hexadecimal message number
 </td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

6.3.11 Step sequence screen in WinCC / ProAgent

The step sequence screen is structured as follows:
The step list shows the following information about the unit which was selected in the diagnostic screen from which you called the step sequence screen:

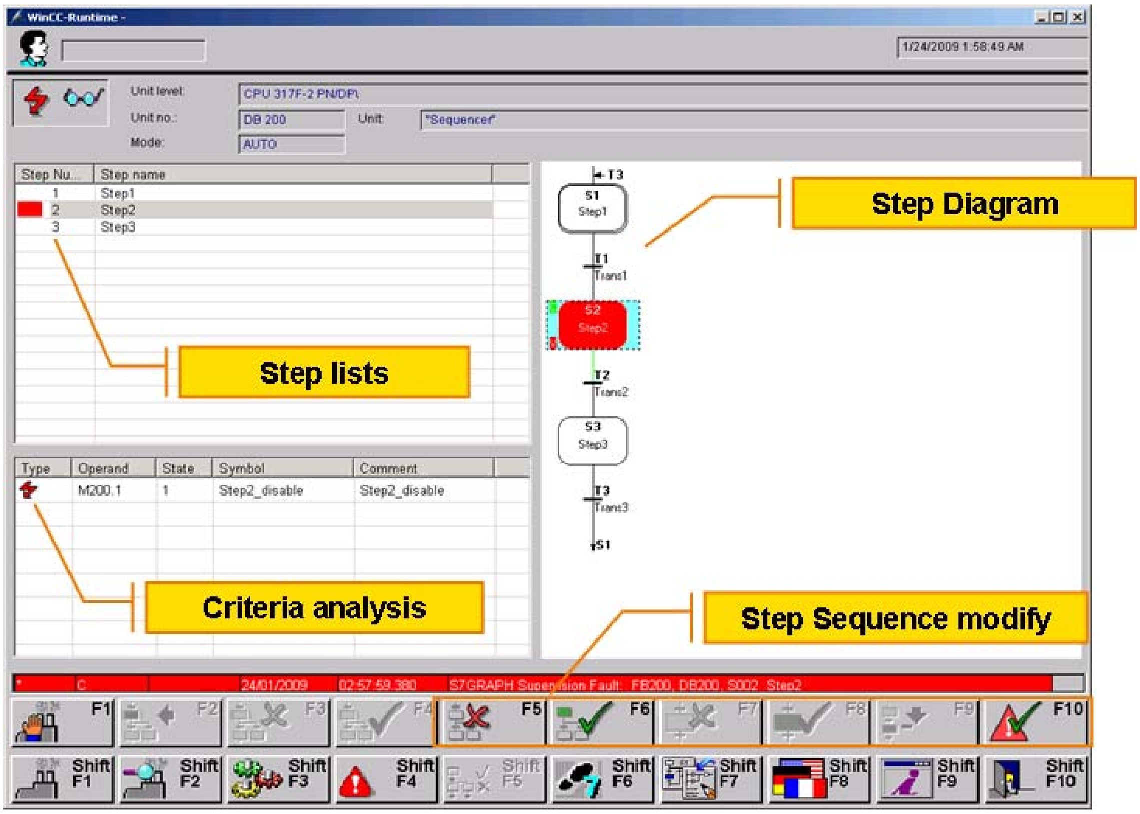
- Designation
- Current step with number and name

The list of faulty operands in the lower left part of the screen displays information about the operands of the selected step.
The step diagram in the right part of the screen graphically shows the steps.

Functions

The step sequence screen allows you to manually select single steps to activate or deactivate them, to re-initialize or disable the step sequence.

Figure 6-17



WinCC-Runtime -

1/24/2009 1:58:49 AM

Unit level: CPU 317F-2 PN/DP\
Unit no.: DB 200 Unit: "Sequencer"
Mode: AUTO

Step Nu...	Step name
1	Step1
🟥 2	Step2
3	Step3

Type	Operand	State	Symbol	Comment
	M200.1	1	Step2_disable	Step2_disable

* C 24/01/2009 02:57:59.380 S7GRAPH Supervision Fault: FB200, DB200, S002 Step2

Copyright © Siemens AG Copyright 2009 All rights reserved

6.4 Further reading

Bibliographic references

This list is not complete and only represents a selection of relevant literature.

Table 6-16

	Topic	Title
/1/	STEP7 V5.4 Documentation Basic Knowledge	6ES7810-4CA08-8AW0
/2/	Documentation of WinCC V7.0	http://support.automation.siemens.com/WW/view/en/29489481
/3/	Programming S7-GRAPH V5.3 for S7-300/400 sequential controls	http://support.automation.siemens.com/WW/view/en/1137630

Copyright © Siemens AG Copyright 2009 All rights reserved

Internet links

This list is not complete and only represents a selection of relevant literature.

Table 6-17

	Topic	Title
\1\	Report S7-system error in connection with FB125, FB126 and SFC13	http://support.automation.siemens.com/WW/view/en/17858394
\2\	Programming S7 diagnostic blocks FB125 and FC125	http://support.automation.siemens.com/WW/view/de/387257
\3\	Diagnostic package PNIODiag	http://support.automation.siemens.com/WW/view/de/26996747
\4\	Report S7-System Error	http://support.automation.siemens.com/WW/view/en/22727527
\5\	Display of old S7-PDIAG messages	http://support.automation.siemens.com/WW/view/en/10604215
\6\	Criteria analysis beyond block boundary	http://support.automation.siemens.com/WW/view/en/27540030
\7\	Using the Web Diagnose Client/Server	http://support.automation.siemens.com/WW/view/en/22619825

Copyright © Siemens AG Copyright 2009 All rights reserved

7 Basic Process Control

7.1 Introduction

Basic Process Control (BPC) is included in the WinCC basic system as a standard and it provides additional tools for configuration to realize typical control tasks.

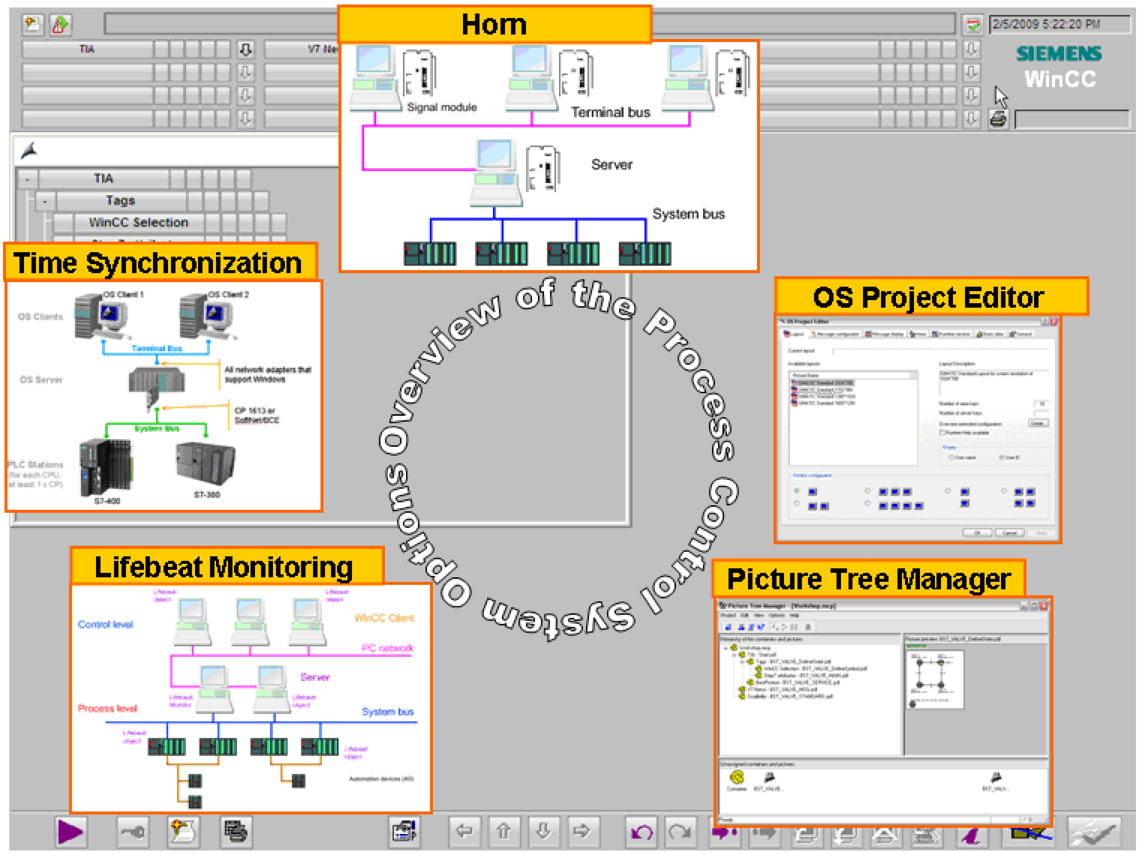
Area of application

With BPC you can use quite a number of control functions from the process control system for your configuration. The control system is created automatically and supports you in the efficient configuration.

Overview of Basic Process Control

The following figure shows a selection of components of the Basic Process Control:

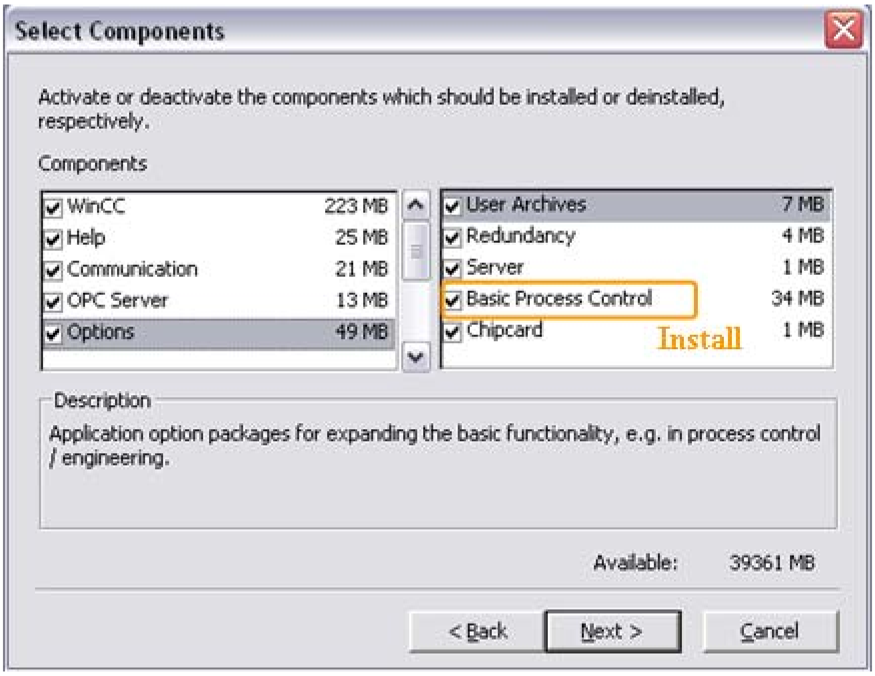
Figure 7-1



7.2 Prerequisites

Basic Process Control is a WinCC option and is only available if the option "Basic Process Control" has been selected during the installation.

Figure 7-2



Select Components

Activate or deactivate the components which should be installed or deinstalled, respectively.

Components

☑ WinCC	223 MB
☑ Help	25 MB
☑ Communication	21 MB
☑ OPC Server	13 MB
☑ Options	49 MB

☑ User Archives	7 MB
☑ Redundancy	4 MB
☑ Server	1 MB
☑ Basic Process Control	34 MB
☑ Chipcard	1 MB

Description

Application option packages for expanding the basic functionality, e.g. in process control / engineering.

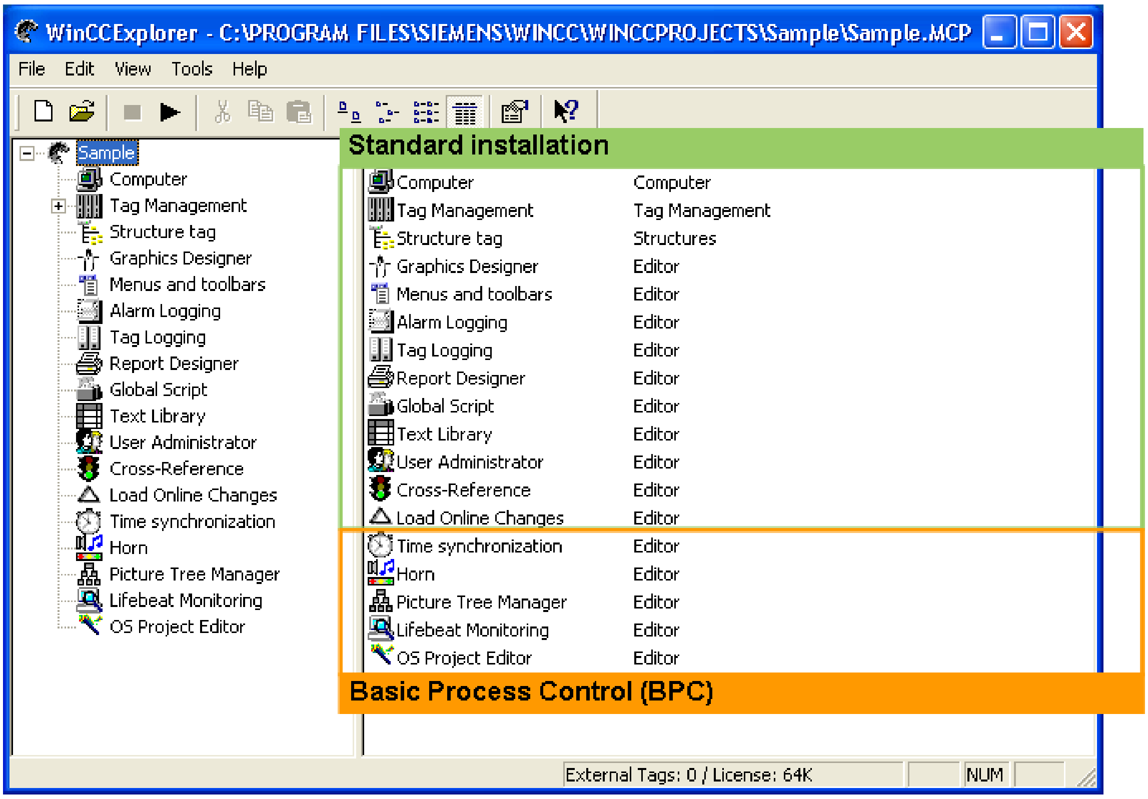
Available: 39361 MB

Note From WinCC V6.0 BPC has been part of the software package and need not be licensed separately.

Copyright © Siemens AG Copyright 2009 All rights reserved

View in the WinCC Explorer

Figure 7-3



Standard installation

Computer	Computer
Tag Management	Tag Management
Structure tag	Structures
Graphics Designer	Editor
Menus and toolbars	Editor
Alarm Logging	Editor
Tag Logging	Editor
Report Designer	Editor
Global Script	Editor
Text Library	Editor
User Administrator	Editor
Cross-Reference	Editor
Load Online Changes	Editor
Time synchronization	Editor
Horn	Editor
Picture Tree Manager	Editor
Lifebeat Monitoring	Editor
OS Project Editor	Editor

Basic Process Control (BPC)

Copyright © Siemens AG Copyright 2009 All rights reserved

7.3 Time synchronization

The time synchronization is a WinCC application which is used to synchronize the time of the whole system according to the SIMATIC procedure.

The time synchronization is configured with the "Time Synchronization" editor. The time can be synchronized as follows:

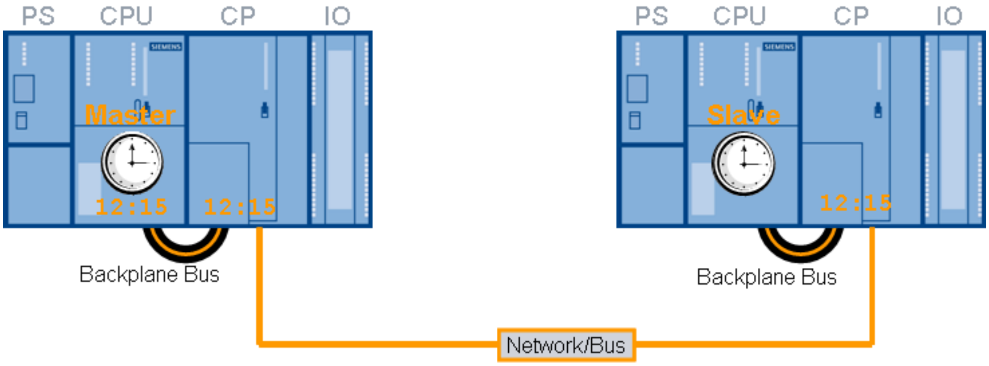
- via the local area network / terminal bus for the Operator Station.
- via the plant bus/Industrial Ethernet bus for WinCC Server with connection to the automation systems.

7.3.1 SIMATIC procedure

- The SIMATIC procedure is based on the communication of two communication processors (CP).
- The communication of the respective CPU with the CP takes place on the backplane bus.
- The SIMATIC procedure is a combination of different time synchronization methods, depending on the used bus.
- Depending on the bus on which the time is stored an automatic runtime adaptation of the message is carried out.

Copyright © Siemens AG Copyright 2009 All rights reserved

Figure 7-4



7.3.2 Master/slave principle

A computer or a specialized device, e.g. Siclock, serves as time master. This master transmits the time to all other devices, the slaves. Only one master can be active in the network and it usually has an external time signal receiver.

The slaves can use two different procedures to synchronize the time with the master:

- One master is active and sends the time messages to the bus. The slaves receive these time messages and synchronize their time then. Several devices may be configured as master if they support the standby mode. The masters in standby-mode are slaves as long as the active master is sending time telegrams. When a standby master detects the absence of the time messages, one of the standby masters will take over the function of the active master and start sending time messages. The devices which communicate via the plant bus use this "master broadcast" procedure.
- The slaves are active and poll the master periodically for the time which is to be synchronized. Each slave has to specify which device is the master. If a master fails, the slaves cannot assume the function of the master. Therefore the slaves need a list of the masters which can substitute the failed master. Computers in the local area network use this "polling" procedure.

Copyright © Siemens AG Copyright 2009 All rights reserved

7.3.3 Time synchronization in runtime

The time synchronization is entered in the startup list of the computer when the following events occur and it is activated at the start of WinCC runtime:

- at the run of the OS project editor.
- after the configuration in the "Time Synchronization" editor.

After the run of the OS project editor you have to configure the time synchronization.

After the start of runtime the time synchronization is activated after maximally three minutes.

7.3.4 Preventing time jumps

Time jumps at the master will not be sent to the system. In order to prevent this, WinCC proceeds as follows:

- When the time is synchronized via the terminal bus or an access point in the plant bus is configured as master and another access point is configured as slave, the time synchronization is permanently deactivated. A corresponding control system message is sent.
- When the time is synchronized via the plant bus and the access points in the plant bus are configured as master, the access points will be set to the slave mode. The master of another computer assumes the time synchronization and synchronizes the time of the respective computer. A corresponding control system message is sent.

Note "Greenwich Mean Time" (GMT) or winter time is used for the user data and time messages in all devices of the plant bus. WinCC V5 projects allowed upgrading to WinCC V6 only when the option "V5-compatibel communication mode" was ticked in the dialog field "Properties Computer" on the tab "Parameter" in the WinCC Explorer. The following default setting is activated for this option:

- for newly created projects from WinCC V6: option deactivated.
- for projects migrated from WinCC V5: option activated.

Copyright © Siemens AG Copyright 2009 All rights reserved

7.3.5 Hardware support of the time synchronization

Industrial Ethernet with automation systems

The time synchronization must have access to the Industrial Ethernet bus with which the AS communicates. Special hardware cards provide the capability for transmitting and receiving time messages.

The following Industrial Ethernet devices support the time synchronization:

- CP1613 hardware card - The software is integrated in the card.
- SoftNet/BCE hardware / software solution - A software driver emulates the hardware.

The two cards have the following properties:

- They have an internal clock.
- They can operate as slaves. They recognize if time messages are not received.
- They can operate as active or standby master.
- The synchronization interval is set to 10 seconds and cannot be configured.

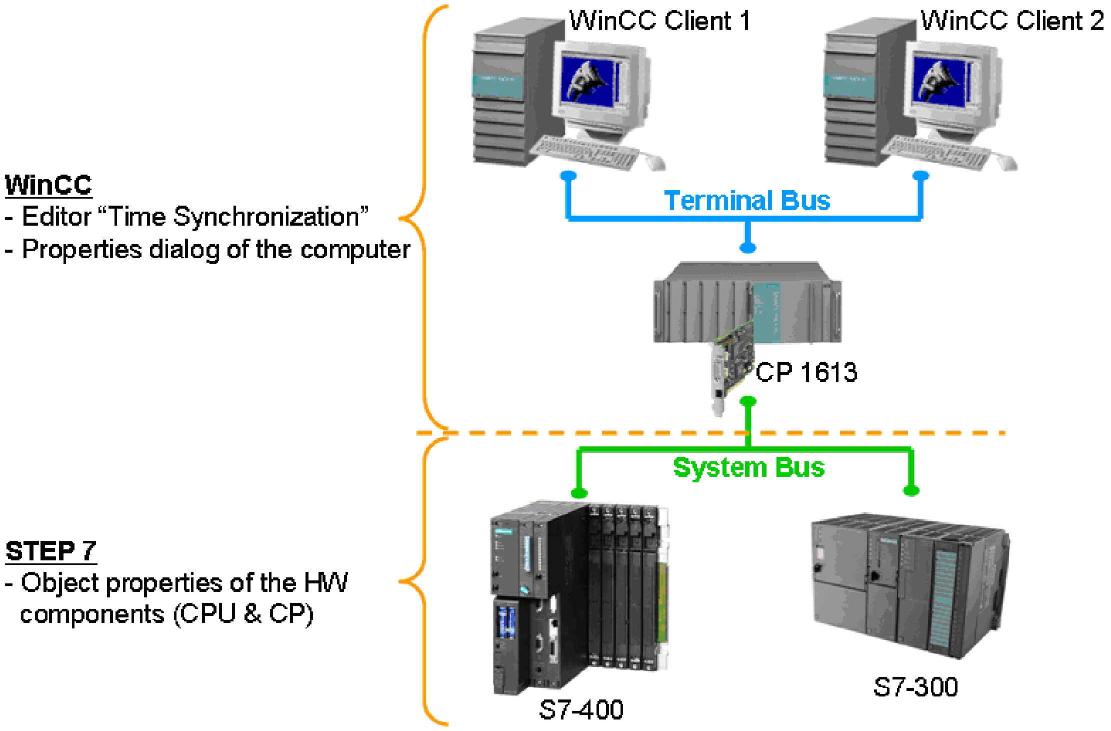
Local area network with operator station

The operator station synchronizes its local time via the local area network. All network adapters which support Windows can be used.

Copyright © Siemens AG Copyright 2009 All rights reserved

Parameterization levels:

Figure 7-5


WinCC
- Editor "Time Synchronization"
- Properties dialog of the computer
STEP 7
- Object properties of the HW components (CPU & CP)
WinCC Client 1
WinCC Client 2
Terminal Bus
CP 1613
System Bus
S7-400
S7-300

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

7.3.6 Configuration in WinCC

The time synchronization via terminal bus

The time synchronization via local area network / terminal bus is possible in three ways:

- The computer is automatically synchronized via a linked WinCC server.
- The time is transferred from one of the permanently defined computers in the network.
- The time is set via a 3rd-party component.

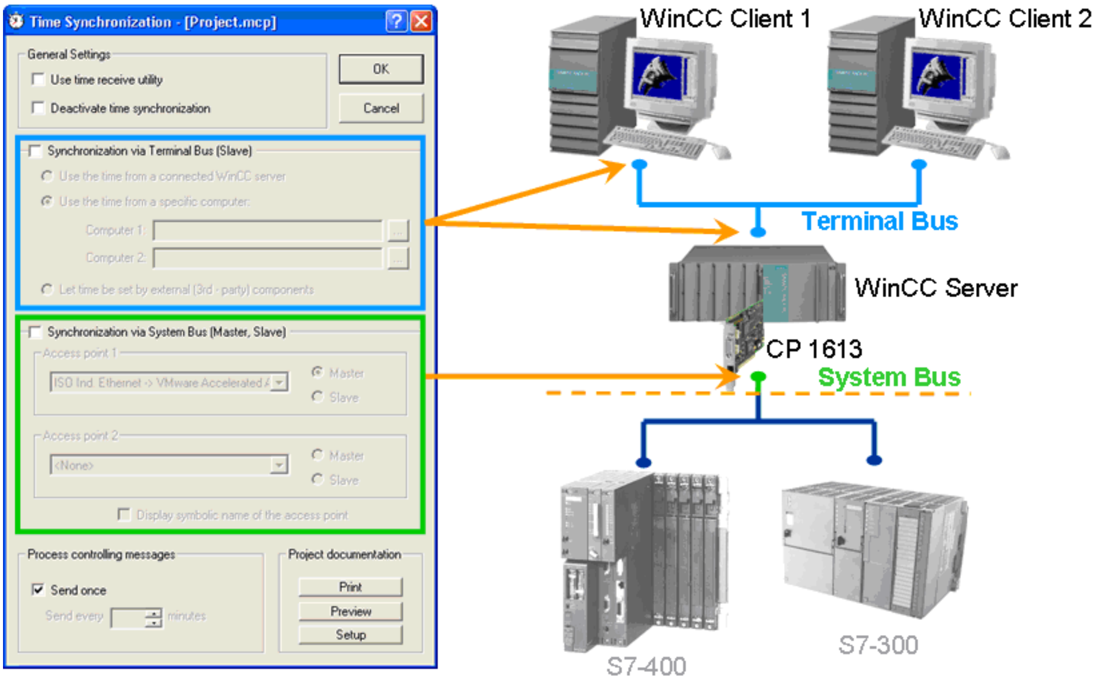
The time synchronization via plant bus/BCE

You can use a BCE network card to synchronize the time via the plant bus.

Note If the computer which is to be configured is a WinCC client, the selection fields of the time synchronization cannot be controlled via the plant bus.

Open the "Time Synchronization" editor with a double-click in the WinCC Explorer. Make the required settings in the dialog field for the configuration.

Figure 7-6



Time Synchronization - [Project.mcp]

General Settings
- □ Use time receive utility
- □ Deactivate time synchronization

□ Synchronization via Terminal Bus (Slave)
- ○ Use the time from a connected WinCC server
- ● Use the time from a specific computer:
  - Computer 1:
  - Computer 2:
- ○ Let time be set by external (3rd - party) components

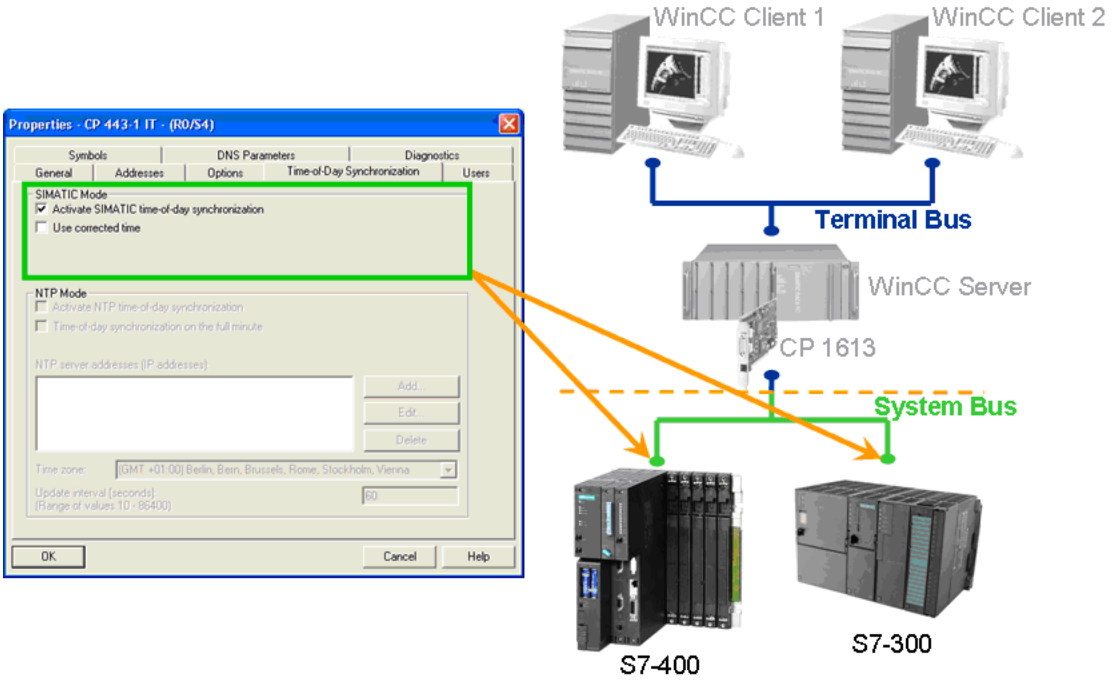
□ Synchronization via System Bus (Master, Slave)
- Access point 1: ISO Ind. Ethernet -> VMware Accelerated A ● Master ○ Slave
- Access point 2: <None> ○ Master ○ Slave
- □ Display symbolic name of the access point

Process controlling messages
- ☑ Send once
- Send every [ ] minutes

7.3.7 Configuration in STEP 7

Only after the configuration of the CP has been made it will be capable of processing the time messages.

Figure 7-7



Properties - CP 443-1 IT - (R0/S4)

SIMATIC Mode
☑ Activate SIMATIC time-of-day synchronization
☐ Use corrected time

NTP Mode
☐ Activate NTP time-of-day synchronization
☐ Time-of-day synchronization on the full minute

NTP server addresses (IP addresses):

Time zone: (GMT +01:00) Berlin, Bern, Brussels, Rome, Stockholm, Vienna

Update interval [seconds]:
(Range of values 10 - 86400) 60

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

You can set the time synchronization in HW-Config under the properties of S7-CPU.

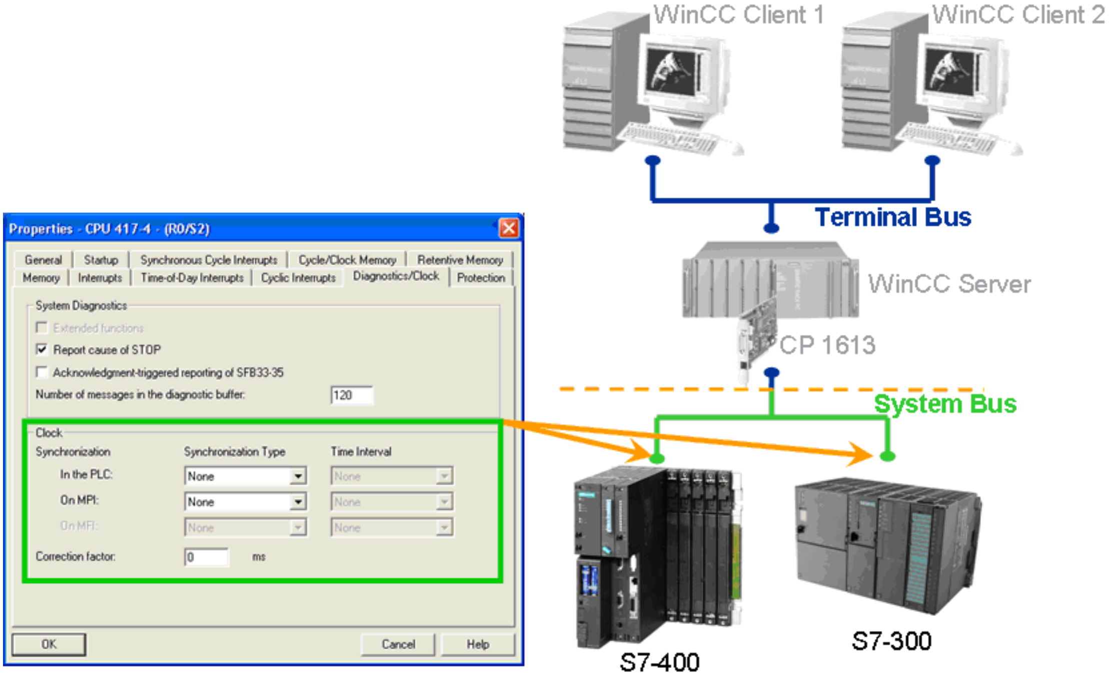
Time interval 10 seconds (typical setting)

If you parameterize the CPU clock as master (clock) for MPI and set the time interval for synchronization to 10 seconds, the CPU will transmit a time synchronization message via the MPI interface at the following times: 0 s, 10 s, 20 s, ..50 s .

Time interval 24 hours

The time synchronization message is transmitted at midnight.

Figure 7-8



Properties - CPU 417-4 - (R0/S2)

System Diagnostics

☐ Extended functions

☑ Report cause of STOP

☐ Acknowledgment-triggered reporting of SFB33-35

Number of messages in the diagnostic buffer: 120

Clock

Synchronization	Synchronization Type	Time Interval
In the PLC:	None	None
On MPI:	None	None
On MFI:	None	None

Correction factor: 0 ms

You can set the synchronization separately:

- in the AS (i.e. internally)
- on MPI (i.e. externally)
- on MFI (i.e. externally via 2nd interface)

You can set the following parameters:

Copyright © Siemens AG Copyright 2009 All rights reserved

Synchronization type

You can determine whether the clock synchronizes other clocks (setting options depend on CPU).

- as slave: The clock is synchronized by another clock.
- as master: The clock synchronizes other clocks as master.
- None: There will be no synchronization.

Time interval

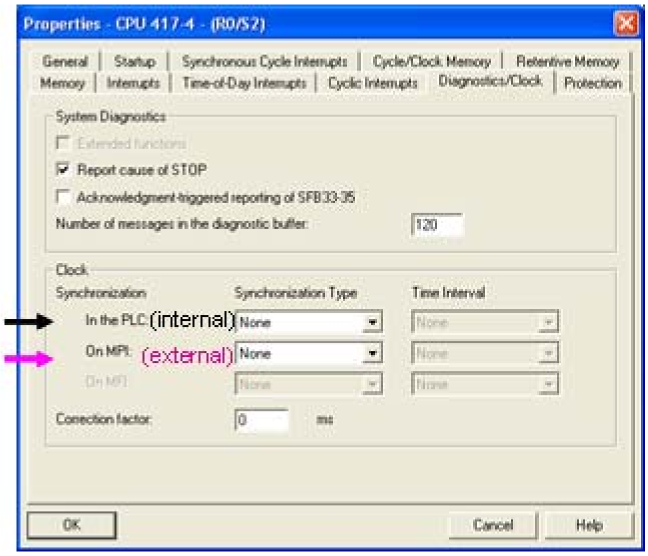
Select at what time intervals the synchronization shall take place.

Correction factor

The correction factor is used to compensate a deviation of the clock within 24 hours. You can enter positive or negative values in ms.

Example:
If the clock is slow by 4 seconds after 24 hours, enter a correction factor of "+4000 ms".

Figure 7-9



Properties - CPU 417-4 - (R0/S2)

System Diagnostics

☐ Extended functions

☑ Report cause of STOP

☐ Acknowledgment-triggered reporting of SFB33-35

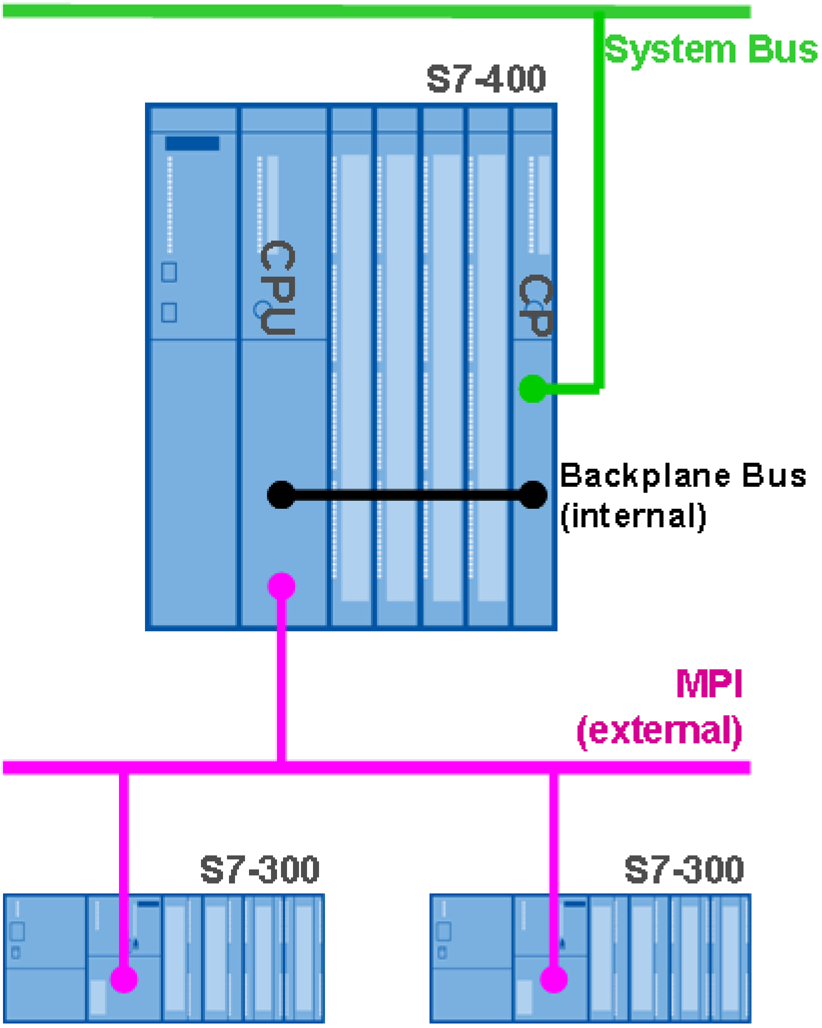
Number of messages in the diagnostic buffer: 120

Clock

Synchronization	Synchronization Type	Time Interval
In the PLC (internal)	None	None
On MPI: (external)	None	None
On MPI	None	None

Correction factor: 0 ms

Figure 7-10



Copyright © Siemens AG Copyright 2009 All rights reserved

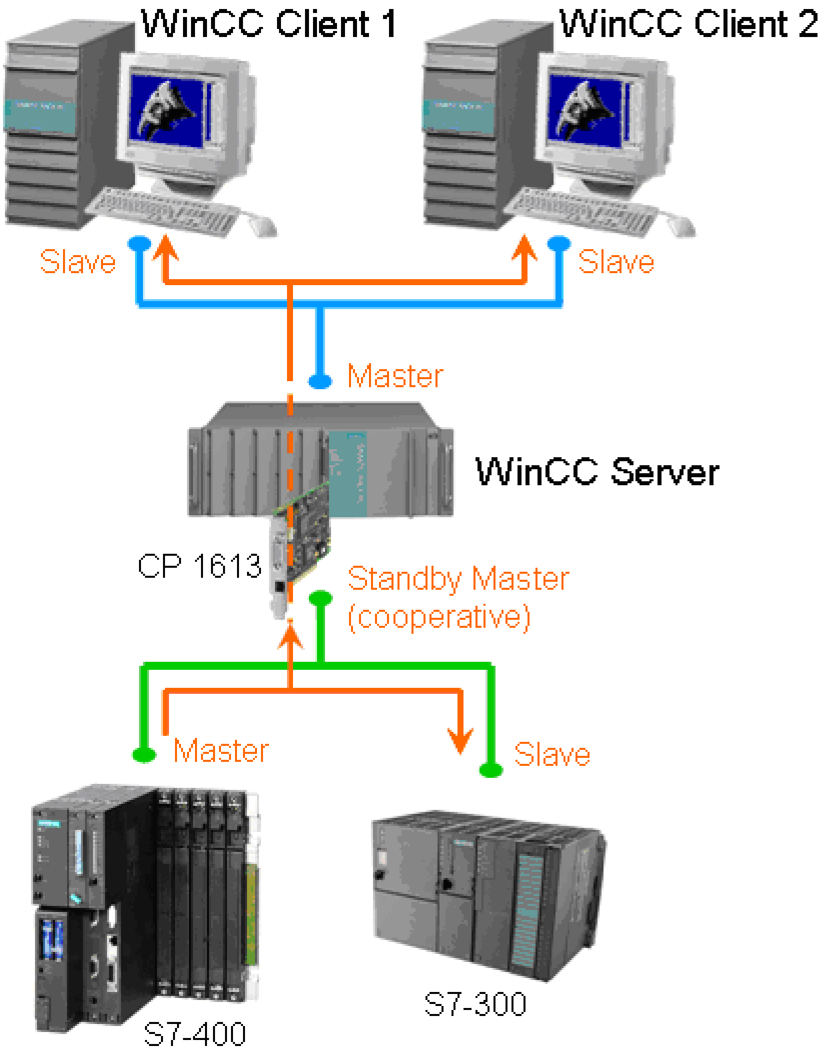
Copyright © Siemens AG Copyright 2009 All rights reserved

7.3.8 Example configuration

The time synchronization is explained by means of an example now. The following is assumed:

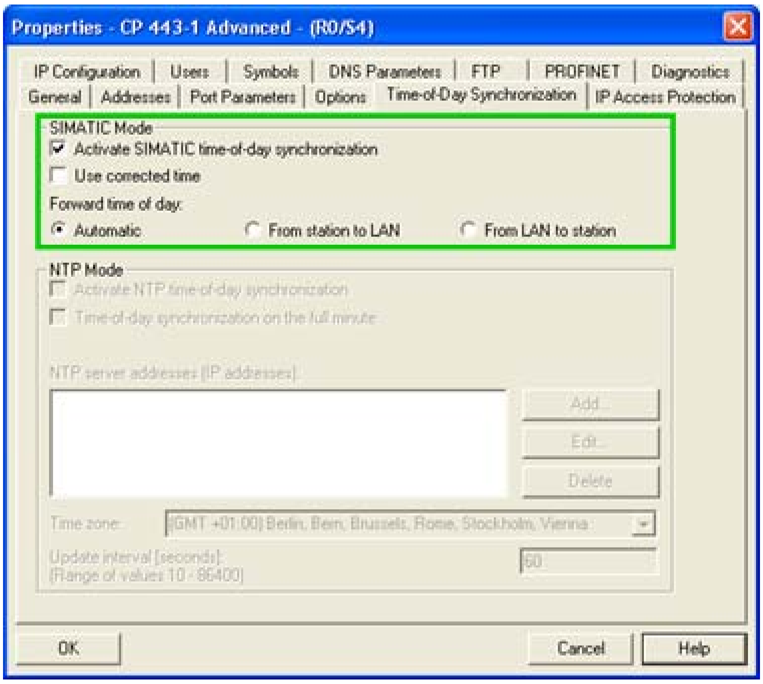
- The S7-400 station is the time master.
- The S7-300 and CP 1613 are synchronized via the S7-400.
- The CP 1613 assumes the role of a cooperative master.
- The WinCC Server functions as time master within the terminal bus.
- Both WinCC Clients are synchronized via the WinCC Server.

Figure 7-11



The S7-400 station as the time master.

Figure 7-12



Properties - CP 443-1 Advanced - (R0/S4)

IP Configuration | Users | Symbols | DNS Parameters | FTP | PROFINET | Diagnostics
General | Addresses | Port Parameters | Options | Time-of-Day Synchronization | IP Access Protection

SIMATIC Mode

☑ Activate SIMATIC time-of-day synchronization

□ Use corrected time

Forward time of day:

● Automatic ○ From station to LAN ○ From LAN to station

NTP Mode

□ Activate NTP time-of-day synchronization

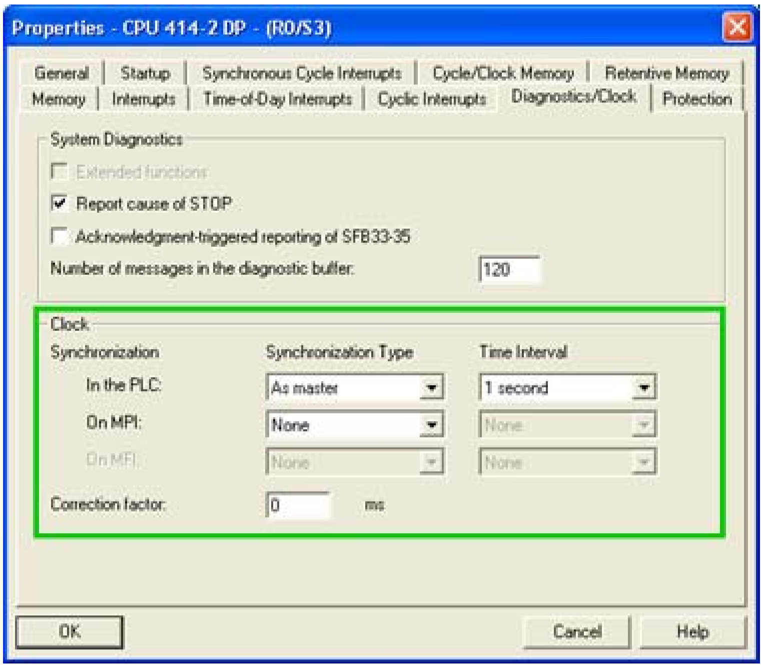
□ Time-of-day synchronization on the full minute

NTP server addresses (IP addresses):

Time zone: (GMT +01:00) Berlin, Bern, Brussels, Rome, Stockholm, Vienna

Update interval [seconds]: (Range of values 10 - 86400) 60

Figure 7-13



Properties - CPU 414-2 DP - (R0/S3)

General | Startup | Synchronous Cycle Interrupts | Cycle/Clock Memory | Retentive Memory
Memory | Interrupts | Time-of-Day Interrupts | Cyclic Interrupts | Diagnostics/Clock | Protection

System Diagnostics

□ Extended functions

☑ Report cause of STOP

□ Acknowledgment-triggered reporting of SFB33-35

Number of messages in the diagnostic buffer: 120

Clock

Synchronization	Synchronization Type	Time Interval
In the PLC:	As master	1 second
On MPI:	None	None
On MFI:	None	None

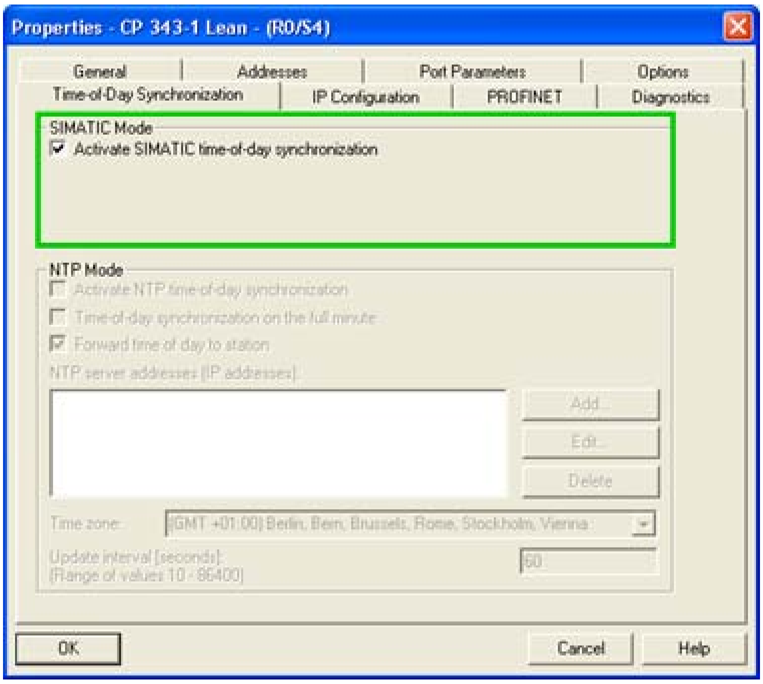
Correction factor: 0 ms

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

The S7-300 station as the time slave.

Figure 7-14



Properties - CP 343-1 Lean - (R0/S4)

SIMATIC Mode

☑ Activate SIMATIC time-of-day synchronization

NTP Mode

□ Activate NTP time-of-day synchronization

□ Time-of-day synchronization on the full minute

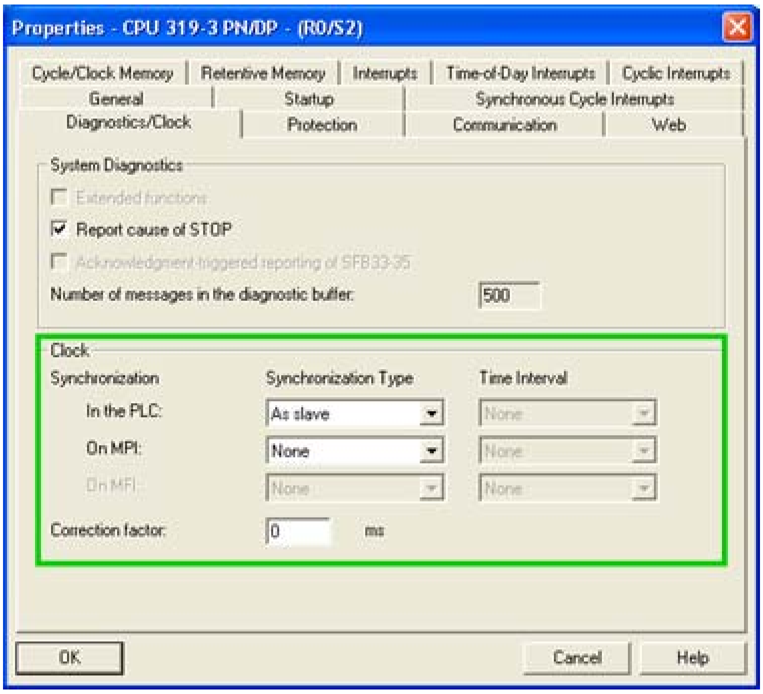
☑ Forward time of day to station

NTP server addresses (IP addresses):

Time zone: (GMT +01:00) Berlin, Bern, Brussels, Rome, Stockholm, Vienna

Update interval [seconds]: 60
(Range of values 10 - 86400)

Figure 7-15



Properties - CPU 319-3 PN/DP - (R0/S2)

System Diagnostics

□ Extended functions

☑ Report cause of STOP

□ Acknowledgment-triggered reporting of SFB33-35

Number of messages in the diagnostic buffer: 500

Clock

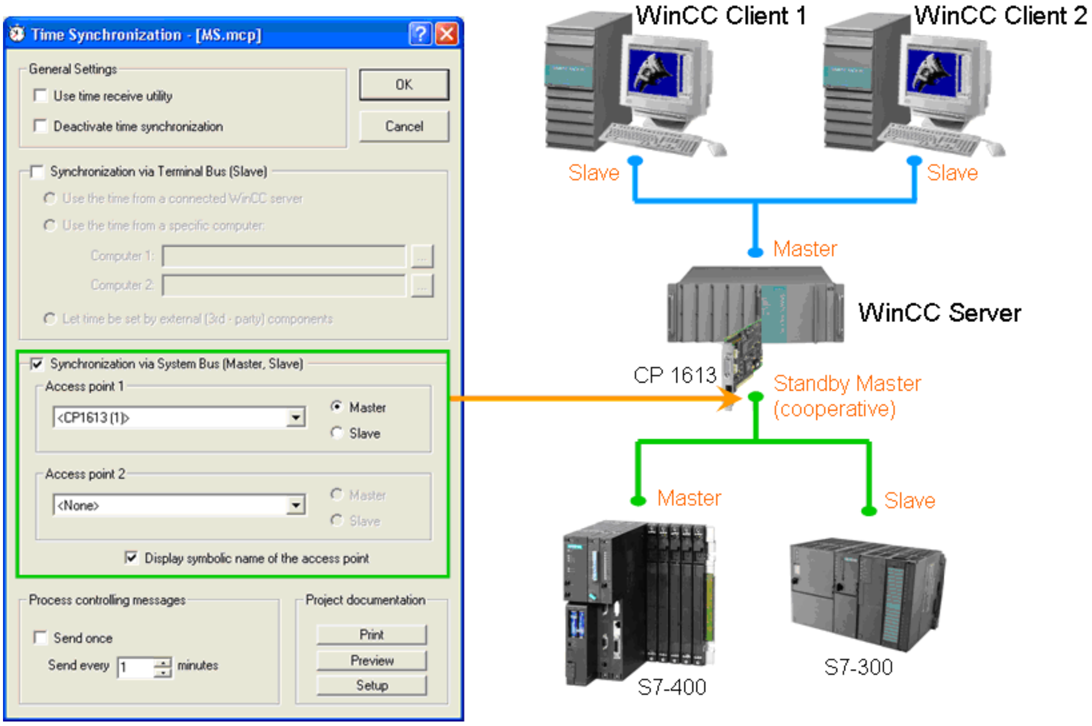
Synchronization	Synchronization Type	Time Interval
In the PLC:	As slave	None
On MPI:	None	None
On MFI:	None	None

Correction factor: 0 ms

Copyright © Siemens AG Copyright 2009 All rights reserved

The WinCC Server as cooperative time master (standby)

Figure 7-16



Time Synchronization - [MS.mcp]

General Settings

□ Use time receive utility

□ Deactivate time synchronization

OK

Cancel

□ Synchronization via Terminal Bus (Slave)

○ Use the time from a connected WinCC server

○ Use the time from a specific computer:

Computer 1:

Computer 2:

○ Let time be set by external (3rd - party) components

☑ Synchronization via System Bus (Master, Slave)

Access point 1

<CP1613 (1)> ● Master ○ Slave

Access point 2

<None> ○ Master ○ Slave

☑ Display symbolic name of the access point

Process controlling messages

□ Send once

Send every 1 minutes

Project documentation

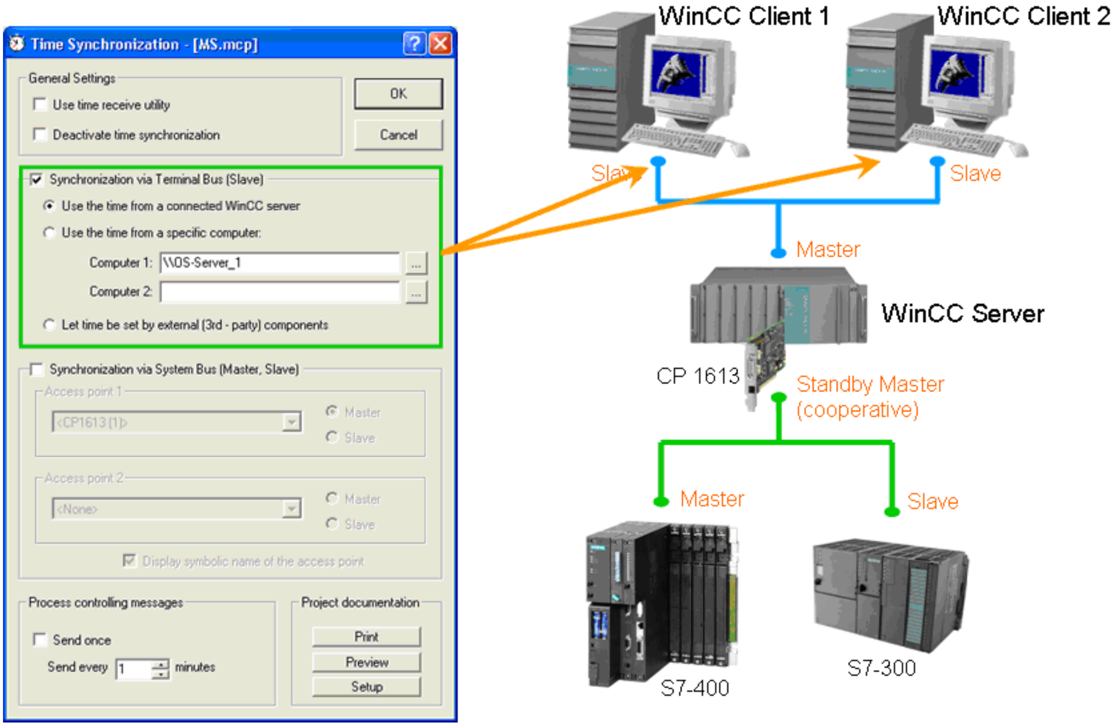
Print

Preview

Setup

The WinCC Clients as time slaves

Figure 7-17



Time Synchronization - [MS.mcp]

General Settings

□ Use time receive utility

□ Deactivate time synchronization

☑ Synchronization via Terminal Bus (Slave)

● Use the time from a connected WinCC server

○ Use the time from a specific computer:

Computer 1: \\OS-Server_1

Computer 2:

○ Let time be set by external (3rd - party) components

□ Synchronization via System Bus (Master, Slave)

Access point 1

<CP1613 (1)> ● Master ○ Slave

Access point 2

<None> ○ Master ○ Slave

☑ Display symbolic name of the access point

Process controlling messages

□ Send once

Send every 1 minutes

Project documentation

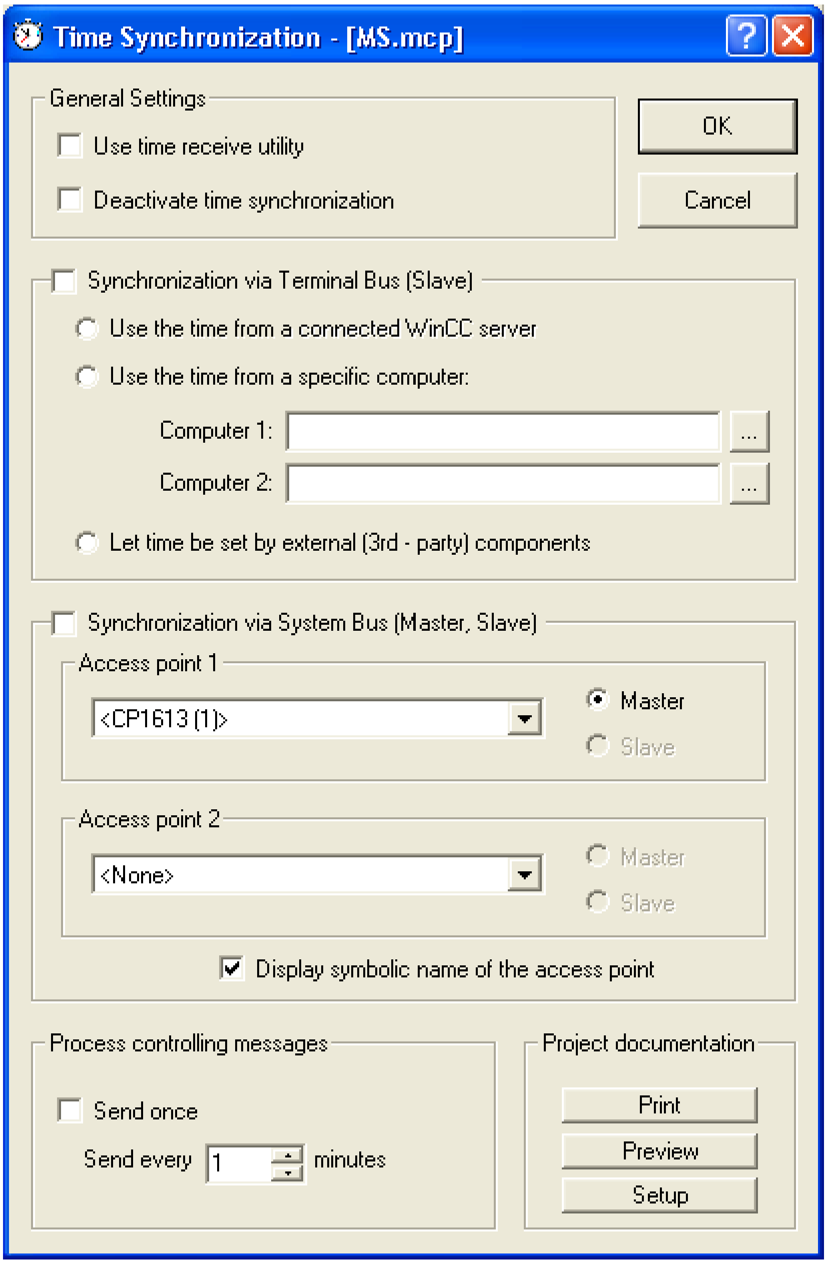
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

7.3.9 The "Time Synchronization" editor

Open the "Time Synchronization" editor with a double-click in the WinCC Explorer. Make the required settings in the dialog field for the configuration.

Figure 7-18



Time Synchronization - [MS.mcp]

General Settings

□ Use time receive utility

□ Deactivate time synchronization

□ Synchronization via Terminal Bus (Slave)

○ Use the time from a connected WinCC server

○ Use the time from a specific computer:

Computer 1:

Computer 2:

○ Let time be set by external (3rd - party) components

□ Synchronization via System Bus (Master, Slave)

Access point 1: <CP1613 (1)> ● Master ○ Slave

Access point 2: <None> ○ Master ○ Slave

☑ Display symbolic name of the access point

Process controlling messages

□ Send once

Send every 1 minutes

Use time receive utility

When you activate the option "Use time receive utility" the time receive utility is active. When used at the plant bus the time synchronization checks now whether the time receive utility is deactivated during the slave operation and activated during the master operation.

Deactivate the time receive utility during the slave operation to prevent that the computer time is set by the time synchronization and by the time receive utility.

Deactivate time synchronization

When you activate the option "Deactivate time synchronization" the time synchronization is deactivated. The time messages are not sent now and/or the local time is not set. The time synchronization is only deactivated after the option has been ticked and acknowledged by clicking the "OK" button.

After every activation/deactivation of the time synchronization you get a corresponding operator message in runtime.

Settings for synchronization

Synchronization is configured via the plant bus / Industrial Ethernet bus or via the local area network. Activate the respective options for this. You can also use both options in parallel.

Synchronization via terminal bus

The time synchronization via terminal bus / local area network is available on WinCC Server projects and WinCC Clients. There are three options for configuration:

- The time of the computer is automatically transferred from a linked WinCC Server. The server packages must have been loaded for this purpose.
- The time is transferred from one of the computers in the network which you entered in the input fields "Computer 1" and "Computer 2".
- The time is set via an external 3rd-party component.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Synchronization via plant bus

The time synchronization via the plant bus / Industrial Ethernet bus is only available on WinCC Server projects. If the computer which is to be configured is a client the selection fields are not operator-accessible.

You can use a BCE network card or up to two CP1613 for the time synchronization.

The selection list of "Access point 1" and/or "Access point 2" displays all devices or network cards which are installed on the computer which are suitable for time synchronization via the Industrial Ethernet bus. Select from the dropdown list the device which you can configure either as master or as slave. Tick the respective option to determine the role of the device.

To configure the time synchronization from an ES, you can also have symbolic names of the access points displayed which are given between "< >".

Activate the respective option for this. When the target PC is started up in runtime these names will be assigned to the physical names of the access points.

Settings for process controlling messages

When problems occur in the synchronization, process controlling messages will be displayed in runtime. For the periodically recurring process controlling messages 1012002-1012005, 1012018, 1012021 and 1012028 you can determine in the field "Process controlling messages" how often these process controlling messages will be displayed in runtime.

To display the process controlling message only once, tick the option "Send once".

If the process controlling message is to be sent several times in runtime, untick the option "Send once". Enter the desired value directly in the input field "Send every ... minutes" or use the up or down arrow buttons.

7.3.10 Time zones

UTC is used on the AS since time jumps as in the clock change are not permitted on the AS. Depending on the configuration, time jumps might result in that the time-of-day interrupts, for instance, are not executed correctly anymore or the operating hour counters do not count correctly anymore.

Therefore, use Universal Time Coordinated (UTC) as a rule. It is characterized as follows:

- UTC is the international time basis which is determined by atomic clocks.
- UTC does not use daylight-saving time and winter time.
- UTC refers to the Prime Meridian through Greenwich near London.

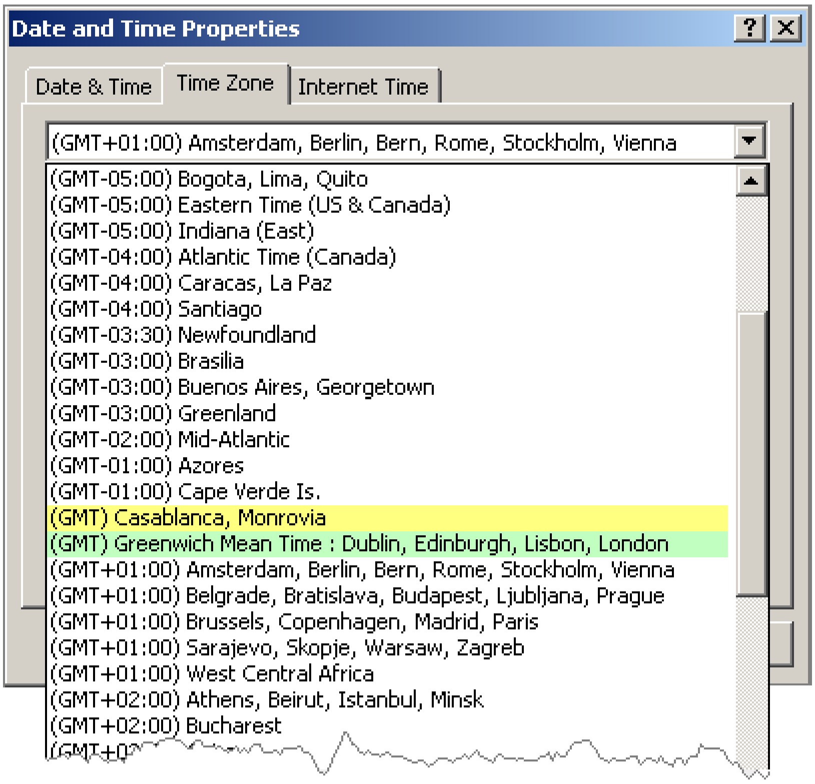
UTC corresponds to GMT (Greenwich Mean Time) with clocks not moved forward for daylight-saving time. The local time zone is set in the control panel of your computer under "Date and Time Properties".

There are two GMTs:

- GMT with clock set to daylight-saving time (Dublin, Edinburgh, Lisbon, London)
- GMT with clock not set to daylight-saving time, i.e. corresponding to UTC (Casablanca, Monrovia)

Copyright © Siemens AG Copyright 2009 All rights reserved

Figure 7-19



(GMT+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna

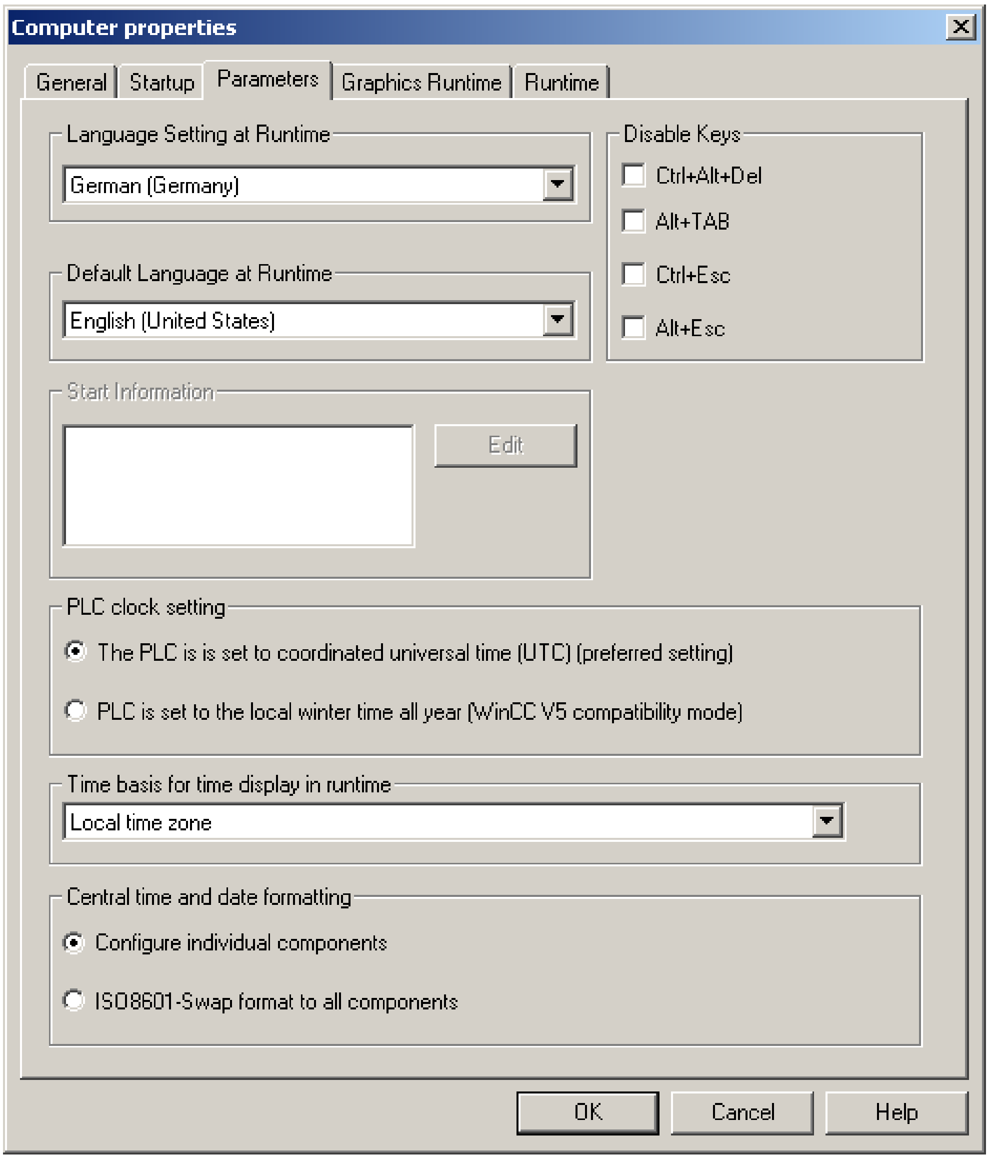
(GMT-05:00) Bogota, Lima, Quito
(GMT-05:00) Eastern Time (US & Canada)
(GMT-05:00) Indiana (East)
(GMT-04:00) Atlantic Time (Canada)
(GMT-04:00) Caracas, La Paz
(GMT-04:00) Santiago
(GMT-03:30) Newfoundland
(GMT-03:00) Brasilia
(GMT-03:00) Buenos Aires, Georgetown
(GMT-03:00) Greenland
(GMT-02:00) Mid-Atlantic
(GMT-01:00) Azores
(GMT-01:00) Cape Verde Is.
(GMT) Casablanca, Monrovia
(GMT) Greenwich Mean Time : Dublin, Edinburgh, Lisbon, London
(GMT+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna
(GMT+01:00) Belgrade, Bratislava, Budapest, Ljubljana, Prague
(GMT+01:00) Brussels, Copenhagen, Madrid, Paris
(GMT+01:00) Sarajevo, Skopje, Warsaw, Zagreb
(GMT+01:00) West Central Africa
(GMT+02:00) Athens, Beirut, Istanbul, Minsk
(GMT+02:00) Bucharest
(GMT+02

Copyright © Siemens AG Copyright 2009 All rights reserved

Settings in WinCC

In WinCC the time settings can be made in the computer properties.

Figure 7-20



Computer properties

General | Startup | Parameters | Graphics Runtime | Runtime

Language Setting at Runtime: German (Germany)

Default Language at Runtime: English (United States)

Disable Keys
- □ Ctrl+Alt+Del
- □ Alt+TAB
- □ Ctrl+Esc
- □ Alt+Esc

Start Information

PLC clock setting
- ● The PLC is is set to coordinated universal time (UTC) (preferred setting)
- ○ PLC is set to the local winter time all year (WinCC V5 compatibility mode)

Time basis for time display in runtime: Local time zone

Central time and date formatting
- ● Configure individual components
- ○ ISO8601-Swap format to all components

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

7.4 Horn

The horn is used to control visual or acoustic alarm devices. It outputs sound files when messages are received. With the "Horn" editor you configure what signals are to be triggered upon what messages.

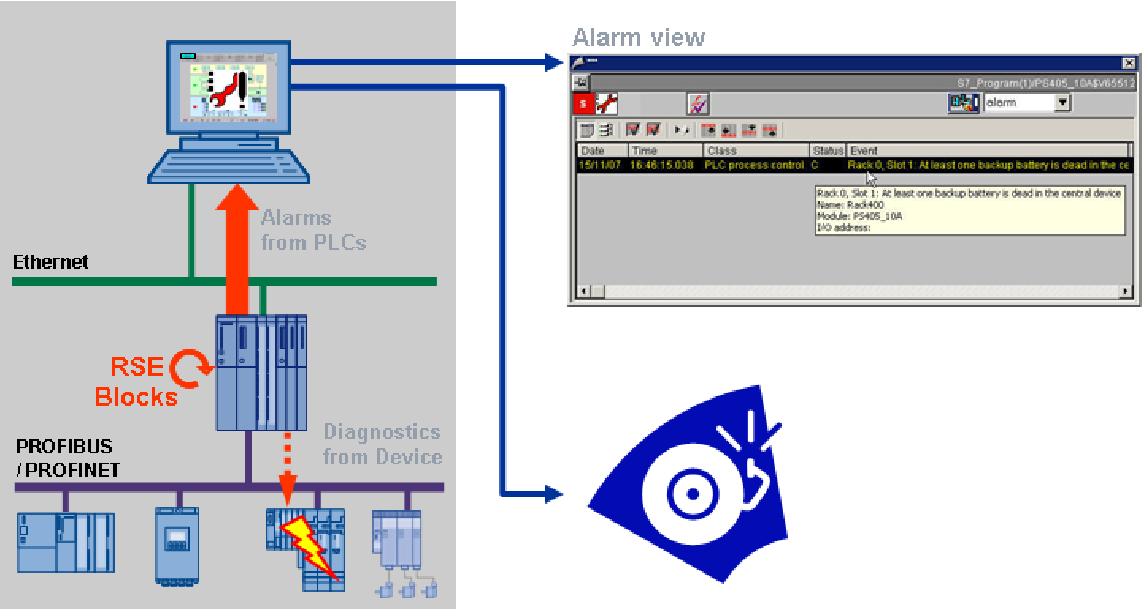
7.4.1 Principle of operation

A coming message activates a signal tag which triggers an acoustic or visual signal at the assigned alarm device. By acknowledging the message the signal tag is reset and the signal is terminated.

7.4.2 Overview of horn function

The following figure schematically shows the structure of the horn-function in WinCC.

Figure 7-21



Date	Time	Class	Status	Event
15/11/07	16:46:15.038	PLC process control	C	Rack 0, Slot 1: At least one backup battery is dead in the ce

Rack 0, Slot 1: At least one backup battery is dead in the central device
Name: Rack400
Module: PS405_10A
I/O address:

Copyright © Siemens AG Copyright 2009 All rights reserved

7.4.3 Message assignment

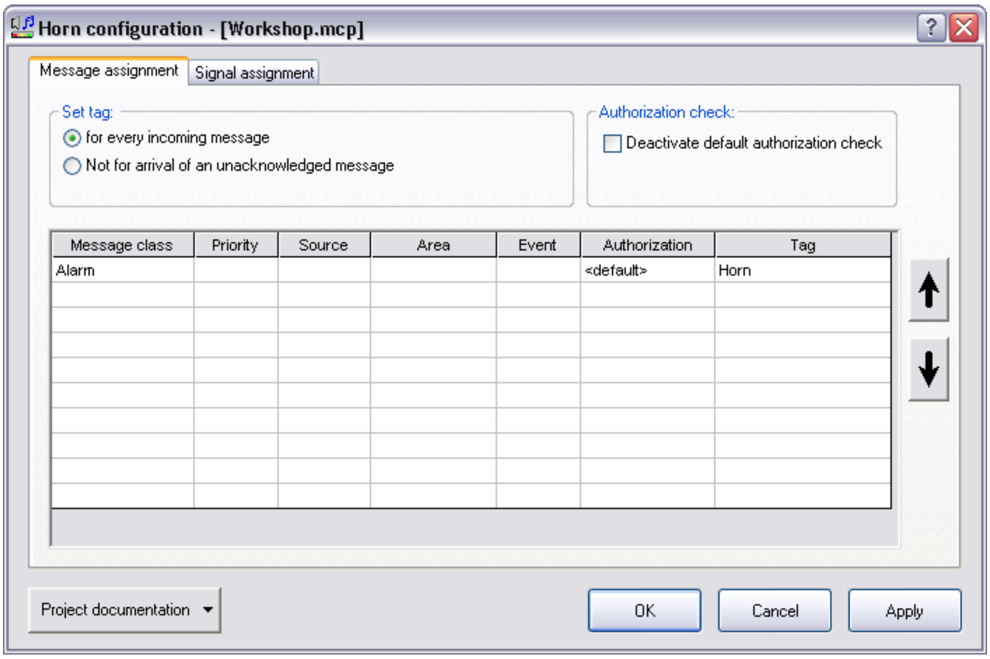
Open the "Horn" editor by double-clicking the entry horn or with the menu option "Open" in the WinCC Explorer context menu.
In the first tab "Message assignment" you assign certain properties of messages to signal tags. The following message properties serve as a filter to trigger a signal:

- Message class
- Priority
- Source
- Area
- Event

In the column "Authorization" you determine in addition whether the horn is triggered user-specifically upon messages from certain areas when the specified filter criteria are fulfilled.

Every line forms a logic "AND" with six inputs. Only if all six conditions are fulfilled, the respective signal tag will be set to "1".

Figure 7-22



Horn configuration - [Workshop.mcp]

Set tag:
● for every incoming message
○ Not for arrival of an unacknowledged message

Authorization check:
□ Deactivate default authorization check

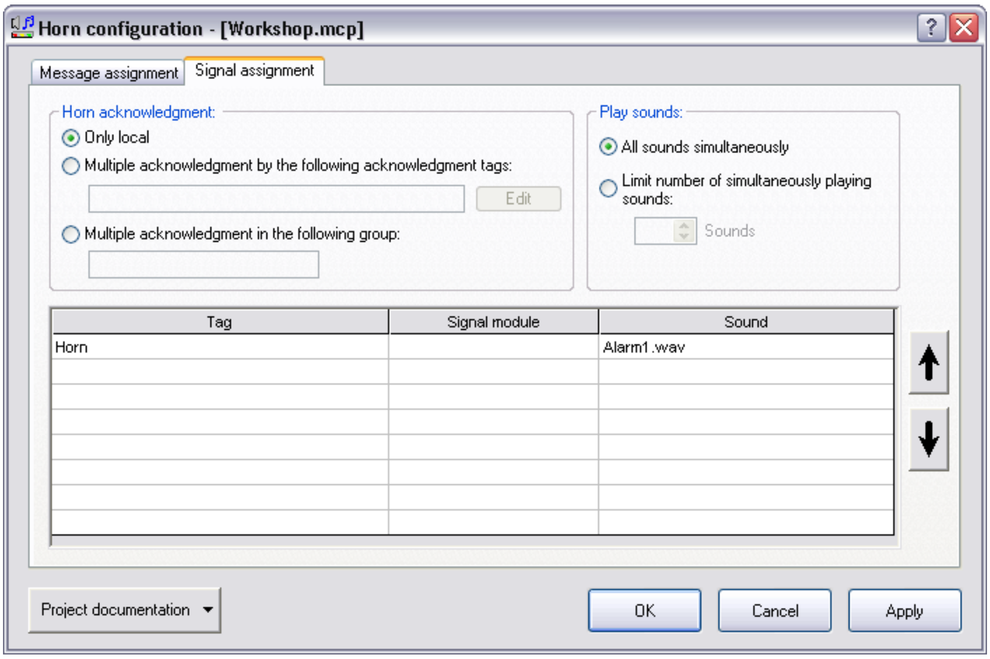
Message class	Priority	Source	Area	Event	Authorization	Tag
Alarm					<default>	Horn

7.4.4 Signal assignment

In the second tab "Signal assignment" you configure the signals for the incoming messages. You assign existing physical signal modules to the signal tags and specify the acknowledgement response.

Print the configuration data of the horn with the "Project documentation" button.

Figure 7-23



Horn acknowledgment:

● Only local

○ Multiple acknowledgment by the following acknowledgment tags:

○ Multiple acknowledgment in the following group:

Play sounds:

● All sounds simultaneously

○ Limit number of simultaneously playing sounds:

Sounds

Tag	Signal module	Sound
Horn		Alarm1.wav

Copyright © Siemens AG Copyright 2009 All rights reserved

7.5 OS project editor

The OS project editor is used for configuring the runtime surface and the alarm system. The project editor provides extended options for the customization of basic data. Use the OS project editor to place the keys in the overview area and configure the sequence of the areas.

7.5.1 Principle of operation

When you create a project in WinCC you start the OS project editor in WinCC Explorer. The OS project editor must be executed before the User Administrator is opened as otherwise the latter will be initialized with the authorization levels of WinCC.

When the OS project editor is opened for the first time the default settings will be displayed. A suitable layout is selected for the runtime-surface by means of the screen resolution and the project type. If a suitable layout is not found, the OS project editor will select the first layout from the list of available layouts in the tab "Layout".

When you open the OS project editor again, the current project settings will be displayed. Changed basic data image files and actions have to be acknowledged in the tab "Basic data" first before these data will be applied in the project.

Copyright © Siemens AG Copyright 2009 All rights reserved

7.5.2 Layout

Settings for the runtime-surface layout are made in the tab "Layout". The basic data are organized in the layouts. A layout is defined in a configuration file.

Monitor configuration

In the group "Monitor configuration" you determine the desired screen layout of the target device in runtime. You can select only the supported monitor configurations for the selected layout. Prior to the execution of the OS project editor settings have to be made for the multi-VGA in the control panel of the operating system.

Overview extended configuration

When the layout supports the generic arrangement of the layout keys in the overview area, the "Detail" button will be enabled at "Overview extended configuration".

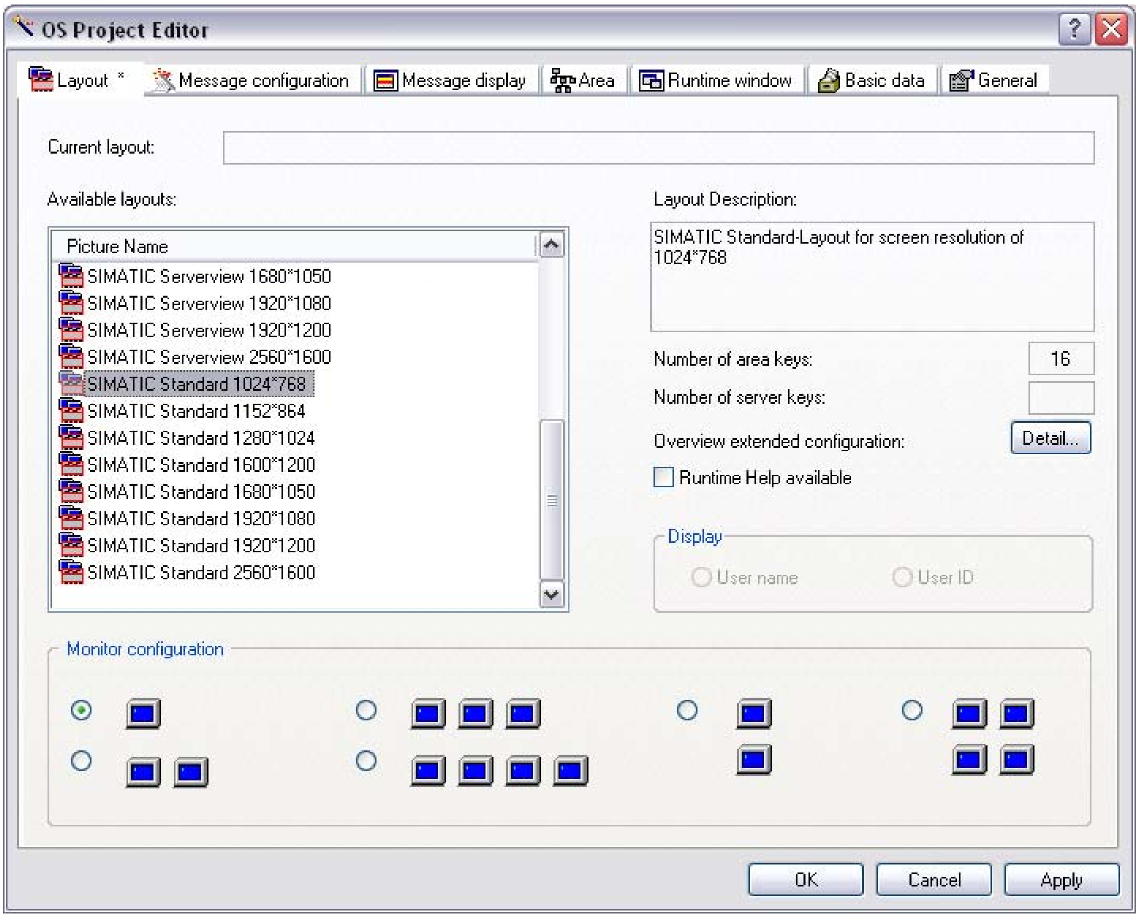
The output fields "Number of area keys" and "Number of server keys" show the currently configured number of keys. If the layout does not support these functions, the fields remain blank and the "Detail" button is not operator-accessible.

The "Detail" button opens a dialog field for configuration of the overview area. The number of keys is configured in this dialog field.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Figure 7-24



OS Project Editor

Tabs: Layout * | Message configuration | Message display | Area | Runtime window | Basic data | General

Current layout:

Available layouts:

Picture Name
SIMATIC Serverview 1680*1050
SIMATIC Serverview 1920*1080
SIMATIC Serverview 1920*1200
SIMATIC Serverview 2560*1600
SIMATIC Standard 1024*768
SIMATIC Standard 1152*864
SIMATIC Standard 1280*1024
SIMATIC Standard 1600*1200
SIMATIC Standard 1680*1050
SIMATIC Standard 1920*1080
SIMATIC Standard 1920*1200
SIMATIC Standard 2560*1600

Layout Description: SIMATIC Standard-Layout for screen resolution of 1024*768

Number of area keys: 16

Number of server keys:

Overview extended configuration: Detail...

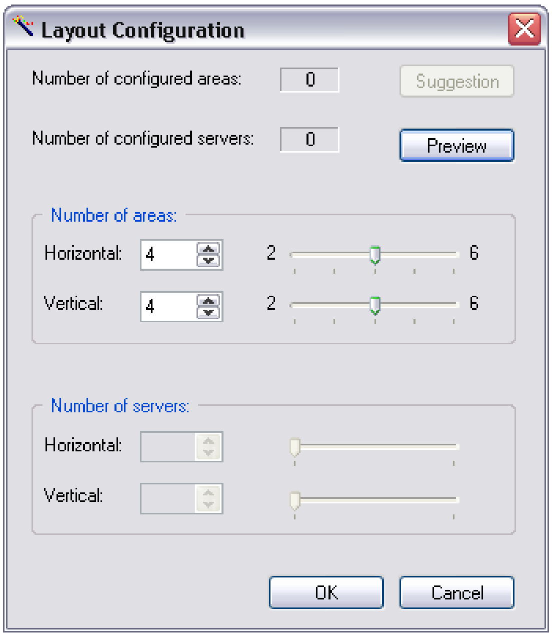
□ Runtime Help available

Display: ○ User name ○ User ID

Monitor configuration: ● (1 monitor) ○ ○ ○ ○ ○ ○ ○

OK | Cancel | Apply

Figure 7-25



Layout Configuration

Number of configured areas: 0 Suggestion

Number of configured servers: 0 Preview

Number of areas:

Horizontal: 4 (2 – 6)

Vertical: 4 (2 – 6)

Number of servers:

Horizontal:

Vertical:

OK | Cancel

Copyright © Siemens AG Copyright 2009 All rights reserved

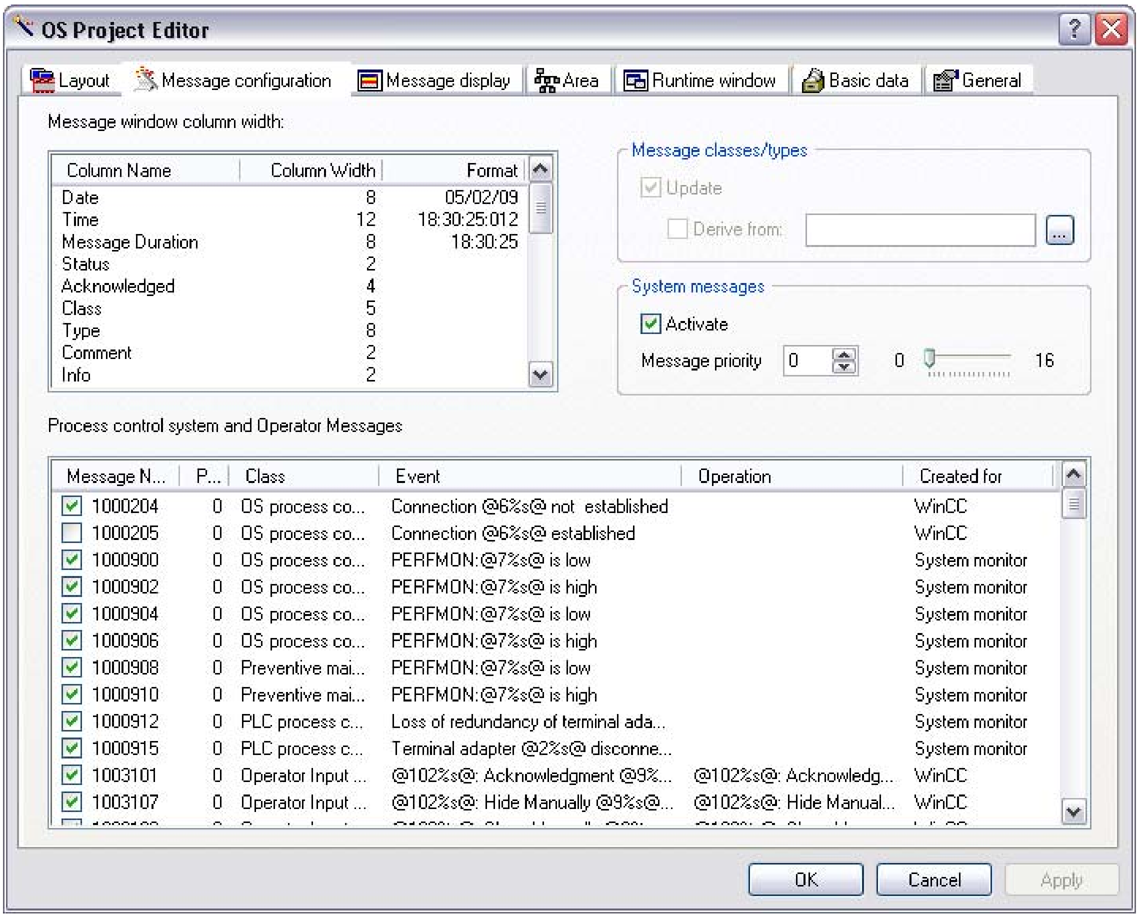
7.5.3 Message configuration

The OS project editor outputs the following data from the message system when the tab "Message configuration" is opened for the first time:

- Message classes
- Message types
- System messages

In the tab "Message configuration" you determine the configuration of the message system performed by the OS project editor.

Figure 7-26



Message window column width:

Column Name	Column Width	Format
Date	8	05/02/09
Time	12	18:30:25:012
Message Duration	8	18:30:25
Status	2	
Acknowledged	4	
Class	5	
Type	8	
Comment	2	
Info	2	

Message classes/types

☑ Update

□ Derive from: ...

System messages

☑ Activate

Message priority 0 0 16

Process control system and Operator Messages

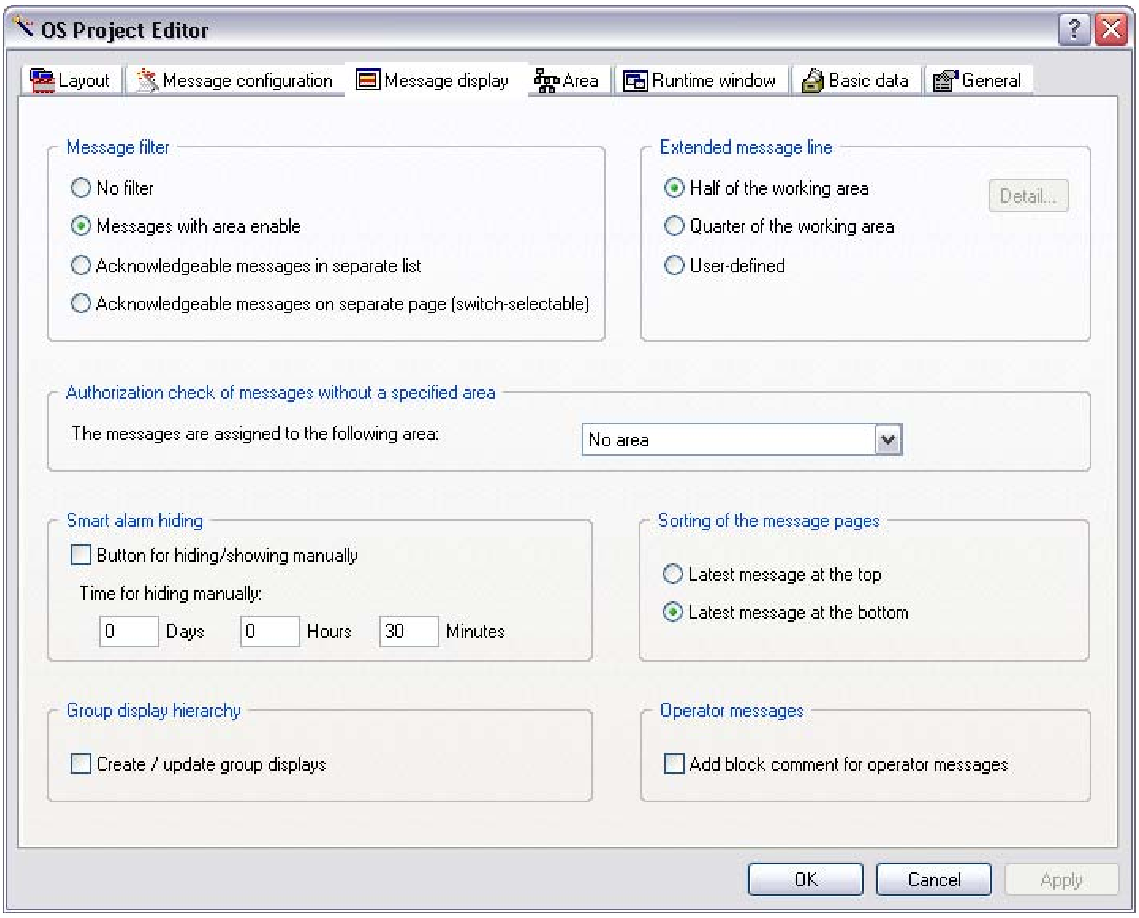
	Message N...	P...	Class	Event	Operation	Created for
☑	1000204	0	OS process co...	Connection @6%s@ not established		WinCC
□	1000205	0	OS process co...	Connection @6%s@ established		WinCC
☑	1000900	0	OS process co...	PERFMON:@7%s@ is low		System monitor
☑	1000902	0	OS process co...	PERFMON:@7%s@ is high		System monitor
☑	1000904	0	OS process co...	PERFMON:@7%s@ is low		System monitor
☑	1000906	0	OS process co...	PERFMON:@7%s@ is high		System monitor
☑	1000908	0	Preventive mai...	PERFMON:@7%s@ is low		System monitor
☑	1000910	0	Preventive mai...	PERFMON:@7%s@ is high		System monitor
☑	1000912	0	PLC process c...	Loss of redundancy of terminal ada...		System monitor
☑	1000915	0	PLC process c...	Terminal adapter @2%s@ disconne...		System monitor
☑	1003101	0	Operator Input ...	@102%s@: Acknowledgment @9%...	@102%s@: Acknowledg...	WinCC
☑	1003107	0	Operator Input ...	@102%s@: Hide Manually @9%s@...	@102%s@: Hide Manual...	WinCC

Copyright © Siemens AG Copyright 2009 All rights reserved

7.5.4 Message display

In the tab "Message display" you configure the runtime behaviour of the message system and the display of the messages on the message pages or in group displays.

Figure 7-27



OS Project Editor

Message filter
- ○ No filter
- ● Messages with area enable
- ○ Acknowledgeable messages in separate list
- ○ Acknowledgeable messages on separate page (switch-selectable)

Extended message line
- ● Half of the working area
- ○ Quarter of the working area
- ○ User-defined

Authorization check of messages without a specified area

The messages are assigned to the following area: No area

Smart alarm hiding
- □ Button for hiding/showing manually

Time for hiding manually: 0 Days 0 Hours 30 Minutes

Sorting of the message pages
- ○ Latest message at the top
- ● Latest message at the bottom

Group display hierarchy
- □ Create / update group displays

Operator messages
- □ Add block comment for operator messages

Copyright © Siemens AG Copyright 2009 All rights reserved

7.5.5 Area

In the tab "Area" you configure the arrangement of the area and server keys for the overview area. Here you also determine user access to areas for which authorization is not available.

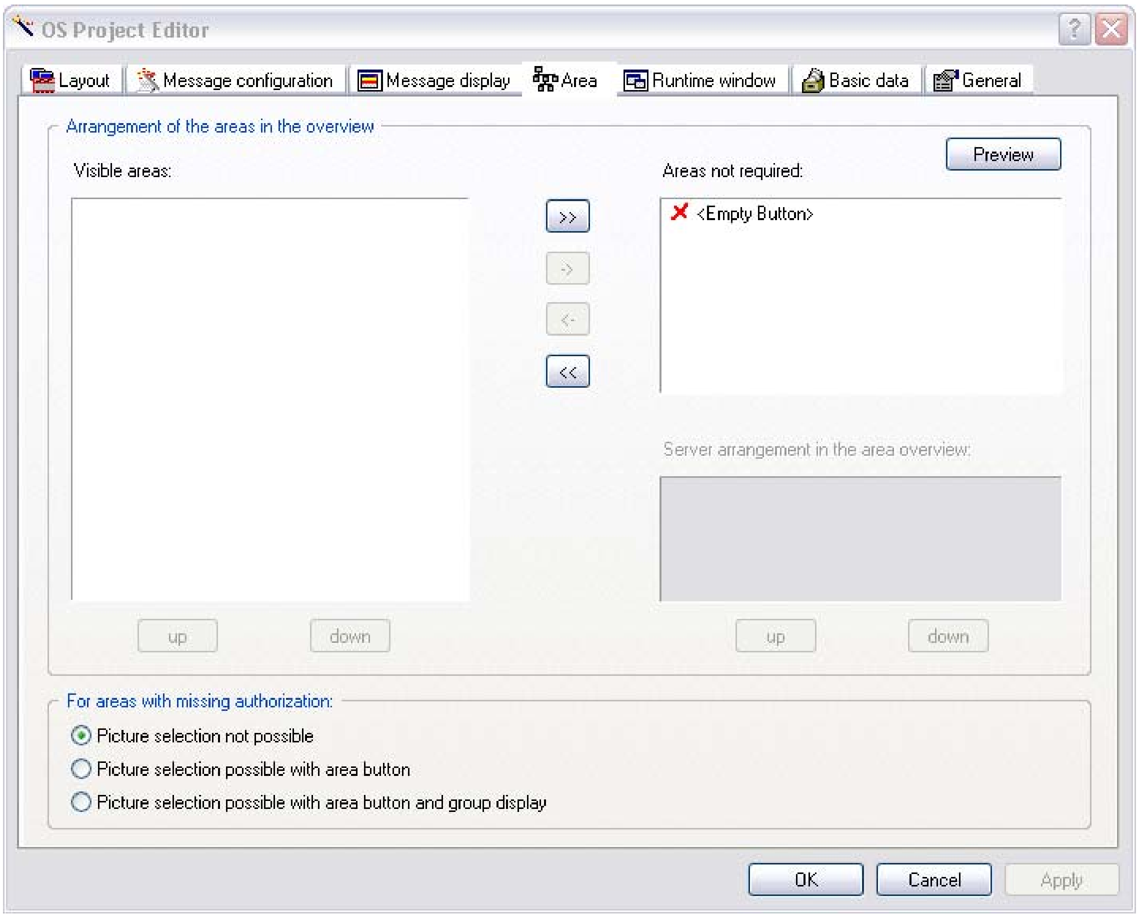
The area keys result from the plant areas which you configured in the Picture Tree Manager and they contain the following:

- one key for opening the area.
- a group display for displaying the group value of this area.
- one key for opening the Picture Tree Navigator.

The server keys serve for visualization of a server in the overview area and they contain the following:

- one key for server selection.
- a group display for displaying the group value of this server.

Figure 7-28



For areas with missing authorization:

● Picture selection not possible

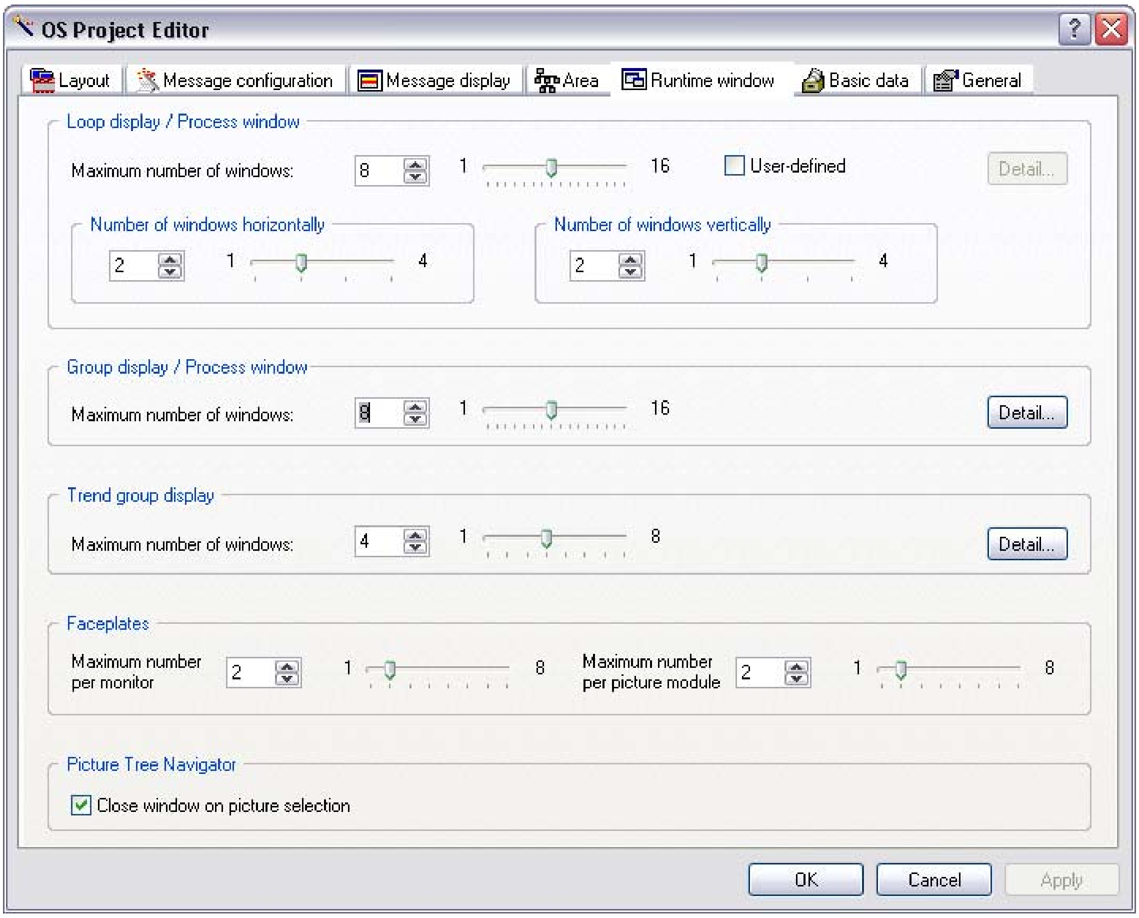
○ Picture selection possible with area button

○ Picture selection possible with area button and group display

7.5.6 Runtime window

In the tab "Runtime window" you configure the settings for the number and arrangement of the pre-configured picture windows.

Figure 7-29



Loop display / Process window

Maximum number of windows: 8 (1 – 16) □ User-defined Detail...

Number of windows horizontally: 2 (1 – 4)

Number of windows vertically: 2 (1 – 4)

Group display / Process window

Maximum number of windows: 8 (1 – 16) Detail...

Trend group display

Maximum number of windows: 4 (1 – 8) Detail...

Faceplates

Maximum number per monitor: 2 (1 – 8)

Maximum number per picture module: 2 (1 – 8)

Picture Tree Navigator

☑ Close window on picture selection

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

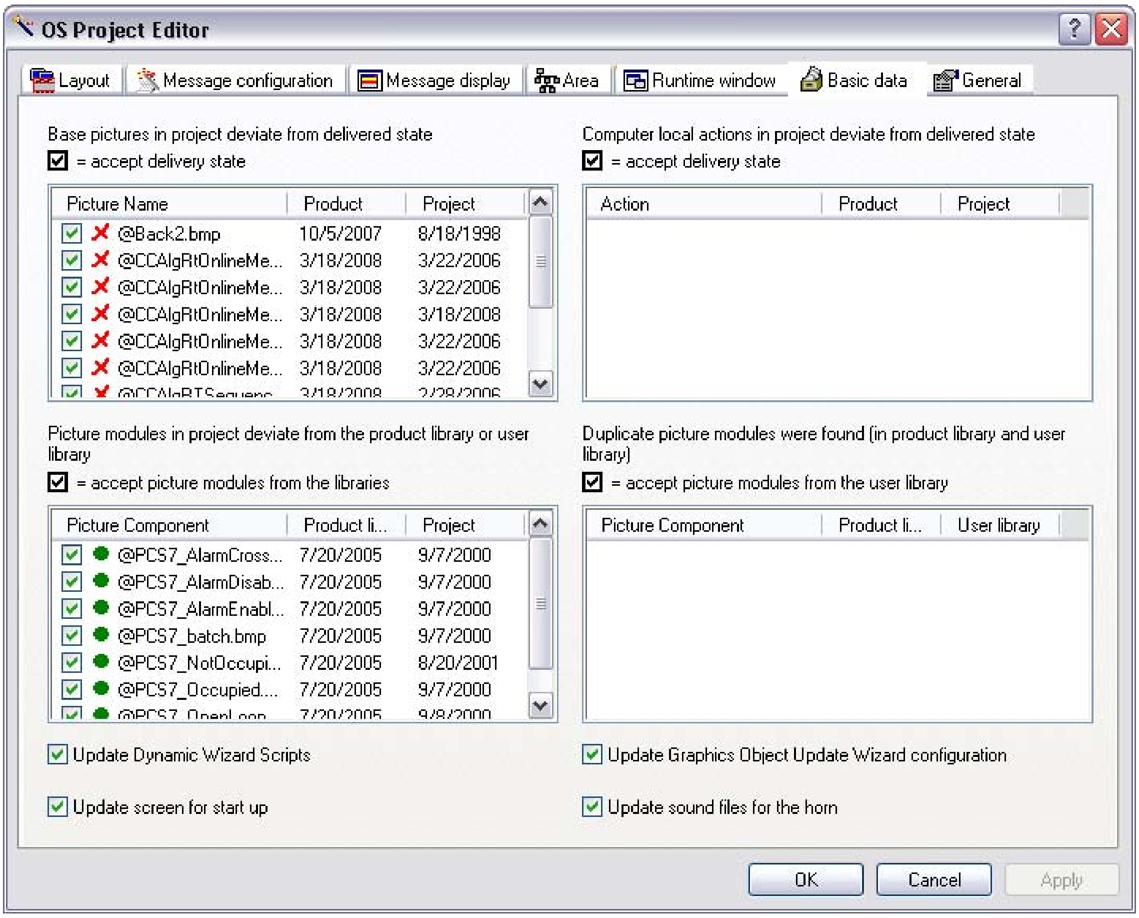
7.5.7 Basic data

The basic data contain image files, actions and standard functions to provide a corresponding surface in runtime. The tab "Basic data" shows which initialized basic data deviate from the local basic data of the project.

The picture settings depend on the respective layout. The list entries change depending on the picture and script configuration.

You can set in this tab what changed files of the project will be overwritten by files of the delivered state. However the consistent runtime operation must be ensured. The red list entries must be overwritten. The option box cannot be deactivated.

Figure 7-30



Base pictures in project deviate from delivered state
☑ = accept delivery state

		Picture Name	Product	Project
☑	✗	@Back2.bmp	10/5/2007	8/18/1998
☑	✗	@CCAlgRtOnlineMe...	3/18/2008	3/22/2006
☑	✗	@CCAlgRtOnlineMe...	3/18/2008	3/22/2006
☑	✗	@CCAlgRtOnlineMe...	3/18/2008	3/18/2008
☑	✗	@CCAlgRtOnlineMe...	3/18/2008	3/22/2006
☑	✗	@CCAlgRtOnlineMe...	3/18/2008	3/22/2006
☑	✗	@CCAlgRTSequenc	3/18/2008	2/28/2006

Computer local actions in project deviate from delivered state
☑ = accept delivery state

Action	Product	Project

Picture modules in project deviate from the product library or user library
☑ = accept picture modules from the libraries

		Picture Component	Product li...	Project
☑	●	@PCS7_AlarmCross...	7/20/2005	9/7/2000
☑	●	@PCS7_AlarmDisab...	7/20/2005	9/7/2000
☑	●	@PCS7_AlarmEnabl...	7/20/2005	9/7/2000
☑	●	@PCS7_batch.bmp	7/20/2005	9/7/2000
☑	●	@PCS7_NotOccupi...	7/20/2005	8/20/2001
☑	●	@PCS7_Occupied....	7/20/2005	9/7/2000
☑	●	@PCS7_OpenLoop	7/20/2005	9/8/2000

Duplicate picture modules were found (in product library and user library)
☑ = accept picture modules from the user library

Picture Component	Product li...	User library

☑ Update Dynamic Wizard Scripts

☑ Update Graphics Object Update Wizard configuration

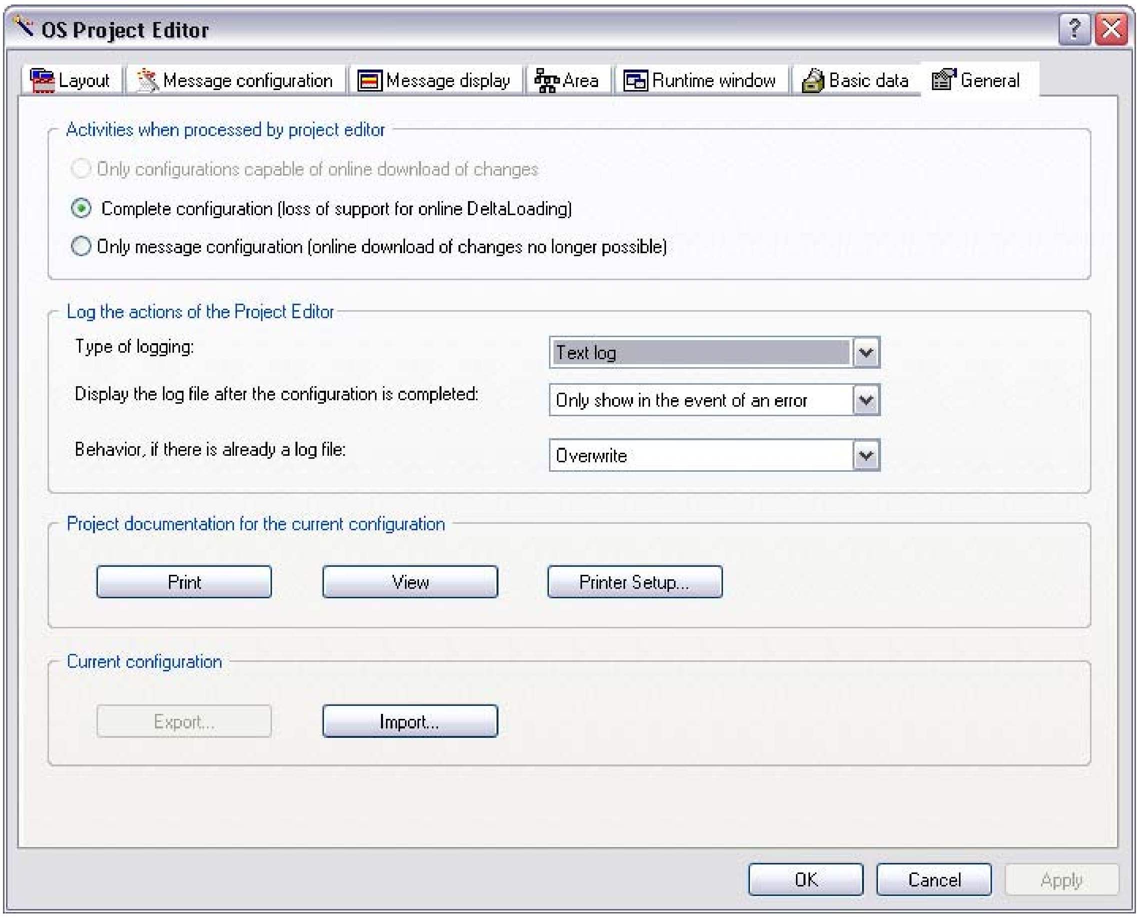
☑ Update screen for start up

☑ Update sound files for the horn

7.5.8 General information

The tab "General" contains settings for the OS project editor.

Figure 7-31



Activities when processed by project editor

○ Only configurations capable of online download of changes

● Complete configuration (loss of support for online DeltaLoading)

○ Only message configuration (online download of changes no longer possible)

Log the actions of the Project Editor

Type of logging: Text log

Display the log file after the configuration is completed: Only show in the event of an error

Behavior, if there is already a log file: Overwrite

Project documentation for the current configuration

Current configuration

Copyright © Siemens AG Copyright 2009 All rights reserved

7.6 Group display

Group displays provide a condensed display of process statuses (statuses of messages) in a graphical form. There are 16 different message types.

The group display object is accessed with a tag which represents the message status. This tag can be used in the other WinCC components if you want to show group display statuses there.

The group display object is visualized in the area overview, in the Picture Tree Navigator, in the faceplate and in the process image by configured group displays.

The group displays in the area overview and in the Picture Tree Navigator always refer to the plant area (picture hierarchy) only in which they are displayed.

Note

Note the following when using group displays:

- The group displays in the area overview are derived through a logic OR from the sum of all group displays which are located in subordinated pictures which belong to this area.
- "Alarm", "Warning" and process controlling messages require acknowledging.

Copyright © Siemens AG Copyright 2009 All rights reserved

Hierarchy of the group displays

The group display usually consists of several individual displays which have occurred in an area or sub-area. This creates a kind of hierarchy of group displays. When you select the alarm source, the picture on the lowest level will be displayed as a rule in which assignment to a certain alarm is still possible.

The OS project editor supports you in configuring the group display hierarchy. When you activate the option "Create/update group displays" in the tab "Message display", the group displays in the area overview will automatically be placed in the picture hierarchy. You can also interconnect the group display objects independently of the picture hierarchy.

For further information about the configuration of a group display refer to the following entry:

http://support.automation.siemens.com/WW/view/en/17778440

7.7 Picture Tree Manager

The Picture Tree Manager serves for the management of a hierarchy of systems, subsystems, function names and Graphic Designer pictures and it provides the following functions:

- Creating and changing a project hierarchy
- Support in the definition of systems and subsystems
- Support in the assignment of pictures to these systems. It creates an order between the pictures made in Graphics Designer.
- Support of the picture selection in runtime through navigation in the hierarchy tree.

7.7.1 Configuration procedure

Start the Picture Tree Manager with a double-click in the WinCC Explorer. The editor has only one window for editing the hierarchy.

The following functionalities are available here:

- By means of the buffer and the functions "Cut", "Copy", "Paste" you create and edit the hierarchy.
- The editing functions are accessed via the menu bar, the context menu or via drag&drop.
- By inserting the empty container from the selection window you extend the hierarchy by one container.
- By cutting and pasting a picture from the selection window or by drag&drop you add a picture in a container of the hierarchy.
- You can also shift subhierarchies (subtrees) within the hierarchy.
- Pictures which you remove from the hierarchy (hierarchy window) are automatically added in the selection window.
- Picture properties such as change date and size of a selected picture can be displayed.

Copyright © Siemens AG Copyright 2009 All rights reserved

7.7.2 General information on hierarchy

In WinCC the interdependency of containers and pictures is mapped in the form of a hierarchy. Please note the following for this hierarchy:

- The nodes of the hierarchy are containers as a rule.
- Every container can be empty or contain a picture of the Graphics Designer.
- You can assign any name to the containers. However the container names are assumed to be unique which will be verified by the Picture Tree Manager. If you derive the picture hierarchy from the plant hierarchy the entire path with separators will be entered for the container names. However only the last part of the container name will be displayed in runtime.
- You can only insert existing pictures in the hierarchy. Picture names cannot be changed in the Picture Tree Manager.
- The hierarchy structure is open, i.e. there is no restriction with regard to the depth and width of the hierarchy (tree).
- When you create a hierarchy with the Picture Tree Manager, hierarchy information will be stored in various WinCC-engineering data, e.g. in the message system, in the User Administrator and in block lists. Therefore it is necessary to determine the WinCC-hierarchy at an early stage in the configuration process and to maintain it.
- Subsequent changes of a hierarchy on an area level necessitate manual corrections at the following points:
    - Correction of hierarchy data in the messages
    - Updating of user authorizations (User Administrator)
    - Creating new packages for connected WinCC Clients

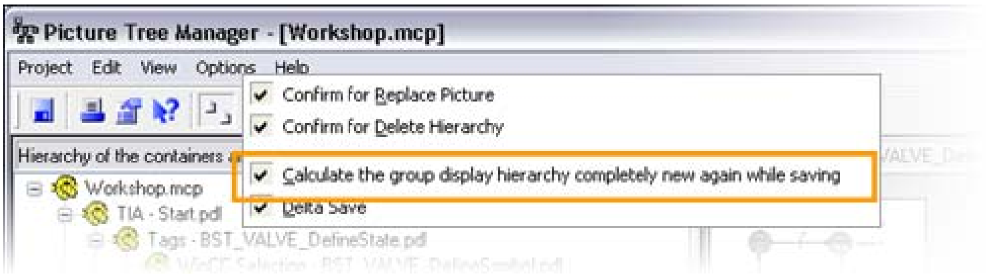
Copyright © Siemens AG Copyright 2009 All rights reserved

7.7.3 Recalculation of the group display hierarchy upon saving

If the option "Calculate the group display hierarchy completely new again while saving" is ticked, the group display hierarchy will be recalculated for all WinCC pictures upon every saving action in the Picture Tree Manager. If no group displays are used, this setting can be disabled to permit faster saving.

When WinCC recognizes during the startup that the group display hierarchy is no longer current, the process controlling message "The group display hierarchy is not updated..." will be displayed. By saving the picture hierarchy with ticked option "Calculate the group display hierarchy completely new again while saving" the data can be updated.

Figure 7-32



Picture Tree Manager - [Workshop.mcp]

☑ Confirm for Replace Picture

☑ Confirm for Delete Hierarchy

☑ Calculate the group display hierarchy completely new again while saving

☑ Delta Save

Project
Edit
View
Options
Help
Hierarchy of the containers
Workshop.mcp
TIA - Start.pdl
Tags - BST_VALVE_DefineState.pdl
WinCC Selection - BST_VALVE_DefineSymbol.pdl
VALVE_De

Copyright © Siemens AG Copyright 2009 All rights reserved

7.8 Lifebeat Monitoring

The "Lifebeat Monitoring" editor serves for monitoring all server and client computers and automation devices which are accessible via PC and industrial-networks.

7.8.1 Principle of operation

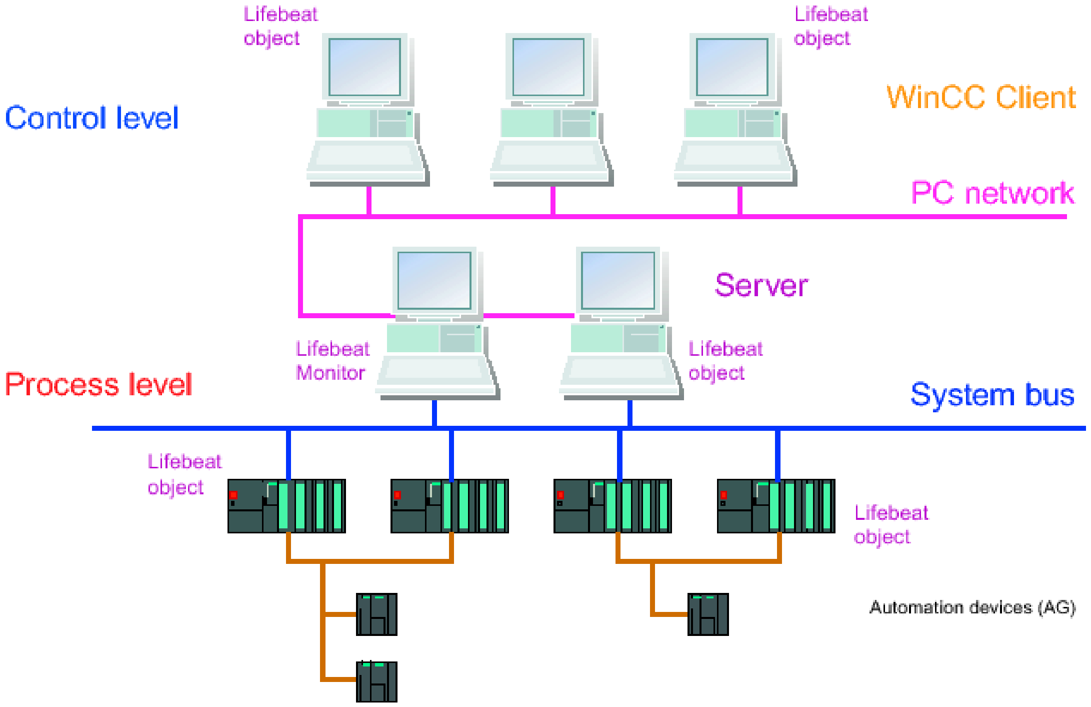
The lifebeat monitoring can only be configured via Industrial Ethernet and PROFIBUS connections of the "SIMATIC S7 PROTOCOL SUITE" or via an OPC connection between WinCC stations.

Lifebeat Monitoring monitors servers, clients and automation devices. Lifebeat Monitoring usually runs on a central WinCC Client. It provides a view on the lifebeat objects which belong to a project and on automation devices and operator stations of other projects. For this purpose all system parts must be connected to one common network.

7.8.2 Overview of the process diagnostics

The following figure schematically shows the structure of the lifebeat monitoring:

Figure 7-33



Copyright © Siemens AG Copyright 2009 All rights reserved

7.8.3 Monitoring of WinCC Stations

The OPC coupling has to be used for the monitoring of WinCC stations. The monitoring via the OPC connection is limited to WinCC stations.

As the software for the OPC-DA Server and the OPD-DA Client are contained in the basic system of WinCC, WinCC can be used simultaneously as OPC-DA Server and as OPC-DA client. As a WinCC Client the computer can connect to several servers at the same time.

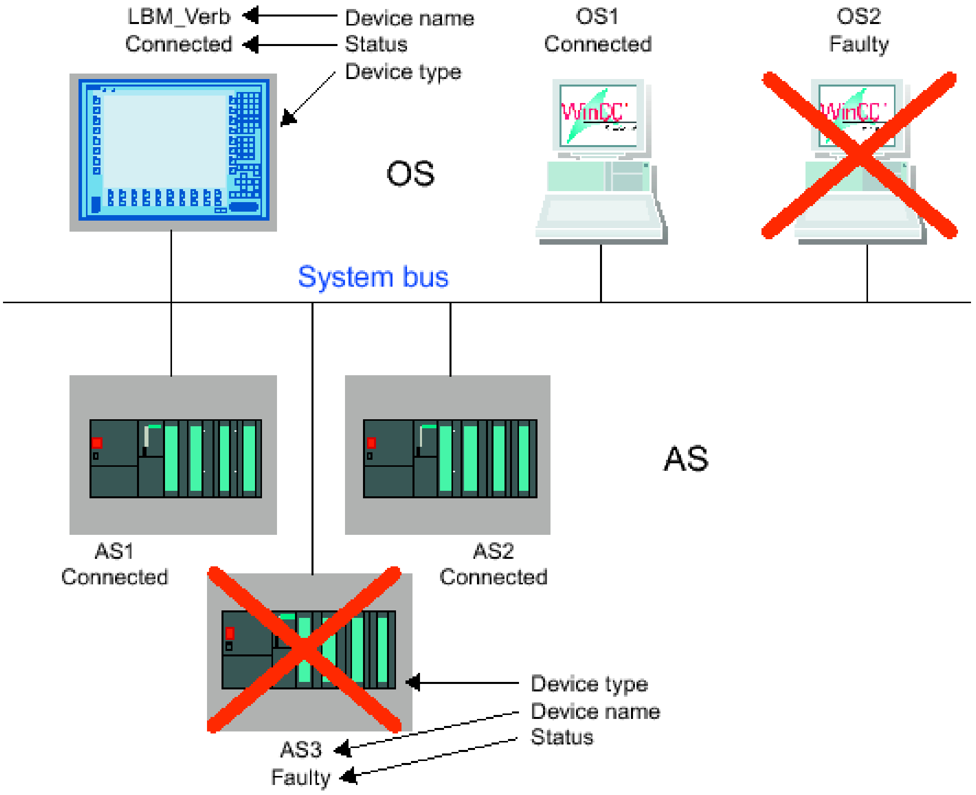
Note

Please note the following for the configuration of the lifebeat monitoring in a distributed system or a distributed redundant system:

- The lifebeat monitoring of a pair of servers monitors its subordinated automation devices.
- Configure the monitoring of all WinCC Clients in the network either only from the standard pair of servers or distribute the monitoring of the WinCC Clients to several pairs of servers.

Copyright © Siemens AG Copyright 2009 All rights reserved

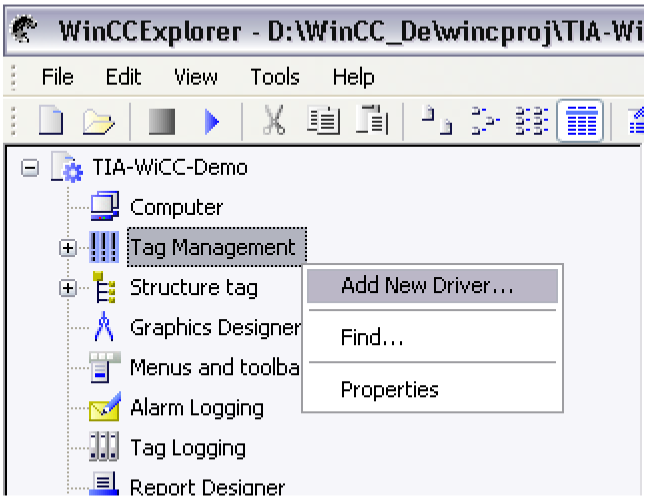
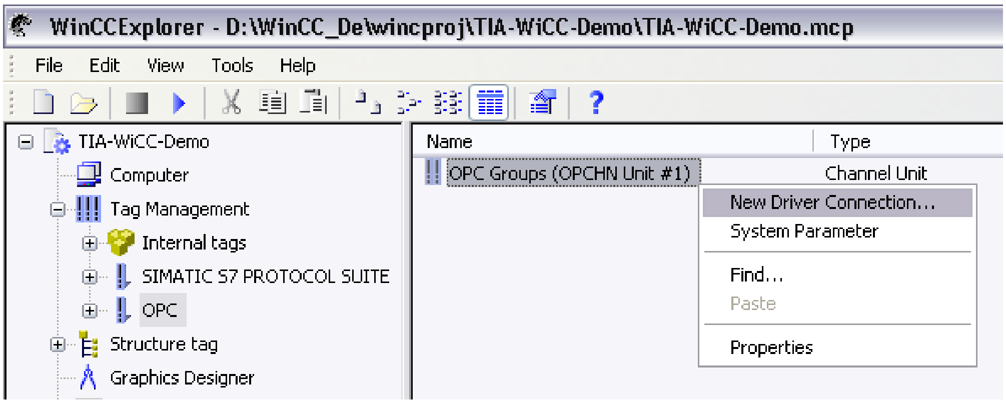
Figure 7-34

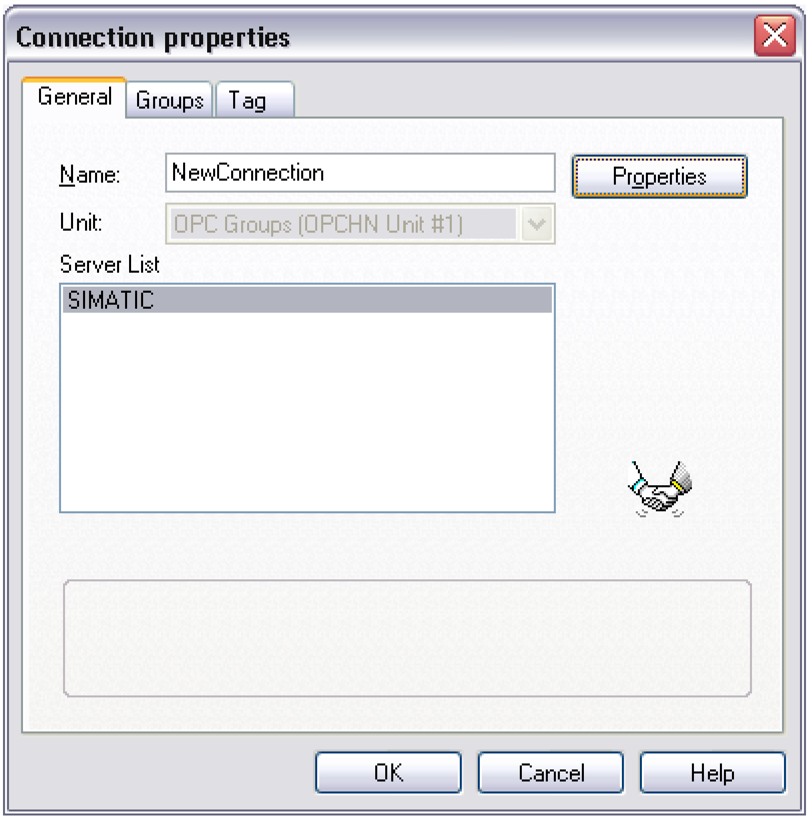


Copyright © Siemens AG Copyright 2009 All rights reserved

7.8.4 Configuration procedure

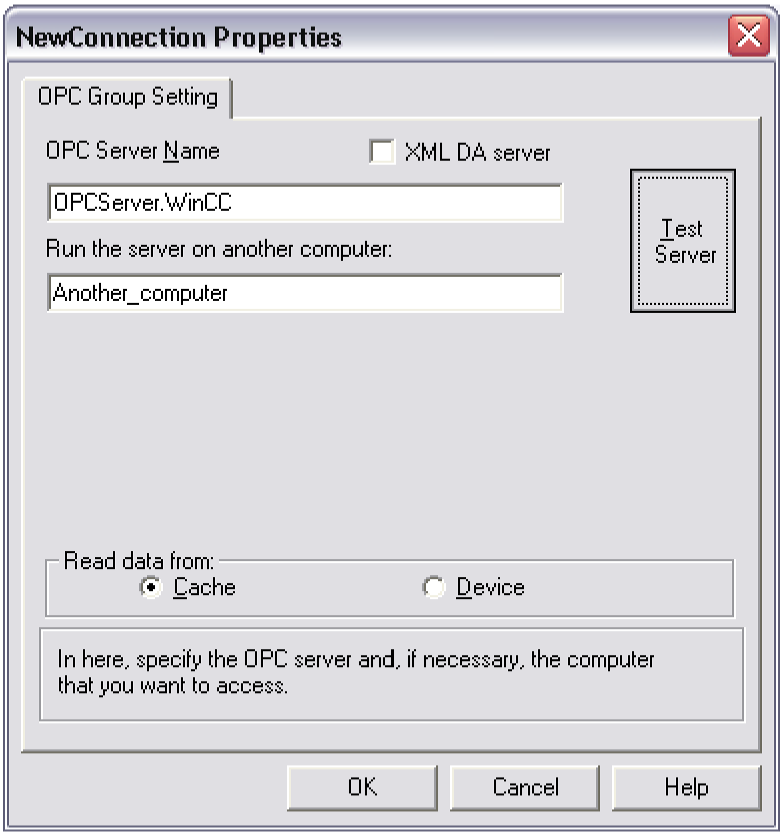
Table 7-1

Step	Action
1.	Start WinCC and add a new driver "OPC.CHN" in the tag management.  WinCCExplorer - D:\WinCC_De\wincproj\TIA-Wi File Edit View Tools Help TIA-WiCC-Demo Computer Tag Management Structure tag Graphics Designer Menus and toolba Alarm Logging Tag Logging Report Designer Add New Driver... Find... Properties
2.	Mark "OPC Unit #1". Open the context menu. Select the menu option "New Driver Connection".  WinCCExplorer - D:\WinCC_De\wincproj\TIA-WiCC-Demo\TIA-WiCC-Demo.mcp File Edit View Tools Help TIA-WiCC-Demo Computer Tag Management Internal tags SIMATIC S7 PROTOCOL SUITE OPC Structure tag Graphics Designer Name Type OPC Groups (OPCHN Unit #1) Channel Unit New Driver Connection... System Parameter Find... Paste Properties

Step	Action
3.	In the context menu of the newly created connection select the menu option "Properties". Click the "Properties" button in the tab "General".  Connection properties Name: NewConnection Unit: OPC Groups (OPCHN Unit #1) Server List SIMATIC General Groups Tag Properties OK Cancel Help

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
4.	Enter the name "OPCServer.WinCC" in the input field "OPC Server Name".  NewConnection Properties OPC Group Setting OPC Server Name: OPCServer.WinCC □ XML DA server Run the server on another computer: Another_computer Read data from: ● Cache ○ Device In here, specify the OPC server and, if necessary, the computer that you want to access.
5.	Enter the name of the computer which is to be monitored in the input field "Start the server on this computer".
6.	Click the "Test Server" button to check whether the desired OPC connection can be established.

Note Please note that correctly set and properly functioning OPC connections are a prerequisite for the monitoring of PC stations (WinCC Station).

7.9 Further reading

Internet links

This list is not complete and only represents a selection of relevant literature.

Table 7-2

	Topic	Title
\1\	Time synchronization with DCF77	http://support.automation.siemens.com/WW/view/en/16533276
\2\	Why is UTC time used on the AS?	http://support.automation.siemens.com/WW/view/en/23067556
\3\	Time synchronization via the SIMATIC procedure	http://support.automation.siemens.com/WW/view/en/18130164
\4\	Settings for time synchronization	http://support.automation.siemens.com/WW/view/en/16622902
\5\	How is the horn configured in SIMATIC PCS 7 / WinCC?	http://support.automation.siemens.com/WW/view/en/17778088
\6\	Triggering the horn	http://support.automation.siemens.com/WW/view/en/24770643
\7\	Using a monitor with a 1680x1050 pixel resolution with the OS project editor	http://support.automation.siemens.com/WW/view/en/32591055
\8\	Copying user-specific pictures into the currently opened OS project with the OS project editor	http://support.automation.siemens.com/WW/view/en/19688107
\9\	Configuring a group display	http://support.automation.siemens.com/WW/view/en/17778440
\10\	Specifying the folder order in the Plant Hierarchy	http://support.automation.siemens.com/WW/view/de/19151848
\11\	Configuring Lifebeat Monitoring	http://support.automation.siemens.com/WW/view/en/9918678

Copyright © Siemens AG Copyright 2009 All rights reserved

8 Curves

8.1 Introduction

The smallest archiving cycle in WinCC TagLogging is 500 ms. There is no way to reduce this archiving cycle through settings in WinCC Tag Logging.

Shorter archiving cycles can be achieved with the process-controlled archiving.

In an S7-400 CPU you can use the block "AR_SEND" (SFB37) for process-controlled archiving in WinCC.

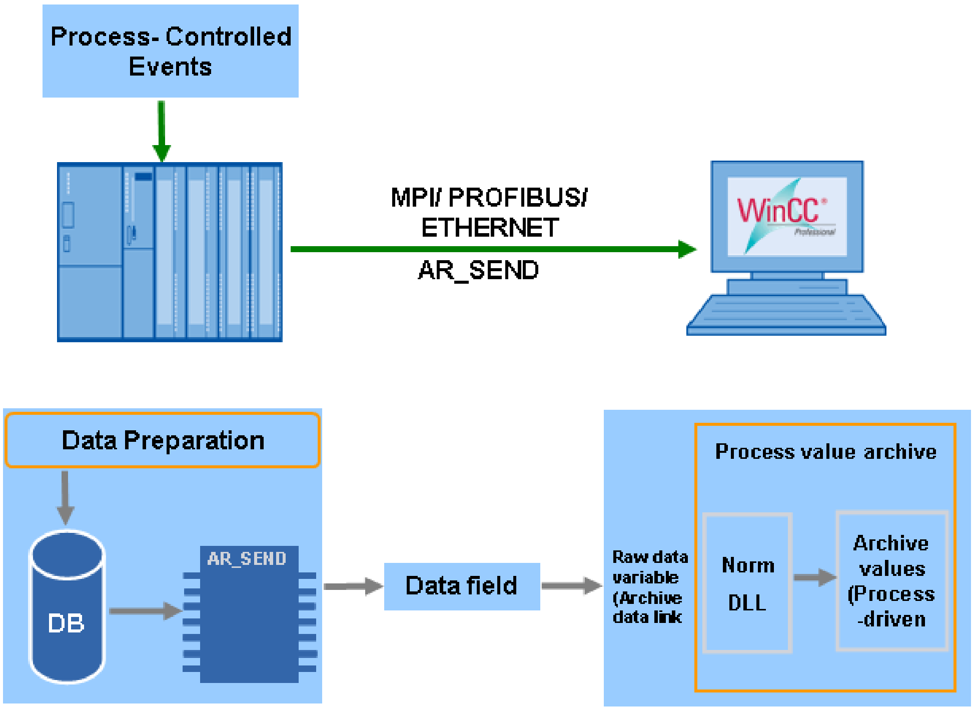
- With this method the archive data are collected in the control and then transferred to WinCC as raw data.
- A conversion DLL on the WinCC side interprets the transmitted data and enters them in the WinCC archives.
- For this purpose the AR_SEND block must be suitably interconnected in the control.
- Only parameterization is required in WinCC but no programming.

Copyright © Siemens AG Copyright 2009 All rights reserved

Overview of the message processing

The following figure schematically shows the structure for process-controlled archiving in WinCC:

Figure 8-1



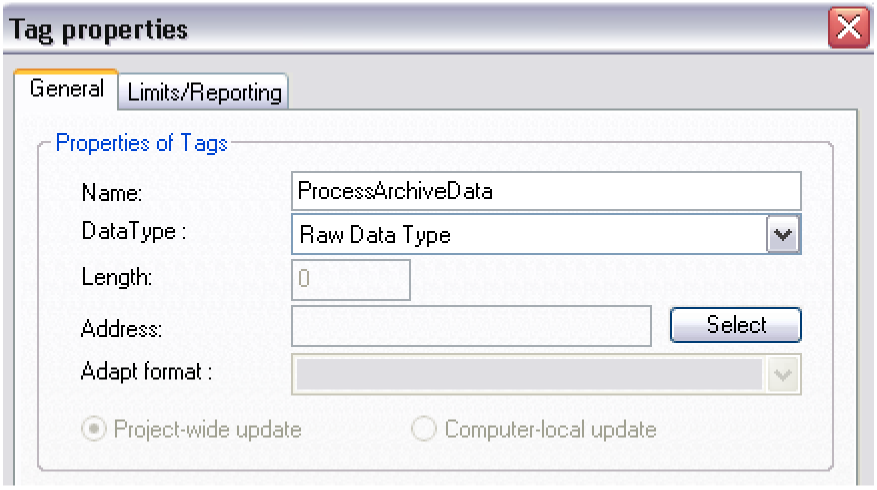
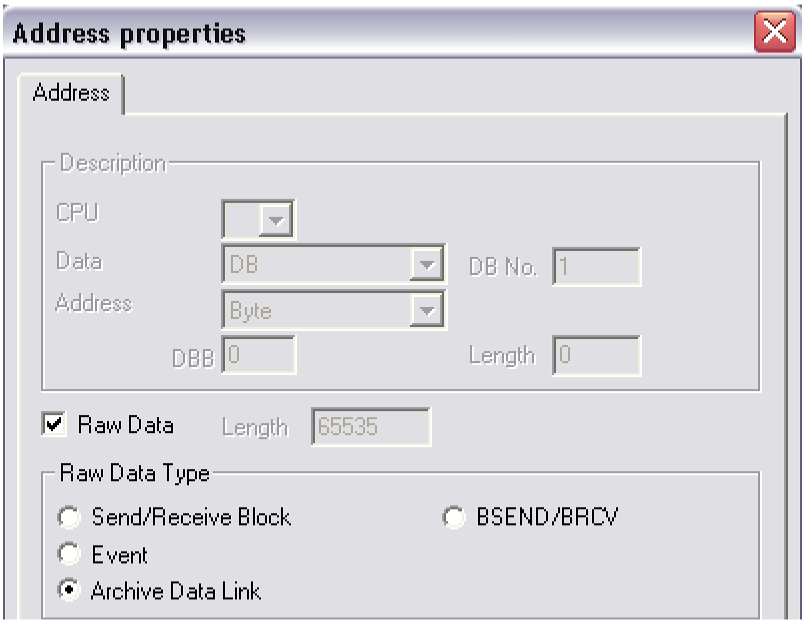
Copyright © Siemens AG Copyright 2009 All rights reserved

8.2 Principle of operation

With SFB37 (AR_SEND) one or several process values can be transferred in a process controlled mode to archives of the WinCC Tag Logging. For this purpose the process values are collected with the respective time stamps in a corresponding data area and transferred to the AR_SEND block. When a user-specified event occurs, the AR_SEND block sends the archive data to WinCC in one or several data blocks. The received raw data are entered in the respective archives by WinCC. WinCC uses the conversion DLL "nrms7pmc.nll" for the interpretation of the raw data. In order that the archive data are correctly interpreted by the functions of the conversion DLL, the data have to be processed according to the data format required by the conversion DLL prior to sending.

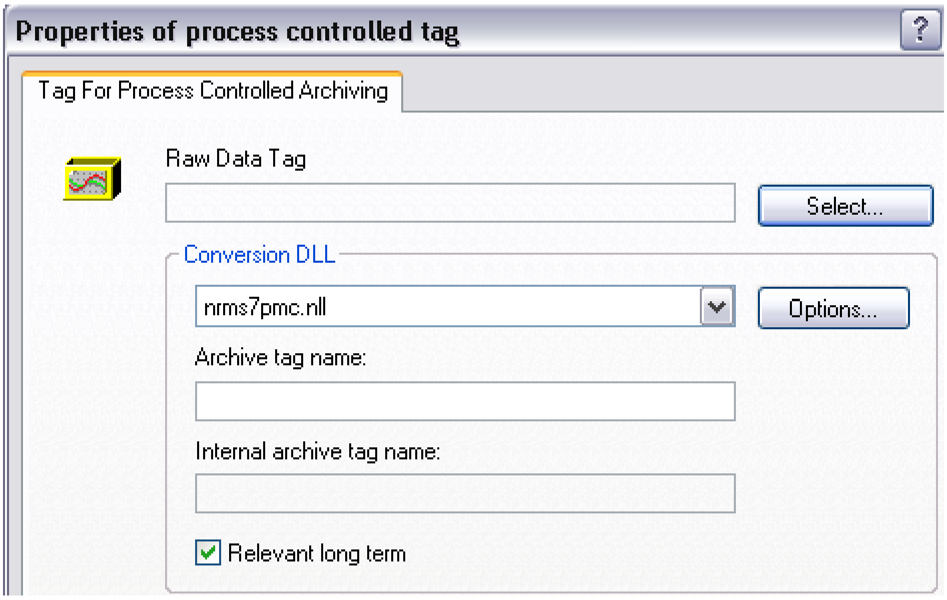
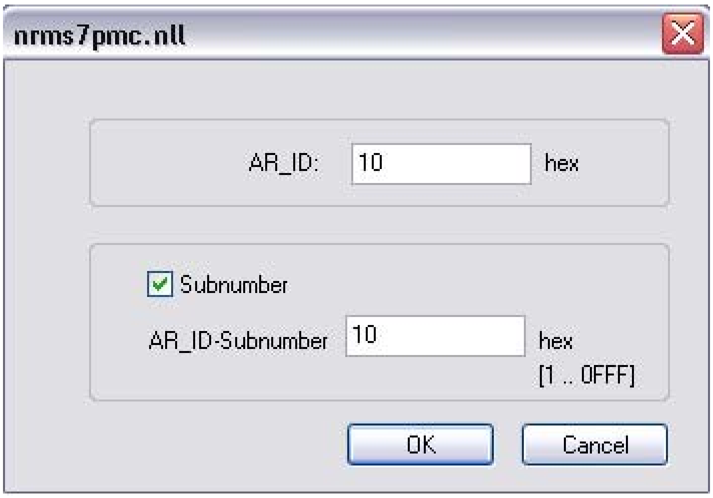
8.3 Configuring the process-controlled archiving in WinCC

Table 8-1

Step	Action
1.	Configure a connection for communication with the S7 control in the WinCC tag management in a channel unit (e.g. MPI or Industrial Ethernet) of the SIMATIC S7 Protocol Suite. Create a tag of the data type "Raw Data Type" in the S7 connection which is used for data transmission. The name must not be longer than 24 characters as this name can be part of the archive tag name.  Tag properties General / Limits/Reporting Properties of Tags Name: ProcessArchiveData DataType : Raw Data Type Length: 0 Address: Adapt format : ● Project-wide update ○ Computer-local update
2.	With the "Select" button the dialog "Address properties" is opened. In the dialog "Address properties" of the raw data tags select the field "Archive Data Link" in the area "Raw Data".  Address properties Address Description CPU Data DB DB No. 1 Address Byte DBB 0 Length 0 ☑ Raw Data Length 65535 Raw Data Type ○ Send/Receive Block ○ BSEND/BRCV ○ Event ● Archive Data Link

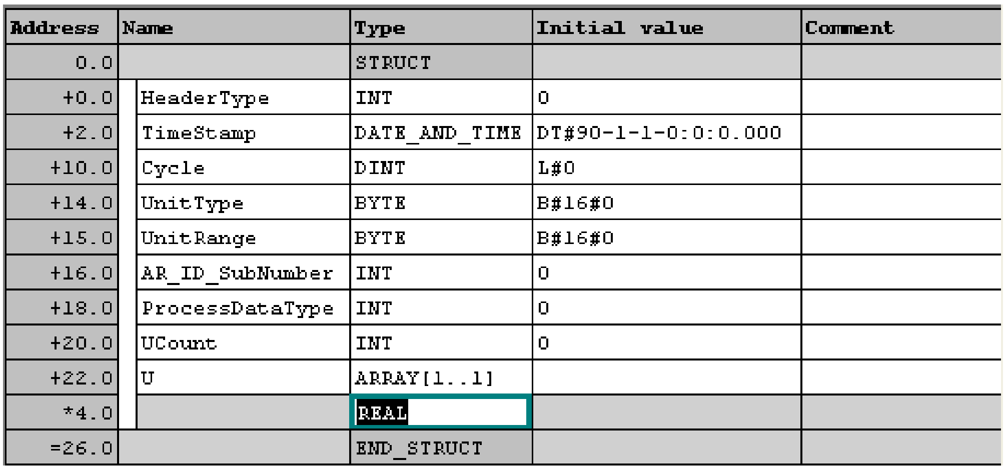
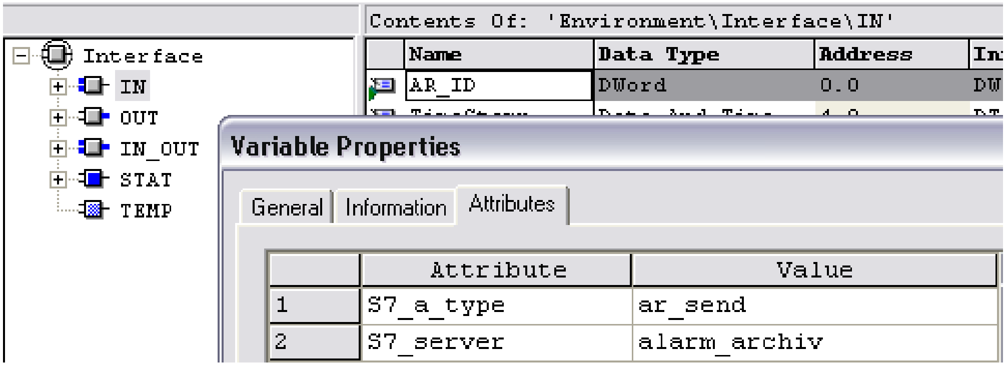
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	Open the TagLogging. Create a process-controlled archive tag in a process value archive. Use the context menu "New process-controlled tag..." for this purpose. Open a selection dialog with the "Select" button to select the raw data tag which is to be used for the parameterizing of the archive tag. You can assign a name in the field "Archive tag name" which deviates from the internal archive tag name. "nrms7pmc.nll" must be selected in the field "Conversion DLL". This value is the default setting.  Properties of process controlled tag Tag For Process Controlled Archiving Raw Data Tag: Conversion DLL: nrms7pmc.nll Archive tag name: Internal archive tag name: ☑ Relevant long term
4.	The respective AR_ID and, if required, AR_ID subnumber must be assigned with the "Options" button in the area "Conversion DLL".  nrms7pmc.nll AR_ID: 10 hex ☑ Subnumber AR_ID-Subnumber 10 hex [1 .. 0FFF]

8.4 Configuring the process-controlled archiving in STEP 7

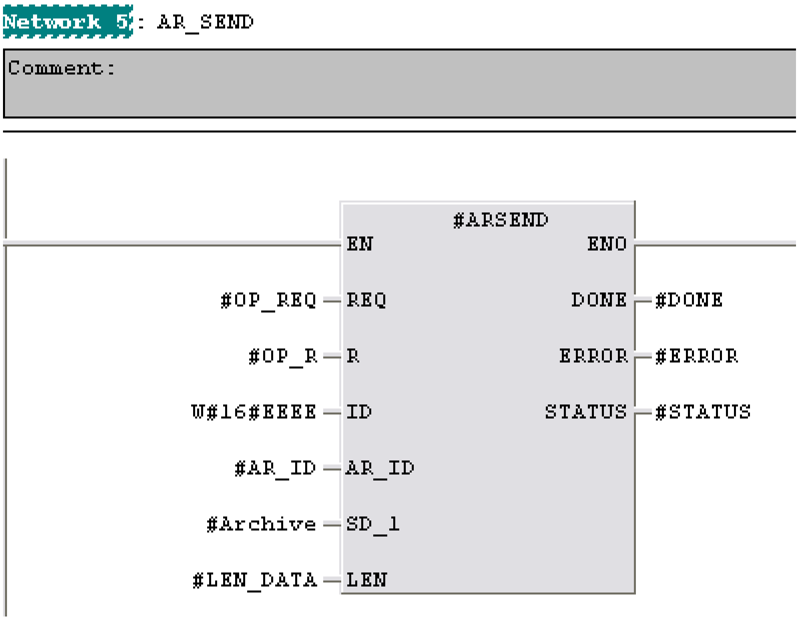
Table 8-2

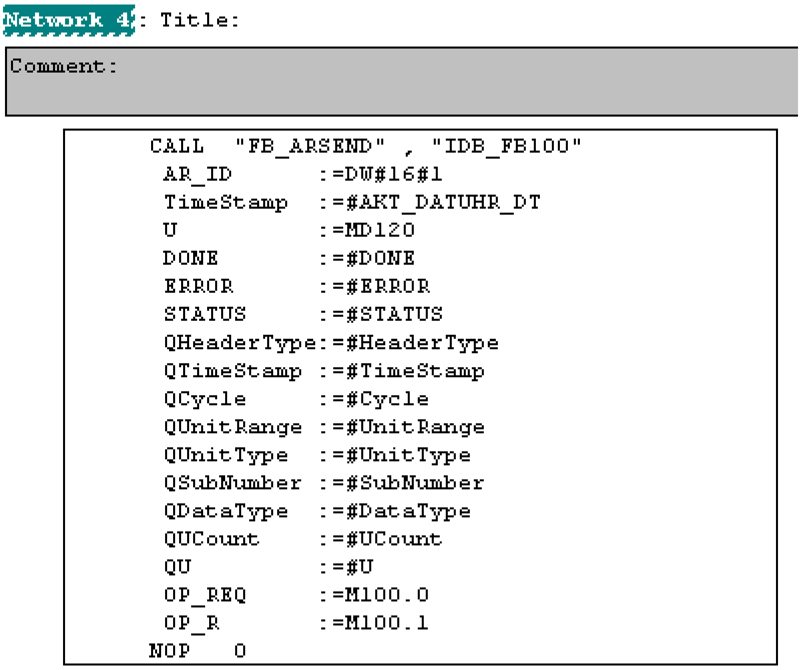
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>Create a data structure for the data to be transferred (DB or UDT).

<table>
<tr><th>Address</th><th>Name</th><th>Type</th><th>Initial value</th><th>Comment</th></tr>
<tr><td>0.0</td><td></td><td>STRUCT</td><td></td><td></td></tr>
<tr><td>+0.0</td><td>HeaderType</td><td>INT</td><td>0</td><td></td></tr>
<tr><td>+2.0</td><td>TimeStamp</td><td>DATE_AND_TIME</td><td>DT#90-1-1-0:0:0.000</td><td></td></tr>
<tr><td>+10.0</td><td>Cycle</td><td>DINT</td><td>L#0</td><td></td></tr>
<tr><td>+14.0</td><td>UnitType</td><td>BYTE</td><td>B#16#0</td><td></td></tr>
<tr><td>+15.0</td><td>UnitRange</td><td>BYTE</td><td>B#16#0</td><td></td></tr>
<tr><td>+16.0</td><td>AR_ID_SubNumber</td><td>INT</td><td>0</td><td></td></tr>
<tr><td>+18.0</td><td>ProcessDataType</td><td>INT</td><td>0</td><td></td></tr>
<tr><td>+20.0</td><td>UCount</td><td>INT</td><td>0</td><td></td></tr>
<tr><td>+22.0</td><td>U</td><td>ARRAY[1..1]</td><td></td><td></td></tr>
<tr><td>*4.0</td><td></td><td>REAL</td><td></td><td></td></tr>
<tr><td>=26.0</td><td></td><td>END_STRUCT</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>Declare an input variable “AR_ID” as DWORD and set the attributes “S7_a_type“ =ar_send, „S7_server“ =alarm_archiv.


Contents Of: 'Environment\Interface\IN'
<table>
<tr><th>Name</th><th>Data Type</th><th>Address</th><th>In</th></tr>
<tr><td>AR_ID</td><td>DWord</td><td>0.0</td><td>DW</td></tr>
</table>
Variable Properties

<table>
<tr><th></th><th>Attribute</th><th>Value</th></tr>
<tr><td>1</td><td>S7_a_type</td><td>ar_send</td></tr>
<tr><td>2</td><td>S7_server</td><td>alarm_archiv</td></tr>
</table>
</td></tr>
</table>

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	Invoke the block "AR_SEND" and configure the parameters.  Network 5: AR_SEND Comment: #ARSEND EN — ENO #OP_REQ — REQ — DONE — #DONE #OP_R — R — ERROR — #ERROR W#16#EEEE — ID — STATUS — #STATUS #AR_ID — AR_ID #Archive — SD_1 #LEN_DATA — LEN

4.	Integrate the FB in your program.
	
	Network 4: Title:
	Comment:
	CALL "FB_ARSEND" , "IDB_FB100"
	AR_ID :=DW#16#1
	TimeStamp :=#AKT_DATUHR_DT
	U :=MD120
	DONE :=#DONE
	ERROR :=#ERROR
	STATUS :=#STATUS
	QHeaderType:=#HeaderType
	QTimeStamp :=#TimeStamp
	QCycle :=#Cycle
	QUnitRange :=#UnitRange
	QUnitType :=#UnitType
	QSubNumber :=#SubNumber
	QDataType :=#DataType
	QUCount :=#UCount
	QU :=#U
	OP_REQ :=M100.0
	OP_R :=M100.1
	NOP 0

Copyright © Siemens AG Copyright 2009 All rights reserved

8.5 Structure and parameters of a data block

Table 8-3

Header type			
Year		Month	
Day		Hours	
Minutes		Seconds	
1/10 s	1/100 s	1/1000 s	Weekday
Cycle			
Unit (type)		Unit (area)	
AR_ID-Subnumber			
Data type of the process data			
Number of process values			
Process value 1			
Process value 2			
Process value i			

Copyright © Siemens AG Copyright 2009 All rights reserved

Description of the parameters

- Header type

The header type determines the type of the information contained in the header:

- 0: Header without time stamp, header without AR_ID-Subnumber
- 1: Header with time stamp, header without AR_ID-Subnumber
- 8: Header without time stamp, header with AR_ID-Subnumber
- 9: Header with time stamp, header with AR_ID-Subnumber

Note With the header types 0 and 8 the bytes for the time stamp are dropped in the header. As these bytes will not stay reserved in the data block, the header is shortened accordingly by 8 bytes.

- Time stamp

The time stamp contains date and time in the SIMATIC-S7-BCD format. The specification of the weekday is not evaluated by WinCC.

Note The automation system S7 does not know the switchover of daylight-saving time / winter time. The local winter time must be set as the system time in the AS as a rule. The correction of the time stamp to daylight-saving time or winter time is done by the conversion DLL in WinCC. The corrected time and a daylight-saving time / winter time identification will then be available for the WinCC-applications. The corrected time and the identification is transferred to the archive in Tag Logging, for instance.

- Cycle

Cycle in which the process values are read. This parameter is a factor of the time units given under unit (area). Data length: Double word.

Example:
"Cycle" = 10 ; "Unit(area)" = 4 means: Reading cycle of the process values = 10 seconds

- Unit (type)

Determines the type of time information and has an influence on the parameter "Number of process values":

  - 1: The process values are read out equidistantly.
  - 2: Every process value has a time stamp.
  - 3: Every process value has a relative time difference in time units with a data length of 2 words.
  - 4: Every process value contains the AR_ID-Subnumber.

- Unit (area)

Specifies the size of the time units used with unit (type) = 1 or 3:

  - 1: Reserved
  - 2: Reserved
  - 3: Milliseconds
  - 4: Seconds
  - 5: Minutes
  - 6: Hours
  - 7: Days

Copyright © Siemens AG Copyright 2009 All rights reserved

- Data type of the process data

The process values are stored directly in the S7 format:

  - 0: BYTE
  - 1: WORD
  - 2: INT
  - 3: DWORD
  - 4: DINT
  - 5: REAL

- Number of process values

Depending on the entry made in "Unit(type)" a certain number of process values can be contained in the transferred data area. The number is limited by the maximum length of the 16 Kbyte data area to be transferred.

Note

The following restriction exists for this parameter "Number of process values" in the case of the AR_SEND-variant "Multiple archive tags":

The data blocks for the different archive tags must start at word boundaries as a rule. Therefore, an even number of process values (=bytes) must be specified for this parameter "Number of process values" when the combination of "Data Type Process Values" = 0 (BYTE) and "Unit (type)" = 1 (process values with equidistant time intervals) is used. This restriction only applies to this AR_SEND variant and this combination of data type and "Unit(type)".

Copyright © Siemens AG Copyright 2009 All rights reserved

8.6 Further reading

This list is not complete and only represents a selection of relevant literature.

Table 8-4

	Topic	Title
\1\	WinCC Tag Logging: Archiving cycles of less than 500 ms	http://support.automation.siemens.com/WW/view/de/24048478
\2\	Using SFB37 (AR_SEND)	http://support.automation.siemens.com/WW/view/de/23629327
\3\	Process-controlled archiving in WinCC	http://support.automation.siemens.com/WW/view/de/23629424
\4\	Process-controlled archiving in WinCC	http://support.automation.siemens.com/WW/view/de/29488253
\5\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

9 User archives

9.1 Introduction

Data from engineering processes can be stored continuously on a server PC with the "User Archive" editor of WinCC. In the Graphics Designer a WinCC UserArchiveControl can be configured which permits displaying the online data from the user archives in tables during runtime.

User archives are also used to provide data for automation systems such as S5, S7. If required, data can be input in the form of recipes or setpoints from the controls.

The User Archive editor offers two types of database tables:

- User archives:
  User archives are database tables in which the user can create user-specific data fields. User archives serve for storing data and they permit a standardized access to these data in compliance with the SQL database conventions.
- Views:
  Views get data from the user archives and serve for providing overviews

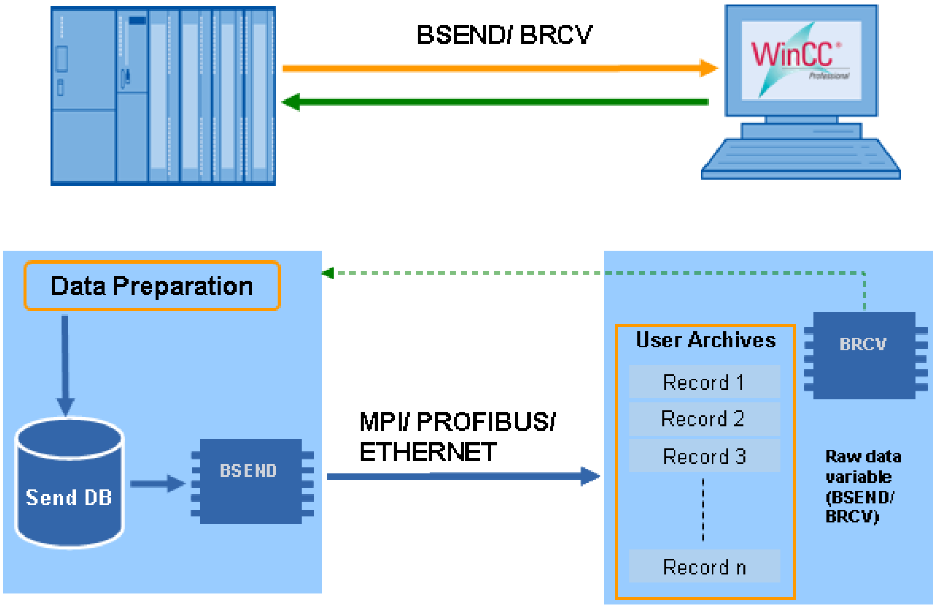
Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

Overview of the user archives

The following figure schematically shows the structure of the user archives in WinCC:

Figure 9-1



9.2 Principle of operation

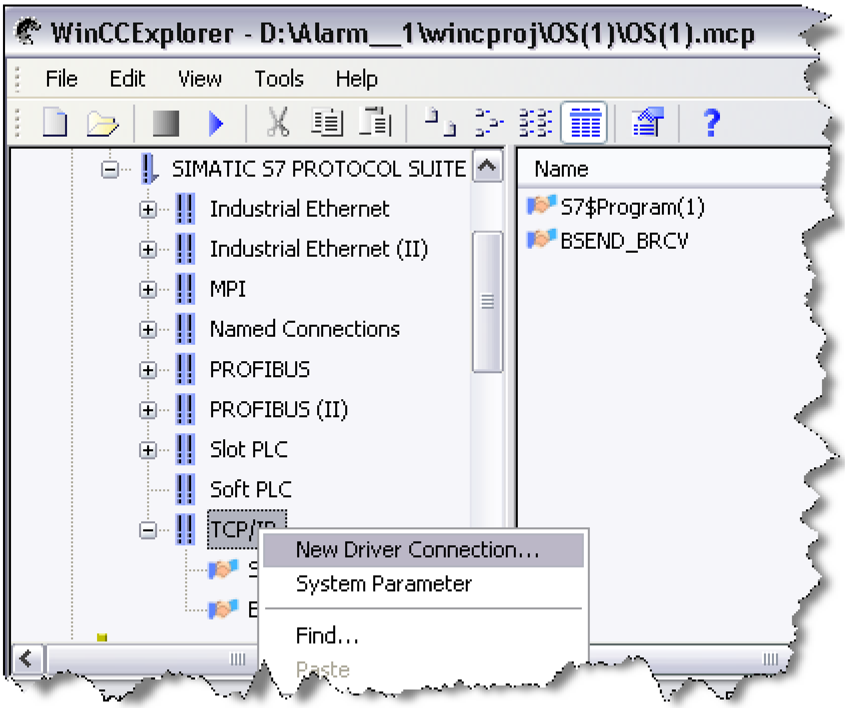
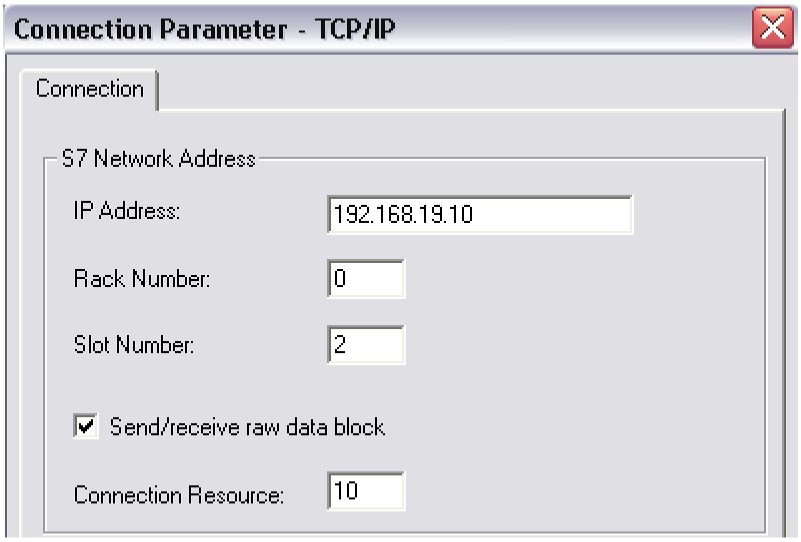
When configuring user archives you can create user-specific database tables with the "User Archive" editor or with the functions of the WinCC script language.

The "User Archive" editor also permits creating new data records and editing data in existing data records even during the configuration.

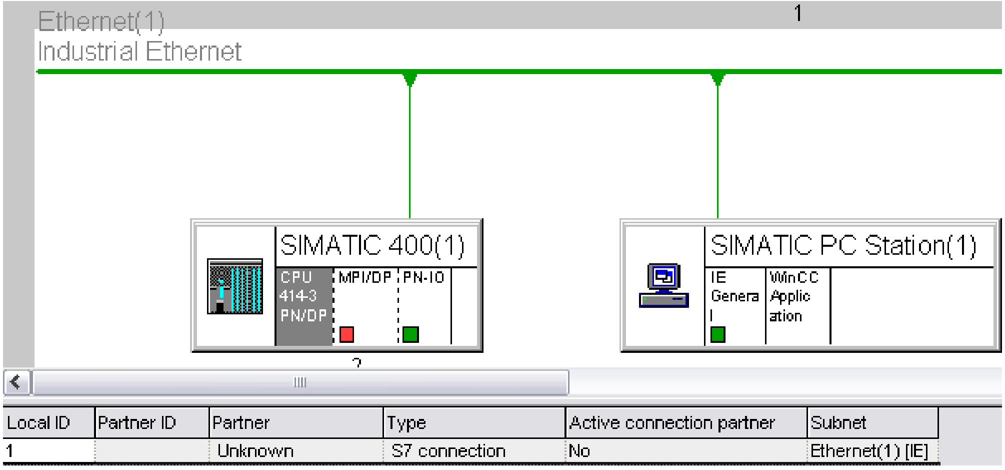
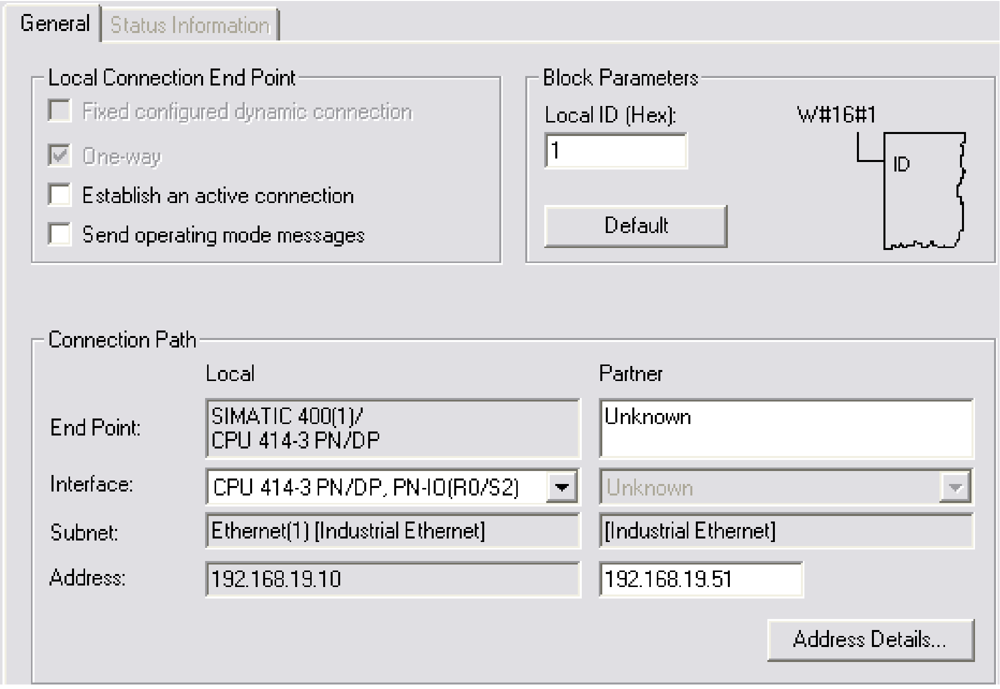
In runtime user archives (similar to database tables) can be displayed as tables in the picture windows of the WinCC UserArchiveControl. A continuous data exchange can take place with the AS via raw data tags or WinCC tags.

9.3 Communication via BSEND / BRCV

Table 9-1

Step	Action
1.	Generate a new connection.  WinCCExplorer - D:\Alarm__1\wincproj\OS(1)\OS(1).mcp File Edit View Tools Help SIMATIC S7 PROTOCOL SUITE Industrial Ethernet Industrial Ethernet (II) MPI Named Connections PROFIBUS PROFIBUS (II) Slot PLC Soft PLC TCP/IP Name S7$Program(1) BSEND_BRCV New Driver Connection... System Parameter Find... Paste
2.	Configure the connection parameters.  Connection Parameter - TCP/IP Connection S7 Network Address IP Address: 192.168.19.10 Rack Number: 0 Slot Number: 2 ☑ Send/receive raw data block Connection Resource: 10

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	Create an S7 connection between the control and WinCC. 
4.	Configure the S7 connection parameters. 

Local ID	Partner ID	Partner	Type	Active connection partner	Subnet
1		Unknown	S7 connection	No	Ethernet(1) [IE]

Local Connection End Point

□ Fixed configured dynamic connection

☑ One-way

□ Establish an active connection

□ Send operating mode messages

Block Parameters

Local ID (Hex): 1 W#16#1

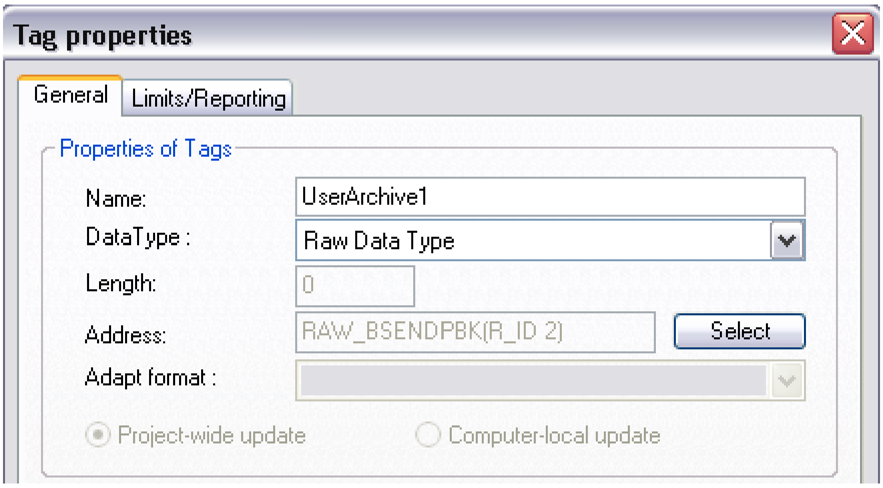
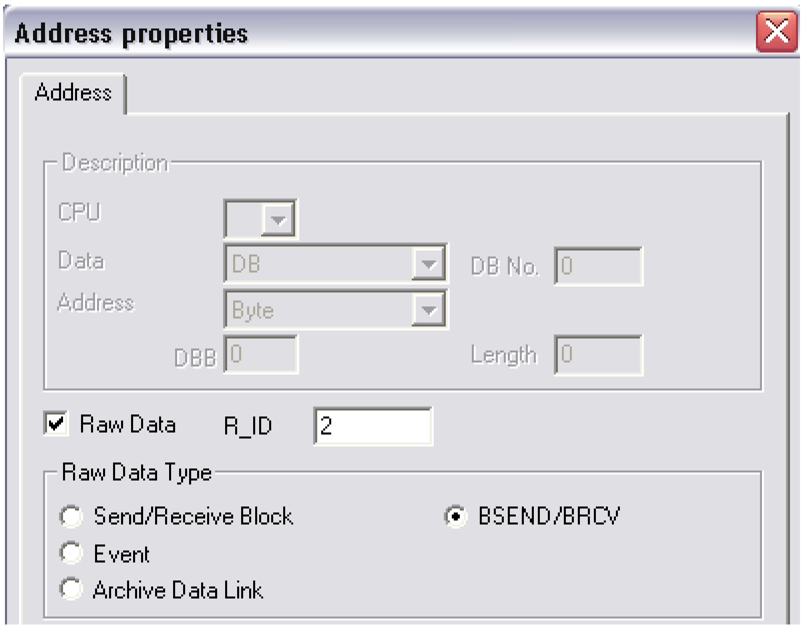
Connection Path

	Local	Partner
End Point:	SIMATIC 400(1)/ CPU 414-3 PN/DP	Unknown
Interface:	CPU 414-3 PN/DP, PN-IO(R0/S2)	Unknown
Subnet:	Ethernet(1) [Industrial Ethernet]	[Industrial Ethernet]
Address:	192.168.19.10	192.168.19.51

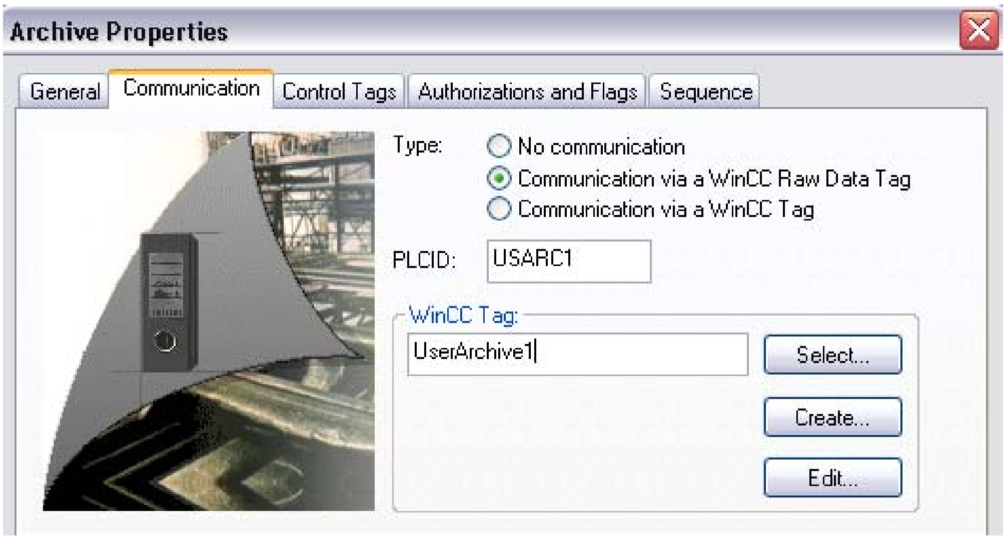
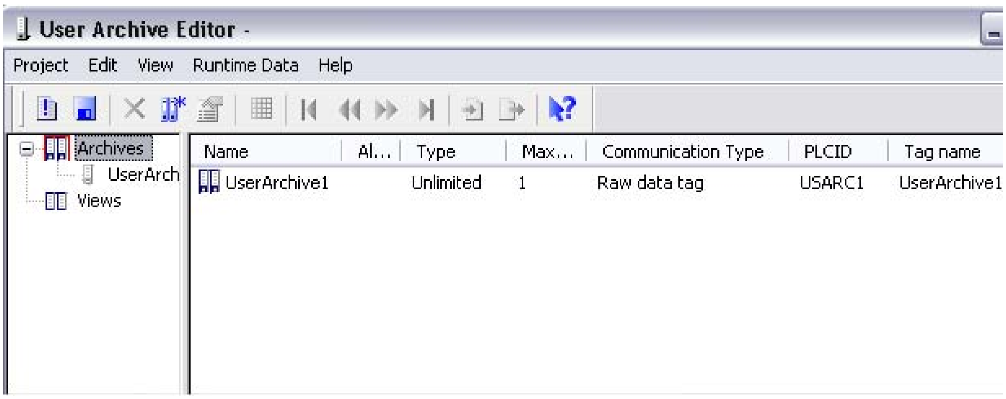
Copyright © Siemens AG Copyright 2009 All rights reserved

9.4 Configuration in WinCC

Table 9-2

Step	Action
1.	Create a new tag of the data type "Raw Data Type".  Tag properties General | Limits/Reporting Properties of Tags Name: UserArchive1 DataType : Raw Data Type Length: 0 Address: RAW_BSENDPBK(R_ID 2) Select Adapt format : ● Project-wide update ○ Computer-local update
2.	Configure the address parameters.  Address properties Address Description CPU Data DB DB No. 0 Address Byte DBB 0 Length 0 ☑ Raw Data R_ID 2 Raw Data Type ○ Send/Receive Block ● BSEND/BRCV ○ Event ○ Archive Data Link

Copyright © Siemens AG Copyright 2009 All rights reserved

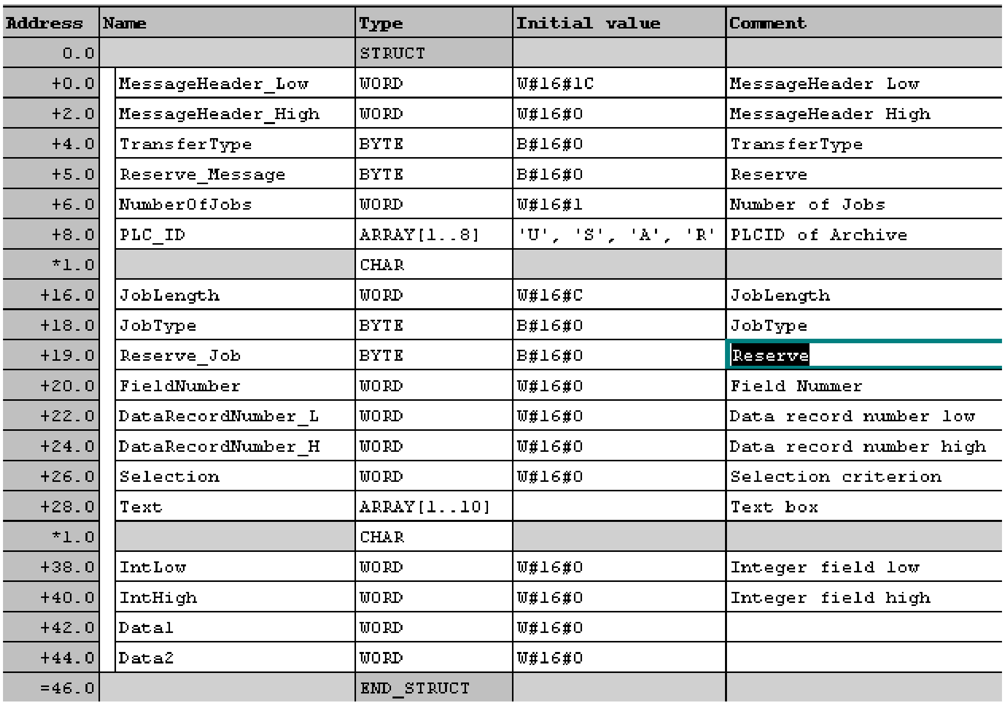
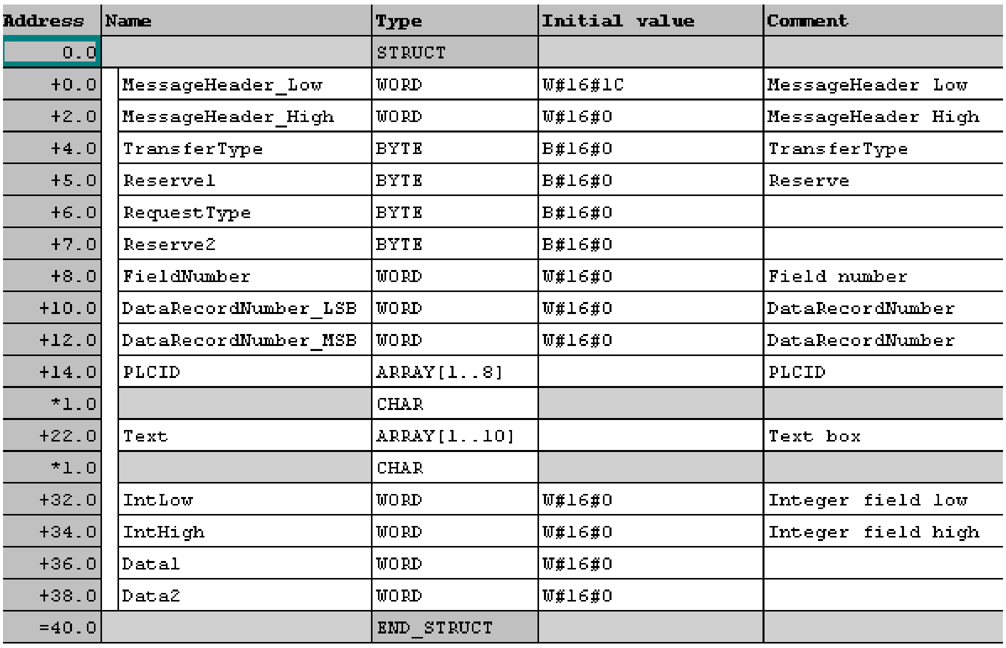
Step	Action
3.	Create a new user archive.  Archive Properties General Communication Control Tags Authorizations and Flags Sequence Type: ○ No communication ● Communication via a WinCC Raw Data Tag ○ Communication via a WinCC Tag PLCID: USARC1 WinCC Tag: UserArchive1 Select... Create... Edit...
4.	Check the settings.  User Archive Editor - Project Edit View Runtime Data Help Archives UserArch Views Name: UserArchive1 Al...: Type: Unlimited Max...: 1 Communication Type: Raw data tag PLCID: USARC1 Tag name: UserArchive1

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

9.5 Configuration in STEP 7

Table 9-3

Step	Action
1.	Create a data area which is to be written to the user archive of WinCC. 
2.	Create a data area which is to be read by the user archive of WinCC. 

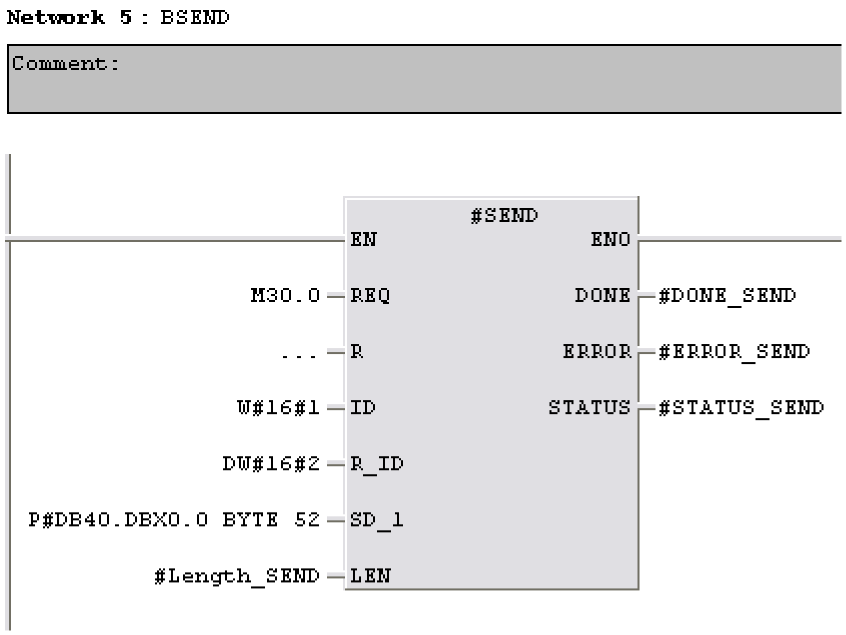
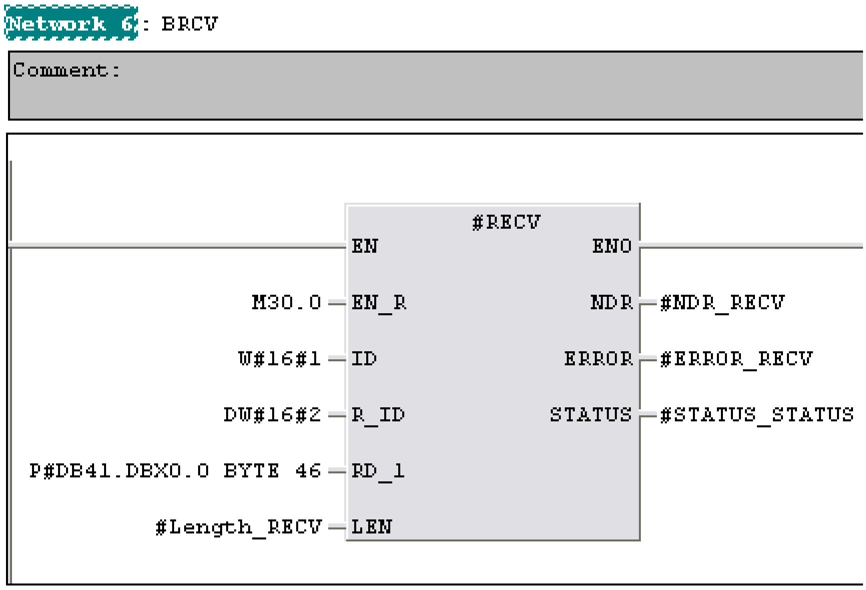
Step 1:

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	MessageHeader_Low	WORD	W#16#1C	MessageHeader Low
+2.0	MessageHeader_High	WORD	W#16#0	MessageHeader High
+4.0	TransferType	BYTE	B#16#0	TransferType
+5.0	Reserve_Message	BYTE	B#16#0	Reserve
+6.0	NumberOfJobs	WORD	W#16#1	Number of Jobs
+8.0	PLC_ID	ARRAY[1..8]	'U', 'S', 'A', 'R'	PLCID of Archive
*1.0		CHAR		
+16.0	JobLength	WORD	W#16#C	JobLength
+18.0	JobType	BYTE	B#16#0	JobType
+19.0	Reserve_Job	BYTE	B#16#0	Reserve
+20.0	FieldNumber	WORD	W#16#0	Field Nummer
+22.0	DataRecordNumber_L	WORD	W#16#0	Data record number low
+24.0	DataRecordNumber_H	WORD	W#16#0	Data record number high
+26.0	Selection	WORD	W#16#0	Selection criterion
+28.0	Text	ARRAY[1..10]		Text box
*1.0		CHAR		
+38.0	IntLow	WORD	W#16#0	Integer field low
+40.0	IntHigh	WORD	W#16#0	Integer field high
+42.0	Data1	WORD	W#16#0	
+44.0	Data2	WORD	W#16#0	
=46.0		END_STRUCT		

Step 2:

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	MessageHeader_Low	WORD	W#16#1C	MessageHeader Low
+2.0	MessageHeader_High	WORD	W#16#0	MessageHeader High
+4.0	TransferType	BYTE	B#16#0	TransferType
+5.0	Reserve1	BYTE	B#16#0	Reserve
+6.0	RequestType	BYTE	B#16#0	
+7.0	Reserve2	BYTE	B#16#0	
+8.0	FieldNumber	WORD	W#16#0	Field number
+10.0	DataRecordNumber_LSB	WORD	W#16#0	DataRecordNumber
+12.0	DataRecordNumber_MSB	WORD	W#16#0	DataRecordNumber
+14.0	PLCID	ARRAY[1..8]		PLCID
*1.0		CHAR		
+22.0	Text	ARRAY[1..10]		Text box
*1.0		CHAR		
+32.0	IntLow	WORD	W#16#0	Integer field low
+34.0	IntHigh	WORD	W#16#0	Integer field high
+36.0	Data1	WORD	W#16#0	
+38.0	Data2	WORD	W#16#0	
=40.0		END_STRUCT		

Copyright © Siemens AG Copyright 2009 All rights reserved

Step	Action
3.	Invoke the block "BSEND" and configure its parameters.  Network 5 : BSEND Comment: #SEND EN — ENO M30.0 — REQ — DONE — #DONE_SEND ... — R — ERROR — #ERROR_SEND W#16#1 — ID — STATUS — #STATUS_SEND DW#16#2 — R_ID P#DB40.DBX0.0 BYTE 52 — SD_1 #Length_SEND — LEN
4.	Invoke the block "BRECV" and configure its parameters.  Network 6: BRCV Comment: #RECV EN — ENO M30.0 — EN_R — NDR — #NDR_RECV W#16#1 — ID — ERROR — #ERROR_RECV DW#16#2 — R_ID — STATUS — #STATUS_STATUS P#DB41.DBX0.0 BYTE 46 — RD_1 #Length_RECV — LEN

9.6 Further reading

This list is not complete and only represents a selection of relevant literature.

Table 9-4

	Topic	Title
\1\	Writing an S7 REAL number into a user archive	http://support.automation.siemens.com/WW/view/en/19606614
\2\	Deleting User Archive completely and importing new data records	http://support.automation.siemens.com/WW/view/en/11925601
\3\	Access to User Archive via C-scripts	http://support.automation.siemens.com/WW/view/en/23050617
\4\	Sorting of entries in User Archives	http://support.automation.siemens.com/WW/view/en/9988124
\5\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

Copyright © Siemens AG Copyright 2009 All rights reserved

10 Glossary

Terms which are important for comprehension of this document are described in the following:

AS

The Automation System (AS) is the English term for PC and it is frequently used as a synonym for it in German.

BCD

Binary Coded Decimal (BCD) is frequently used for the control of LCD or LED numerical displays or for the transmission of date and time.

BCE

Basic Communication Ethernet (BCE) means a 3COM-Etherlink card for max. 8 nodes for Industrial Ethernet communication.

BPC

Basic Process Control (BPC) is included in the WinCC basic system as a standard and it provides additional tools for configuration to realize typical control tasks.

CAS

Central Archive Server (CAS) is an option of WinCC and serves for the central process data archiving.

CFC

The Continuous Function Chart (CFC) is a method for the graphical programming of programmable logic controls in which function blocks are interconnected.

CMMS

The term Computerized Maintenance Management System (CMMS) means a computer-aided maintenance management system and describes the systematic software support of maintenance procedures.

CP

The Communication Processor (CP) is used for communication tasks in the automation and provides connections as the Industrial Ethernet or Profibus.

CPU

The Central Processing Unit (CPU) is the central processing unit of the PLC which is capable of executing a program.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

CSV

The file format Comma Separated Values (CSV) describes the structure of a text file for storaging or for exchanging simply structured data.

DB

Data Blocks (DB) do not contain STEP 7 statements which is in contrast to code blocks. They collect user data, i.e. there are variable data in the data blocks with which the user program works.

DCF77

The time signal transmitter DCF77 is a long-wave transmitter in Mainflingen which supplies the exact time to most of the radio-controlled clocks in Western Europe. The designation is derived from D for Germany, C for long-wave transmitter, F because of the vicinity to Frankfurt and the number 77 for the carrier frequency 77.5 kHz.

DCS

Distributed Control System (DCS) means a control system in the process control which regulates the different manufacturing processes by means of programmable logic control units.

DEO

The Diagnostic Entry Operand (DEO) is used for the criteria analysis in diagnosable blocks for S7-PDIAG.

DP

Distributed peripherals (DP) is a term from automation engineering and designates the connection of distributed control electronics elements for a (large-scale) machine to a central CPU via a bus system. The term has become popular with the introduction of field buses such as Profibus.

DTM

With the DowntimeMonitor (DTM) of the Machine Data Management software, downtimes can be centrally acquired and analyzed in machine-based or line-based production plants.

EAM

Enterprise Architecture Management (EAM) is part of the enterprise architecture management.

EPC

Engineering, Procurement and Construction (EPC) means the project processing and the corresponding contract layout common in the international building and construction industry and, especially, plant engineering.

ERP

Enterprise Resource Planning (ERP) is a complex application software which supports the resource planning of an entire enterprise. ERP designates the task of the enterprise to utilize the resources in an enterprise (capital, equipment or personnel) as efficiently as possible for the operations of the company.

ES

Engineering Stations (ES) are PCs on which the PCS 7 Engineering Software for the configuration of a PCS 7 project has been installed.
To load the configuration data to the target systems (OS, BATCH, Route Control, AS) and perform tests in the process, an Engineering Station is connected to the plant bus and the terminal bus.

FB

Function Blocks (FB) are among the blocks which you program yourself. A function block is a block "with a memory". It has an assigned data block as memory (instance data block).

FBD

The programming language Function Block Diagram (FBD) uses the graphic logic symbols known from the Boolean algebra to represent logic. Complex functions as, for instance, mathematical functions, can also be represented directly in conjunction with the logic boxes.

FC

Functions (FC) are among the blocks which you program yourself. A function is a code block "without a memory". Temporary tags of the FC are stored in the local data stack. These data get lost after the FC have been processed.

GMT

Greenwich Mean Time (GMT) is the mean solar time at the Prime Meridian. Greenwich Mean Time was recognized as the worldwide time standard from 1884 to 1928. Although this function was replaced by the Coordinated Universal Time UTC, GMT is still a commonly used term for this time zone.

GRAPH

The programming language S7-GRAPH (sequential control) is used to program sequential controls. This includes the creation of a step sequence, determination of the respective step contents and the switching conditions (transitions). S7 GRAPH also shows complex processes in a very clear structure and thus enables efficient programming and troubleshooting.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

HMI

Human Machine Interface (HMI) permits the operator to control the machine, monitor the plant statuses and, if required, interfere in the process.

Interlock

Interlock is a programmable condition for step locking in process diagnostics which has an influence on the execution of individual actions.

LAD

Representation in the graphic programming language Ladder Logic (LAD) is based on circuit diagrams. The elements of a circuit diagram such as NC contact and NO contact are networked. One or several networks form the entire statement section of a code block.

LAN

A Local Area Network (LAN) is a local computer network which usually comprises several rooms, but rarely more than one plot of land. A local network can be built with various technologies. Ethernet is the most commonly used standard today.

MES

Manufacturing Execution System (MES) is a process-oriented manufacturing management system. It excels over similar efficient systems for production planning, the so-called ERP (Enterprise Resource Planning), due to its direct interface to automation and it permits checking the production in realtime. This includes classic data acquisition and processing such as Production Data Acquisition (PDA), Machine Data Acquisition (MDA) and personnel data recording but also all other processes which have a real-time effect on the manufacturing/production process.

MFI

Multi Function Interface (MFI) is a module slot of the CPU-series 41x-3 and 41x-4 to extend the CPU by another PROFIBUS DP-interface with the module IF 964-DP.

MPI

The Multi Point Interface (MPI) is an interface which is used for connecting PUs (Programming Units), OPs (operating devices/Operator Panels) and other SIMATIC S7 devices.

NTP

The Network Time Protocol (NTP) is a standard for synchronizing clocks in computer systems via packet-based communication networks. NTP uses the connectionless UDP protocol. It was specifically developed to permit a reliable synchronization via networks with a variable packet runtime.

OB

Organisation blocks (OBs) are the interface between the operating system and the user program. They are invoked by the operating system and they control the cyclic and interrupt-driven program execution, the start response of the automation system and the error handling.

OCX

OLE custom controls (OCX) is a file which provides an ActiveX control element under Windows. An OCX has the same basic properties as a Dynamic Link Library (DLL) but it has to implement the Interface OleObject. This ensures that it supports the Object Linking and Embedding protocol (OLE).

OEM

Original Equipment Manufacturer (OEM) means the original equipment manufacturer who manufactures complete components or products in his own factories but who does not market them himself.

OPC (-DA)

OLE for Process Control (OPC) is the name of a standardized software interface which permits the data exchange between applications of most different manufacturers in automation systems.

OS

The Operator Station (OS) is the Human Machine Interface of the process control system SIMATIC PCS 7. The user can monitor, operate and control all processes with it. Operator Stations are available with visualized and pre-defined user interfaces as terminals.

PC

A programmable controller (PC) is, according to its inner structure, a microcomputer with a process periphery and it consists of the arithmetic and logic unit, control unit and storage.

PCM

Process Control Monitor (PCM) is used for collecting, manipulating, evaluating and storing process values. The integration into WinCC guarantees full transparency of all machine and plant data as a basis for optimization of the plant productivity.

PLC

A programmable logic controller (PLC) is a module which is used for open-loop or closed-loop control of a machine or plant. Such modules are usually electronic and resemble the modules of a computer. The encoders (sensors) and the final controlling elements (actuators) are connected with this module.

Copyright © Siemens AG Copyright 2009 All rights reserved

PN

Profinet (PN) is the open Industrial Ethernet standard of Profibus & Profinet International (PI) for automation. Profinet uses TCP/IP and IT standards, it is capable of realtime Ethernet and permits the integration of fieldbus systems.

PNIO

Profinet-IO has been designed for Real-Time (RT) and synchronous communication IRT (IRT= Isochronous Real-Time) with the distributed IO. The designations RT and IRT merely describe the realtime properties of the communication within Profinet-IO.

RLO

The Result of a Logic Operation (RLO) designates the signal status "0" or "1" of the output of a binary basic operation/logic operation which is stored in a register in the CPU.

RT

The Runtime (RT), or WinCC RT, is used for monitoring and controlling automatic processes. With the clear graphical interface with window technology the user can get a fast overview over the entire plant right up to the detail.

S7

SIMATIC 7 (S7) means the entire SIMATIC 7 series which consists, for instance, of the SIMATIC STEP 7 basic software for the creation of PLC programs and of the controllers, e.g. S7-300.

SCADA

Supervisory Control and Data Acquisition (SCADA) means the concept of supervision, control and data acquisition of technical processes.

SDB

The System Data Blocks (SDB) are created by different applications, partially also by the CPU itself and they contain both the hardware which was configured in STEP 7 and also the parameterized networks and connections.

SFB

A System Function Block (SFB) is a function block which is integrated in the S7-CPU. As SFBs are part of the operating system they are not loaded as part of the program. SFBs are used for communication via configured connections or for integrated special functions.

Copyright © Siemens AG Copyright 2009 All rights reserved

Copyright © Siemens AG Copyright 2009 All rights reserved

SFC

A System Function (SFC) is a preprogrammed function which is integrated in the S7-CPU. You can invoke the SFC from your program. As SFCs are part of the operating system they are not loaded as part of the program. Like FCs, SFCs are blocks "without memory".

SFM

With the function "Report System Error" (SFM) STEP 7 provides a convenient option to display diagnostic information in the form of messages. The blocks and message texts required for this are generated automatically by STEP 7. The user merely has to load the created blocks to the CPU and transfer the messages into the WinCC project.

SQL

Structured Query Language (SQL) is a database language for the definition, query and manipulation of data in relational databases. SQL is ANSI and ISO standardized and is supported by almost all common database systems.

SSL

The System Status List (SSL) describes the current status of the automation system: It provides an overview over the configuration, current parameterization, current statuses and processes in the CPU and the assigned modules.

STL

The programming language Statement List (STL) is a machine-based textual language. The individual statements correspond to the steps with which the CPU performs the program execution. Several statements can be combined to networks.

TIA

Totally Integrated Automation (TIA) is an automation technology strategy which has been designed and developed by Siemens since 1996. This strategy defines the interaction of extensive single components, tools (SW) and the related services (spare parts service etc.).

UDT

User-defined Data Types (UDT) are special data structures which you created and which you can use according to your definition in the entire S7 user program. UDTs can serve as templates for the creation of data blocks with the same data structure, i.e. you create the structure only once and after that you create the required data blocks by simply allocating the UDT.

UTC

Universal Time Coordinated (UTC) is the international time basis which is determined by atomic clocks. The term GMT was first replaced by the politically more neutral designation UT (Universal Time). Since UT is based on meridian crossings of stars and, thus, follows the rotational variations of the earth, it is unsuitable in the second range for the worldwide coordination of precision devices (e.g. GPS). Therefore another system was introduced which contains leap seconds to smooth out these variations. This newer coordinated system got the extended designation UTC.

VGA

Video Graphics Array (VGA) refers to a computer graphics standard which defines certain combinations of resolution and bits per pixel (colour depth) and the refresh rate.

Copyright © Siemens AG Copyright 2009 All rights reserved

11 History

Table 11-1 History

Version	Date	Modifications
V1.0	27.04.2009	First issue

Copyright © Siemens AG Copyright 2009 All rights reserved