

SIMATIC

PCS 7 process control system Getting Started - Part 1 (V8.0 SP1 or higher with APL)

Getting Started

Preface	1
Requirements for Getting Started	2
PCS 7 in overview	3
Initial work for the project	4
Creating CFCs	5
Creating SFCs	6
Compiling, downloading and testing the charts	7
Configuring the operator station	8
Working in runtime	9
Performing additional tasks	10
Starting and adapting the example	11

Valid for PCS 7 as of V8.0 SP1

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Table of contents

1	Preface.....	9
2	Requirements for Getting Started.....	13
2.1	Hardware Requirements for Getting Started - Part 1.....	13
2.2	Software Requirements for Getting Started - Part 1.....	14
2.3	Required configuration for Getting Started - Part 1.....	15
3	PCS 7 in overview.....	17
3.1	Brief Overview of PCS 7.....	17
3.2	What Is Included in PCS 7?.....	18
3.3	What is SIMATIC Manager?.....	19
3.4	What is the Basic Structure of SIMATIC Manager?.....	20
3.5	What Do the Views Signify in SIMATIC Manager?.....	21
3.6	Procedure.....	22
3.6.1	How to Open SIMATIC Manager.....	22
4	Initial work for the project.....	23
4.1	Planning the project.....	23
4.1.1	The "color_gs" Project.....	23
4.1.2	Task list for Getting Started.....	24
4.1.3	System Configuration for the 'color_gs' Project.....	26
4.1.4	Overview of Configuration Tasks.....	27
4.2	Preparational settings for the network.....	28
4.2.1	Settings for the Network and Interfaces.....	28
4.2.2	Procedure.....	28
4.2.2.1	How to Make the Settings in the Configuration Console.....	28
4.3	Creating the project.....	30
4.3.1	Use of the "New Project" Wizard.....	30
4.3.2	Background Knowledge for the PCS 7 Wizard.....	30
4.3.3	Procedure.....	32
4.3.3.1	How to Create the "color_gs" Project.....	32
4.3.3.2	How to Close and Open the "color_gs" Project.....	37
4.3.3.3	How to Work in the Various Views.....	38
4.4	Configuring the stations.....	39
4.4.1	Configuration overview.....	39
4.4.2	Procedure.....	39
4.4.2.1	How to configure the AS.....	39
4.4.2.2	How to Rename the PC Station.....	42
4.4.2.3	How to configure the PC station of the OS.....	42
4.4.2.4	How to Make Settings in NetPro.....	44
4.4.2.5	How to configure and download the PC station of the OS.....	47

4.4.2.6	How to download the hardware configuration of the AS.....	47
4.5	Working in the PH.....	49
4.5.1	Settings in the Plant Hierarchy.....	49
4.5.2	How to Perform the Settings for the PH.....	49
4.5.3	Structure in the Plant View.....	51
4.5.4	How to Adapt the Default Names.....	51
4.5.5	How to Insert Additional Hierarchy Folders.....	54
4.5.6	How to Check the Assignment of AS/OS to the PH.....	55
4.6	The current status.....	56
4.6.1	The Current State of your Project.....	56
5	Creating CFCs.....	57
5.1	CFC Charts and the CFC Editor.....	57
5.2	Working with libraries.....	58
5.2.1	CFC Charts and the Master Data Library.....	58
5.2.2	How to Store Objects in the Master Data Library.....	58
5.2.3	Working with the Master Data Library.....	59
5.2.4	How to Open the Libraries.....	60
5.2.5	How to Store Blocks.....	61
5.2.6	How to Store Process Tag Types.....	63
5.2.7	Showing and Hiding Libraries.....	64
5.2.8	How to Hide and Show Libraries.....	64
5.3	CFCs in the PH.....	67
5.3.1	Working with CFC Charts.....	67
5.3.2	Which Charts do you Need in the "color_gs" Project?.....	67
5.3.3	Process-Related Meaning of the "CFC_SETP" CFC Chart.....	68
5.3.4	Process-Related Meaning of the "CFC_FC111" CFC Chart.....	68
5.3.5	Process-Related Meaning of the "CFC_LI111" CFC Chart.....	69
5.3.6	Process-Related Meaning of the "CFC_NP111" CFC Chart.....	69
5.3.7	Process-Related Meaning of the "CFC_NK11x" CFC Chart.....	70
5.3.8	Procedure.....	70
5.3.8.1	How to Rename CFC Charts in the PH.....	70
5.3.8.2	How to Insert New CFC Charts in the PH.....	71
5.3.8.3	How to insert the "Motor_Lean" process tag type.....	72
5.3.8.4	How to insert the "Valve_Lean" process tag type.....	73
5.4	The current status.....	74
5.4.1	Current Status of Your Project.....	74
5.5	Working with the CFC Editor.....	75
5.5.1	Introduction to the CFC Editor.....	75
5.5.2	CFC Chart in the CFC Editor.....	75
5.5.3	Catalog in the CFC Editor.....	76
5.5.4	Overview of the Configuration Steps for CFC Charts.....	77
5.5.5	How to Open the "CFC_SETP" CFC Chart.....	77
5.5.6	Assignment of Block Parameters in CFC Charts.....	78
5.5.7	How to Insert the Blocks into the "CFC_SETP".....	78
5.5.8	How to Assign Parameters for the Blocks in "CFC_SETP".....	79
5.5.9	How to Insert the Blocks into the "CFC_FC111".....	81
5.5.10	How to Assign Parameters for the Blocks in the "CFC_FC111".....	83
5.5.11	How to Insert the Blocks in the "CFC_LI111".....	86

5.5.12	How to Assign Parameters for the Blocks in the "CFC_LI111".....	87
5.5.13	How to assign parameters for the blocks in "CFC_NK11x".....	89
5.5.14	How to Assign Parameters for Blocks in the "CFC_NP111".....	90
5.5.15	How to select block icons.....	91
5.5.16	Interconnection of Blocks in the CFC Charts.....	91
5.5.17	How to interconnect the blocks in the "CFC_NP111".....	92
5.5.18	How to Interconnect Blocks in the "CFC_FC111".....	94
5.5.19	How to Interconnect Blocks in the "CFC_LI111".....	95
5.5.20	How to interconnect the blocks in the "CFC_NK11x".....	96
5.6	CFCs in the process object view.....	97
5.6.1	Use of the Process Object View for Valve Control.....	97
5.6.2	Procedure.....	97
5.6.2.1	How to Define Inputs/Outputs for the Process Object View.....	97
5.6.2.2	How to Adapt the Parameters for "CFC_NK11x".....	99
5.6.2.3	How to Delete Interconnections to Addresses.....	102
5.7	The current status.....	104
5.7.1	Current Status of Your Project.....	104
6	Creating SFCs.....	105
6.1	Overview of SFC Charts.....	105
6.2	Working with the SFC Editor.....	106
6.2.1	Introduction to the SFC Editor.....	106
6.2.2	Important Functions in the SFC Editor.....	106
6.2.3	Properties of Steps and Transitions.....	107
6.2.4	Overview of the Configuration Steps for SFC Charts.....	108
6.2.5	How to Move an SFC Chart.....	108
6.2.6	How to Rename the SFC Chart.....	109
6.2.7	How to Open the "SFC_RMT1" SFC Chart.....	110
6.2.8	Technological Structure of the Sequential Control System.....	110
6.2.9	How to Create the Sequential Control System in the SFC Chart.....	111
6.2.10	How to Rename Steps.....	113
6.2.11	How to Rename Transitions.....	115
6.3	Setting parameters.....	118
6.3.1	How to Assign Parameters to the Steps of the SFC Chart.....	118
6.3.2	Parameters for the Steps.....	121
6.3.3	How to Assign Parameters to the Transitions of the SFC Chart.....	123
6.3.4	Parameters for the Transitions.....	124
6.3.5	How to Optimize the Run Sequence.....	126
6.4	The current status.....	127
6.4.1	Current Status of Your Project.....	127
7	Compiling, downloading and testing the charts.....	129
7.1	Overview of Compiling, Downloading, and Testing.....	129
7.2	Procedure.....	130
7.2.1	How to Compile and Download CFC and SFC Charts.....	130
7.2.2	Testing the Program.....	133
7.2.3	How to Test the Program in the SFC Editor.....	134
7.2.4	How to Test the Program in the CFC Editor.....	135
7.3	The current status.....	137

7.3.1	Current Status of Your Project.....	137
8	Configuring the operator station.....	139
8.1	Introduction of the OS Project Editor.....	139
8.2	Operator Station in Process Mode.....	140
8.3	Configuration of the operator station.....	141
8.4	Working in the SIMATIC Manager.....	142
8.4.1	Preparations in SIMATIC Manager.....	142
8.4.2	Procedure.....	143
8.4.2.1	How to Edit Picture Properties.....	143
8.4.2.2	How to Delete Unnecessary Pictures.....	144
8.4.2.3	How to Create Block Icons.....	145
8.4.2.4	How to Compile the OS.....	147
8.4.2.5	How to Start the OS.....	150
8.5	Working on the OS.....	152
8.5.1	Structure of the OS - WinCC Explorer.....	152
8.5.2	Function of Process Pictures.....	152
8.5.3	Introduction of the OS Project Editor.....	152
8.5.4	How to set the OS activation for the ES.....	153
8.6	Working in general with the Graphics Designer.....	154
8.6.1	Introduction to the Graphics Designer.....	154
8.6.2	How to Open a Process Picture.....	154
8.6.3	How to Open the Various Toolbars.....	155
8.6.4	Objects in the Graphics Designer.....	157
8.6.5	What Are Static Objects?.....	157
8.6.6	What Are Text Fields?.....	157
8.6.7	How Does Tag Interconnection Work?.....	157
8.7	Creating the process picture.....	158
8.7.1	How to Insert Pipes and a Tank into the Process Picture.....	158
8.7.2	Labeling the Parts of the Plant.....	161
8.7.3	Step 1 - How to Insert a Text Field.....	161
8.7.4	Step 2 - How to Set the Text Field.....	162
8.7.5	Step 3 - How to Duplicate the Text Field.....	162
8.7.6	Current status of the process picture.....	164
8.7.7	How to Connect the Raw Material Tank with the Process Value.....	164
8.7.8	Step 3 - How to Add Explanatory Text.....	167
8.7.9	Step 4 - How to configure the setpoint default.....	168
8.7.10	How to Complete the Work.....	170
8.8	The current status.....	171
8.8.1	Current Status of Your Project.....	171
9	Working in runtime.....	173
9.1	Planning the user interface.....	173
9.1.1	Operator Station in Process Mode.....	173
9.1.2	User Interface in Process Mode.....	173
9.2	Operator control and monitoring in process mode.....	175
9.2.1	How to set the language in WinCC.....	175
9.2.2	How to Activate Process Mode.....	175

9.2.3	How to Start the Process.....	176
9.2.4	How to Stop the Process.....	179
9.2.5	How to Control the Process by Means of the Process Picture.....	179
9.2.6	How to Specify the Reactor.....	179
9.2.7	How to Open the Faceplates.....	180
9.2.8	How to Change the Setpoint.....	180
9.2.9	How to Work with Messages.....	184
9.2.10	How to Exit Process Mode.....	186
10	Performing additional tasks.....	187
10.1	Introduction to the Additional Task.....	187
10.2	How to Copy the Existing 'RMT1' Part of the Plant.....	188
10.3	Preparation for Process Mode.....	190
10.4	How to Compile and Download the Changes.....	191
10.5	How to Adapt the OS Configuration.....	198
10.6	How to Start Process Mode.....	199
11	Starting and adapting the example.....	201
11.1	Example project "color_gs".....	201
11.2	Procedure.....	202
11.2.1	How to Open the Example Project.....	202
11.2.2	How to Adapt the Hardware for the Example Project.....	202
11.2.3	How to Adapt the Blocks for the Example Project.....	203
11.2.4	How to adapt the project data for the example project.....	204
11.2.5	How to Compile and Download the Example Project.....	205
	Index.....	209

Preface

Purpose of this documentation

Getting Started - Part 1 (as of V8.0 with APL) gives you an initial overview of the PCS 7 process control system, enabling you to create a simple project yourself. You can configure the project on an existing SIMATIC PC station.

This Getting Started is aimed at newcomers to PCS 7 who work in the following areas:

- Configuration
- Commissioning and service

In the remainder of the documentation, we refer simply to *Getting Started - Part 1*.

Required basic knowledge

You should already have knowledge in the following areas:

- Microsoft operating system Windows XP, Windows Server 2003
- Functions and configurations of SIMATIC S7 (S7-400, STEP 7)
- Functions and configuration of SIMATIC NET (network components, transmission media)

Options for accessing PCS 7 documentation

Note

PCS 7 Readme

The information given in the *PCS 7 Readme* on the Internet takes precedence over all the PCS 7 manuals. Please read this *PCS 7 Readme* carefully; it contains important information and amendments on PCS 7.

- The *PCS 7 Readme* on the *Process Control System; SIMATIC PCS 7* DVD contains important information regarding PCS 7 and takes precedence over the PCS 7 documentation supplied.
 - After installation of PCS 7, you will find the document *Process Control System PCS 7; PCS 7 Readme* in the submenu **SIMATIC > Product information > <Language>**.
-

As of PCS 7 V8.0, you receive basic PCS 7 system documentation with the *Process Control System; SIMATIC PCS 7* DVD.

The PCS 7 Internet site www.siemens.de/pcs7-dokumentation (www.siemens.com/pcs7-documentation) provides convenient access to the complete PCS 7 documentation. You can find the following for the latest PCS 7 versions:

- In the section "Hardware manuals for SIMATIC PCS 7 ..."
 - The manuals for components approved for a PCS 7 version
- In the section "Software manuals for SIMATIC PCS 7 ..."
 - The complete system documentation
 - The separate setup program for PCS 7 documentation and the PCS 7 help system for download. After the installation of the setup program, you will find the documentation at the following locations on the Engineering Station:
 - As online help (CHM file) for the SIMATIC Manager application
 - As a PDF file in the Windows Start menu with the SIMATIC documentation
 - The complete documentation for PCS 7 as a *Manual Collection*.

Guide

Getting Started - Part 1 explains the individual steps required to create the "color_gs" project. You will find the most important background information required to understand the steps in this Getting Started as well as detailed instructions on how to work through them.

Additionally, we provide you with the completed "color_gs" project as an example project. This is installed along with the system documentation of PCS 7. You open this project on an existing engineering station (ES) in order to view the configuration data and compare the data with your own configuration data. You activate the project on an operator station (OS) in order to control and monitor the process.

Note

To test the example project in process mode, the hardware configuration of the project must correspond to your actual hardware configuration. If necessary, replace the hardware components of the example project with the actual hardware components present.

You can find additional information about opening and adapting the example project under "Starting and adapting the example".

Conventions

In this Getting Started, all the instructions are given using their full menu commands. You can also activate virtually all of the functions via the shortcut menu or by double-clicking.

Note

In this documentation, the versions of profiles, libraries and modules are always shown with Vxx.

Ensure you use a version appropriate for you software or hardware.

Example:

- Profile: PCS7_Vxx
 - PCS 7 AP Library Vxx
 - IE General: SW Vxx
-

Note

In this documentation, the names of elements in the software interface are specified in the language of this documentation. If you have installed a multi-language package for the operating system, some of the designations will be displayed in the base language of the operating system after a language switch and will, therefore, differ from the designations used in the documentation.

In PCS 7, you can use standard Windows functions in many situations:

- Multiple selection using the <CTRL> and <SHIFT> keys
- Column sorting in tables by clicking on the column header
- Use of "drag-and-drop" instead of "copy and paste".

The individual tutorials in Getting Started build on each other so that you will create your own complete PCS 7 project step-by-step. For this reason, please work through all the tutorials in the given sequence.

PCS 7 glossary

A PCS 7 glossary containing the definitions of important technical terms used in the documentation is available within the PCS 7 software via the Help menu in the SIMATIC Manager (menu command **Help > Topics > "Glossary"** button).

Additional information

You can find detailed background information and general context in the following documentation, which you can use for reference purposes:

- Configuration manual *SIMATIC; Process Control System PCS 7; Engineering System*
- Configuration manual *SIMATIC Process Control System PCS 7; Operator Station*

This documentation is available as online help or in PDF format.

- Online help
 - In the PCS 7 software in SIMATIC Manager via the menu command **Help > Topics**
- PDF file
 - In the Start menu, in the SIEMENS SIMATIC documentation folder, in the preferred language
 - On the "SIMATIC PCS 7" DVD in the _Manuals folder

If you wish to familiarize yourself with specific topics in greater depth, refer to the appropriate manuals, for example, for SFC and CFC.

Changes in comparison to the previous version

The documentation has been converted to the "Advanced Process Library", the standard library of PCS 7.

Requirements for Getting Started

2.1 Hardware Requirements for Getting Started - Part 1

Hardware Components

The list below shows the hardware components you need to work through Getting Started and that we have used in the Getting Started example. For some hardware components you must use a specific version because it is not possible to work through Getting Started with a different (e.g., older) version.

Hardware Component	Version Used in Getting Started	Other Version Possible
PG or PC with a standard network card	Intel® PRO/1000	Yes
Rack	UR2	Yes
Power supply	PS 407 10A	Yes
CPU	CPU 414-3 PN/DP, Firmware as of V 6.0	Yes *
Memory card		
Crossover cable		No
* When using a CPU without a PROFINET interface, you also need a CP 443 -1 for the connection to the engineering station over Industrial Ethernet.		

Use of Other Hardware Components

If you are using other hardware components, you must enter the components you are actually using in the relevant places, for example, in HW Config. For the sake of clarity, we recommend using exactly the same components as those we have used in Getting Started.

If you have different hardware, you can find additional information in the "ES Configuration Manual".

Using S7-PCLSIM

If you do not have any hardware components available, you can use the S7-PLCSIM software that is included on the SIMATIC PCS 7 DVD. You require a special license to use this software.

If you use this software, you can use exactly the same hardware components as described in Getting Started.

Note

Communication should be performed with S7-PCLSIM via ISO. This requires network settings to be made. Once the OS has been compiled, the ISO parameters must be entered in the WinCC Protocol Suite.

2.2 Software Requirements for Getting Started - Part 1

Software requirements

- You can find the requirements for the installation and operation of the PCS 7 software in the *PCS 7 Readme* file on the SIMATIC PCS 7 DVD.
- You can find information on the installation of the PCS 7 software in the operating manual *SIMATIC; Process Control System PCS 7; PC Configuration and Authorization*.

Note

Engineering system

PC stations with a pre-installed engineering system contain all the necessary software components. However, you must transfer the license keys to the PC station.

2.3 Required configuration for Getting Started - Part 1

If you have not purchased a bundle PC for use with the Getting Started, note the PC settings to be specifically made for PCS 7.

You can find information about this in the documentation, *SIMATIC; Process Control System PCS 7; PC Configuration and Authorization*.

PCS 7 in overview

3.1 Brief Overview of PCS 7

Description

PCS 7 is a process control system with many automatic functions to assist you during configuration. It enables you to create a project fast and conveniently. You will get to know some of these automatic functions in this Getting Started. At the same time, PCS 7 provides the advanced user many options for creating individual, project-specific solutions customized to the requirements at hand. These individual solutions are not part of this Getting Started - you can find additional information about these in the configuration manuals once you are familiar with the basic functionality.

What is a PCS 7 project?

Among other things, a PCS 7 project includes the following objects:

- Hardware Configuration
- Blocks
- CFC charts and SFC charts

These objects are always included - regardless of the number of operator stations, modules, and networking.

3.2 What Is Included in PCS 7?

PCS 7 Applications

You create the project on an engineering station (ES). Various applications are available on the ES. All applications provide you with a graphic user interface for simple operation and clear display of your configuration data. When you work through Getting Started, you will get to know the following applications:

- SIMATIC Manager is the central application and gateway to all other applications that you use to create a PCS 7 project. SIMATIC Manager is the starting point for creating your entire project.
- HW Config contains the configuration of the entire hardware of a system, for example, CPUs, power supply, communications processors.
- CFC editor and SFC editor are the editors you use for creating CFCs and sequential control systems.
- PCS 7 OS with various editors is the tool you use for configuring the OS

3.3 What is SIMATIC Manager?

SIMATIC Manager

SIMATIC Manager represents the central application within the PCS 7 system and is used to access all the other applications you need to configure your PCS 7 project.

The SIMATIC Manager and all other applications are "linked": This is why you also see all blocks you have inserted into an CFC chart with the CFC editor in the SIMATIC Manager, for example.

Another great advantage of this link becomes clear when configuring the operator station: You have convenient access to all the data you have created in the SIMATIC Manager and the applications it includes. For example, you can visualize a process tag from a CFC chart quickly and easily when configuring the OS.

Due to the central function of SIMATIC Manager within PCS 7, it is worth taking time to become familiar with its structure and functions.

3.4 What is the Basic Structure of SIMATIC Manager?

Structure of SIMATIC Manager

SIMATIC Manager has a split window similar to Windows Explorer:

- In the left-hand window you will see a tree structure which displays different content depending on the View (Page 21) selected.
- In the right pane, the detailed window, you can see details of the object you have selected in the tree structure.

3.5 What Do the Views Signify in SIMATIC Manager?

Meaning of the Views

SIMATIC Manager provides you with three different views. An important feature of these views is that the objects they contain exist only once in reality but can be displayed and edited in the various views.

The structural principle of the views is the same:

The left pane displays the tree structure and the right pane displays the detail view. Each view offers advantages for performing certain tasks:

- **Component view** – this view represents the physical memory location of the individual objects, for example, of the charts and blocks. In the Component view, you can see immediately which blocks and charts belong to which AS.
- **Plant view** – this view shows the exact hierarchical structure of your plant. You can divide the plant into units and see which charts and which process pictures belong to which unit.
- **Process object view** – this view shows details of the individual objects from the plant view. This is particularly suitable when you want to assign the same parameter values to a large number of objects or if you want to add the same comments or make the same interconnections for these objects.

In the step-by-step instructions in Getting Started, you are always told which view you should be working in.

All the work that you perform in SIMATIC Manager is saved automatically by PCS 7.

3.6 Procedure

3.6.1 How to Open SIMATIC Manager

Procedure

You can start SIMATIC Manager in two ways:

Option	Procedure
1	Double-click the STEP 7 icon on your desktop. 
2	In the Start menu under the SIEMENS SIMATIC products, select the menu command SIMATIC Manager .

When you start SIMATIC Manager, the project you had open last will open automatically.

Initial work for the project

4.1 Planning the project

4.1.1 The "color_gs" Project

Introduction

Following a brief overview of PCS 7 (Page 17), you begin with creating the "color_gs" project. Detailed step-by-step instructions are provided to assist you. To facilitate your understanding of the step-by-step instructions, some additional theoretical knowledge is necessary. Therefore, we will provide you with the most important background information for each topic.

Plant description

We will only configure a small part of the entire plant for fully automatic dye production since configuring the entire plant would be beyond the scope of this Getting Started project. However, you should understand how this small part is integrated in the overall plant in order to better understand the total context. The following is a summary of the individual phases of the production process:

Phase I - Raw Materials

The liquid raw materials for the product are stored in two raw material tanks and are pumped from these tanks to the reactors.

The solid raw materials are stored in three silos. Screw conveyors are used to measure out the solid raw materials from the silos to a weigh hopper for weighing. Another screw conveyor and a blower are used to blow the raw materials into one of the two mixing tanks in the correct mixing ratio.

Phase II – Production

The required quantities of liquid material are fed from the two raw material tanks to Reactor 1 or Reactor 2 by means of valves. The solid materials from the mixing containers are transported via screw conveyors to the reactors where they are blended using an agitator. The product is produced in the reactors by agitating, heating and cooling the raw materials together with the additives. Valves and actuators control the temperature in the reactors. When necessary, water from a filtration plant can be introduced into the reactors using a flow controller.

Phase III - Holding Phase

The product is pumped to a holding tank for postprocessing. Here, it is stirred slowly and kept at a constant temperature.

Phase IV – Filling

After the holding phase, the product is temporarily stored in a filling tank. From there, it is filled into bulk-tank trucks or small packing drums.

Phase V – Cleaning

The reactors, piping, valves, actuators, holding tank, and filling tank can be cleaned by a cleaning-in-place (CIP) system. The resulting wastewater is collected in a separate effluent tank and disposed of.

4.1.2 Task list for Getting Started

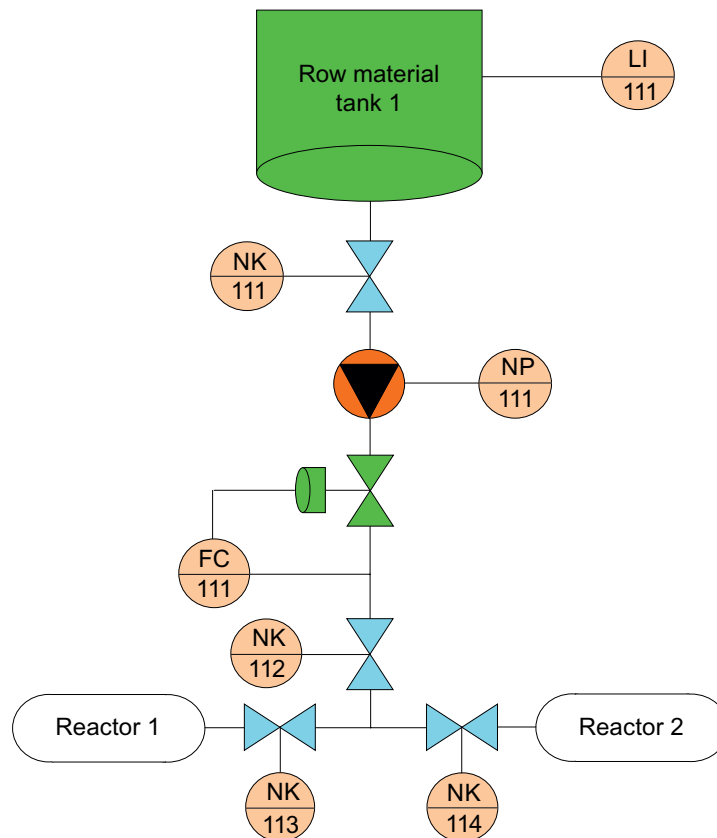
Specific Configuration Task

You will now configure part of "Phase I – Raw Materials":

Specifically, you will configure the storage of the liquid raw materials in two raw material tanks and the pump control used to pump these raw materials to the two reactors.

Piping and Instrumentation Diagram (P&ID)

The piping and instrumentation diagram illustrates the precise sequence of the configuration task and shows you all of the associated relevant process tags:



Explanation of the piping and instrumentation flow diagram

The terms used have the following meanings:

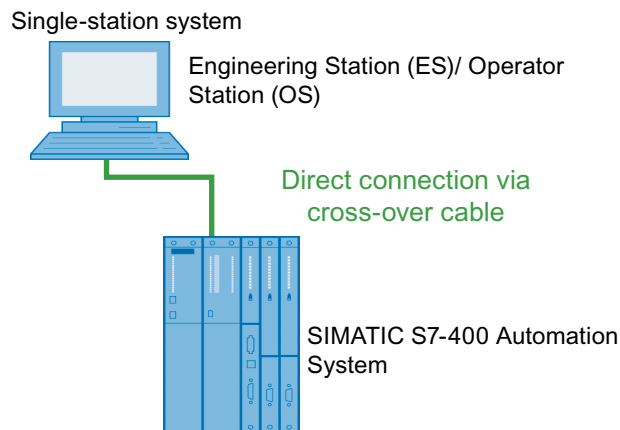
- LI111 (level indicator) - measurement of the current fill level of the raw material tank
- NK111 and NK112 (customer-specific identifier for valves) - shut-off valves which must always be opened for dosing raw materials
- NP111 (customer-specific identifier for motors) - pump that transports the raw material to the reactors
- NK113 or NK114 (customer-specific identifier for valves) - valves of which only one may be open at a given time in order to transport the raw material to either reactor 1 or reactor 2
- FC111 (flow control) - actuator which regulates quantities for the raw material

The states of the valves NK111 to NK114 can be displayed and monitored on the operator station. You also have the possibility to influence the dosing via FC111.

4.1.3 System Configuration for the 'color_gs' Project

Structure

The "color_gs" project will be implemented on a minimum system consisting of a single automation system and a combined engineering station and operator station. The operator station is designed as a single station system. The following figure illustrates the system configuration.



Description

In Getting Started, you will build a control system containing the following components:

- Automation system (AS)
The individual components are described in the section "Requirements for performing the Getting Started".
- Program, which controls the "color_gs" plant.
You create this program in the ES and download it to the CPU. The CPU executes the loaded program and shows process values to you.
- Operator station (OS) on which the plant operator controls and monitors the plant during runtime. You create the process picture seen by the plant operator on the OS yourself.

Note

Note that the plant configuration and hardware settings that result from it need to be especially adapted to the requirements of this Getting Started.

When configuring a real project, you will surely use more automation systems and also operate the engineering station and operator station(s) on several computers. The hardware settings will then be more complex, in any case, and will no longer correspond to the descriptions in the Getting Started.

4.1.4 Overview of Configuration Tasks

Configuration Sequence

You configure the system components in the following configuration steps:

- Setting the Parameters for the Network (Page 28)
- Creating the Project (Page 30)
- Configuring the Stations (Page 39)
- Working in the Plant Hierarchy (Page 49)
- Creating CFC Charts (Page 57)
- Creating SFC Charts (Page 105)
- Compiling, Downloading, and Testing Charts (Page 129)
- Configuring operator stations (Page 141)
- Creating the Process Pictures (Page 154)
- Working in Process Mode (Page 173)
- Performing the Additional Task (Page 187)

4.2 Preparational settings for the network

4.2.1 Settings for the Network and Interfaces

Settings

Before starting to configure the "color_gs" project, make the following settings:

- Network adapter settings on the configuration console (Page 28)
PCS 7 automatically identifies the network adapters installed on your computer during startup of the station. You can use this information to program the interfaces on the configuration console.

Note

These settings are usually made immediately after PCS 7 is installed. If you did not install PCS 7 yourself, you should check the settings again and make any necessary modifications.

- Selecting the network adapter
Select the network adapter the PC station requires to communicate with the PC station in this dialog.

4.2.2 Procedure

4.2.2.1 How to Make the Settings in the Configuration Console

Requirements

- All the necessary hardware components must be inserted on the rack and switched on.
- The crossover cable must be connected between the 3Com network adapter of your ES computer and the Ethernet connection of the CPU.

Procedure

1. In the Start menu under **Siemens Automation > SIMATIC > SIMATIC NET**, select the menu command "Set PC Station" ("Communication settings" for 64-bit operating systems). The configuration console opens.
2. Open the "Modules" folder in the tree view.
3. Select the network adapter by which communication between the automation system and the OS takes place.

4. Double-click the "General" entry in the detail view.
The detail view for "General" opens.
5. In the detail view, select the "Configured mode" entry from the "Module operating mode" drop-down list.
6. Click "Apply".
This button is only active if you have made changes. Your settings are now saved. The network adapter is now activated.
7. Open the "Access points" folder in the tree view.
8. Double-click the "S7ONLINE" access point in the detail view.
The detail view for "Access point" opens.
9. In the "Assigned Interface Configuration" drop-down list, select the entry "PC internal.local.1" and save your settings by clicking "OK".
10. Specify "PG mode" as the module operating mode for all other network adapters.
11. Close the configuration console.

4.3 Creating the project

4.3.1 Use of the "New Project" Wizard

PCS 7 "New Project" Wizard

The PCS 7 "New Project" wizard is started automatically by means of default setting when you open SIMATIC Manager. You can enable or disable this option in the PCS 7 "New Project" wizard.

The "New Project" wizard supports you step-by-step in creating a new project and offers default settings. The PCS 7 wizard automatically creates various objects according to the default settings or the specific settings that you make.

Objects for "color_gs"

For the "color_gs" project, the following objects are important:

- Hardware objects: SIMATIC stations, for example a SIMATIC 400 station for the AS, a SIMATIC PC station for the OS
- Hierarchy folders representing the hierarchy levels of the plant structure. The number of hierarchy folders created corresponds to the setting you input in the PCS 7 wizard.
- A CFC chart
- An SFC chart
- One picture per plant hierarchy folder
- A master data library

4.3.2 Background Knowledge for the PCS 7 Wizard

What happens in the background when a new project is created?

The next two sections provide you with some theoretical background knowledge for the PCS 7 "New Project" wizard. They introduce two objects that are of great importance for working with PCS 7:

- Multiproject
- Master data library

How does a multiproject function?

When you create a new project with the PCS 7 wizard, a so-called multiproject is created automatically. A multiproject consists of a number of single projects.

In the context of the example project, the multiproject is structured as follows: The multiproject represents the entire plant and all of the single projects within this multiproject based on the

individual phases of the process for producing paint. Since you are configuring only one phase of the overall plant in this Getting Started, your multiproject only contains one single project in this case.

Multiprojects have one major advantage: You can distribute the single projects to different configuration engineers who can then edit them. Once the configuration of the single projects is completed, these can be merged to form a complete project.

In Getting Started, although you will be working within a multiproject, you will not be using the wide range of functions provided by this multiproject engineering.

Detailed information is available in the *Process Control System PCS 7; Engineering System Manual*.

What is a master data library?

When you create a new project with the PCS 7 wizard, a master data library is created automatically. You store all the blocks required for the entire project in this library. Before you create a CFC, for example, you first store all the standard blocks you will insert in this CFC in your master data library.

A master data library provides the following advantage:

- When you archive a project, the master data library is automatically archived along with it.
- You can also adapt the blocks and use copies (instances) of these adapted blocks repeatedly in the project.

In the context of a "multiproject", the master data library is particularly important because it allows you to provide all the project engineers involved with blocks of a defined version so that you can be sure that only this version is used in the project.

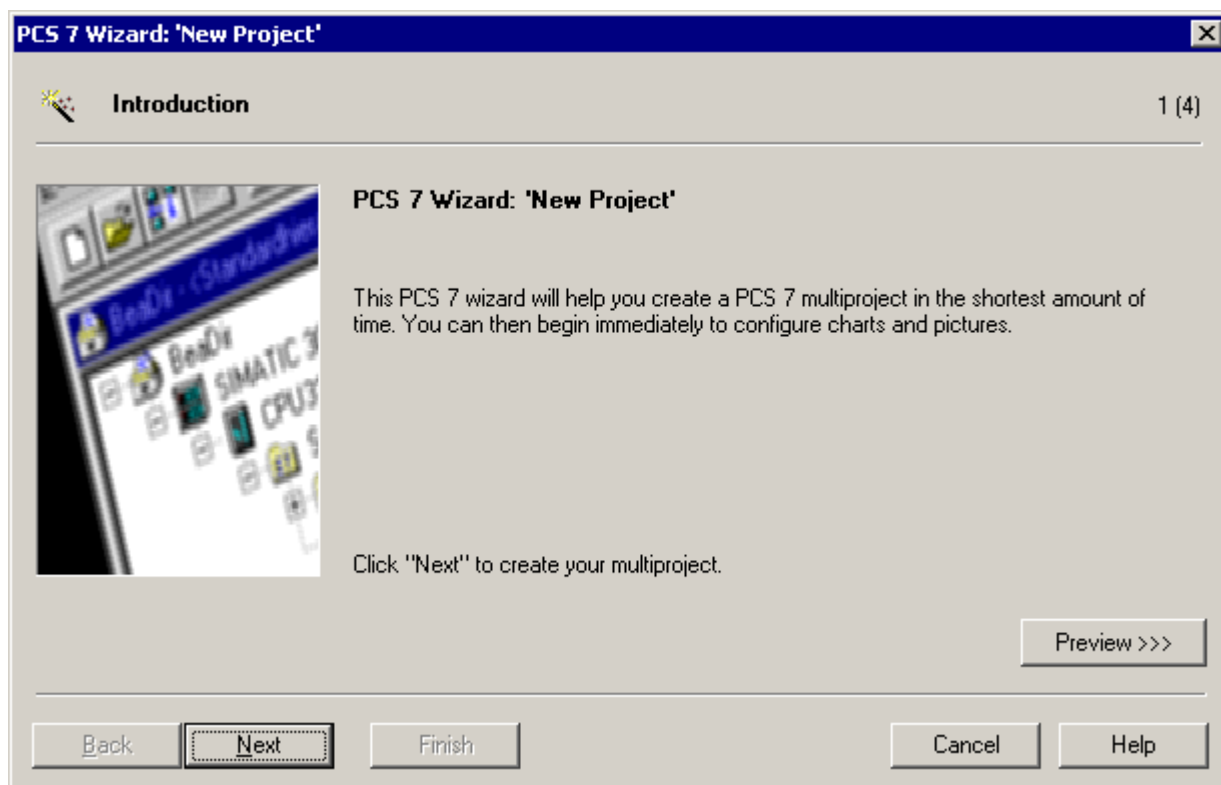
4.3.3 Procedure

4.3.3.1 How to Create the "color_gs" Project

Procedure

The PCS 7 wizard assists you in creating the "color_gs" project:

1. Open SIMATIC Manager.
2. Select the menu command **File > 'New Project' Wizard....**
The "New Project" wizard of PCS 7 opens.



3. Click "Next".

4. In step 2(4) "Which CPU are you using in your project?", select the CPU bundle that you are using in your project.
Detailed information about the selected CPU bundle is displayed beneath the list.

PCS 7 Wizard: 'New Project' 2 (4)

Which CPU are you using in your project?

CPU: AS414-3IE Find Bundles: V1.9

Bundle:	Description
6ES7654-1D10-3BD* E-STAND:5	AS414-3PN V6.0; AC10A; UR2; DP module, optional CP443-5DX05
6ES7654-1D10-3GD* E-STAND:5	AS414-3PN V6.0; DC10A; UR2; DP module, optional CP443-5DX05
6ES7654-1D10-3BC* E-STAND:5	AS414-3PN V6.0; AC10A; UR2; DP module
6ES7654-1D10-3GC* E-STAND:5	AS414-3PN V6.0; DC10A; UR2; DP module

Number of communication modules: 0 CP 443-5 V6.4 Preview >>>

Back Next Finish Cancel Help

5. Click "Next".

4.3 Creating the project

6. Make the following settings in Step 3(4) "Which objects are you still using?":
 - Select item "4" from the "Number of levels" drop-down list.
 - Under "AS objects", check that the "CFC" and "SFC" check boxes are activated.
 - Activate the "PCS 7 OS" check box under "OS objects". The "single-station system" option is automatically selected.

The screenshot shows the 'PCS 7 Wizard: 'New Project'' dialog box, specifically Step 3(4) titled 'Which objects are you still using?'. The dialog is divided into several sections:

- Plant hierarchy :** Contains a 'Number of levels:' label and a drop-down menu currently set to '4'.
- AS objects :** Contains two checked checkboxes: 'CFC chart' and 'SFC chart'.
- OS objects :** Contains four checkboxes: 'PCS7 OS' (checked), 'SIMATIC BATCH' (unchecked), 'Route Control' (unchecked), and 'OpenPCS 7' (unchecked).
- System type:** A group box containing three radio buttons: 'Single station system' (selected), 'Multiple station system' (unchecked), and 'Multiple station system redundant' (unchecked).
- Buttons:** At the bottom, there are 'Back', 'Next', 'Finish', 'Preview >>>', 'Cancel', and 'Help' buttons.

7. Click "Next".
8. In Step 4(4), enter the name "color_gs_Prj" in the "Directory name" input box and accept the specified storage location.

9. Click "Preview >>>" to see a preview of your current configuration status.
This preview corresponds to the appearance of the project in SIMATIC Manager.

PCS 7 Wizard: 'New Project'

Where do you want to store the multiproject? 4 (4)

Directory name: The following objects will be created:

Multiproject: color_gs_Prj_MP
Project: color_gs_Prj_Prj
Master data library: color_gs_Prj_LIB

Storage location (path):

Available directories and files:

- color_gs
- projID.pro
- S7Pro_1
- S7Pro_2
- S7Test1

color_gs_Prj_Prj (Plant View)

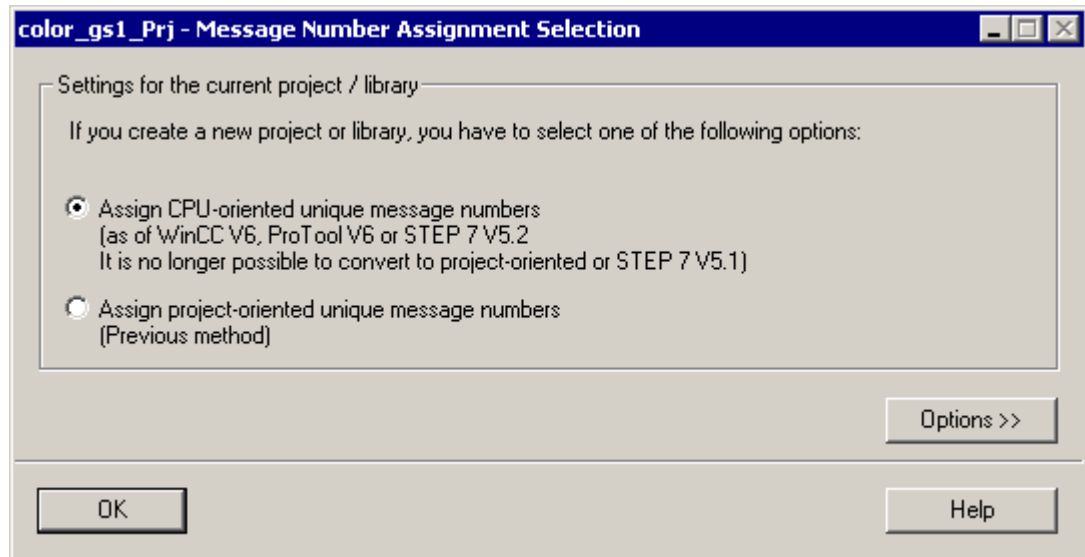
Object name	AS assignment	OS assignment
CFC(1)	A5417-4\S7...	
SFC(1)	A5417-4\S7...	

color_gs_Prj_Prj (Component View)

Object name	PH assignment	Type
SFC(1)	Plant(1)\Uni...	SFC
CFC(1)	Plant(1)\Uni...	CFC

10. Click "Finish".

The "Message Number Assignment Selection" dialog box opens for creating the project, with the "Assign CPU-oriented unique message numbers" option button activated.



11. Click "OK" to apply the setting.

The project is completed using these settings.

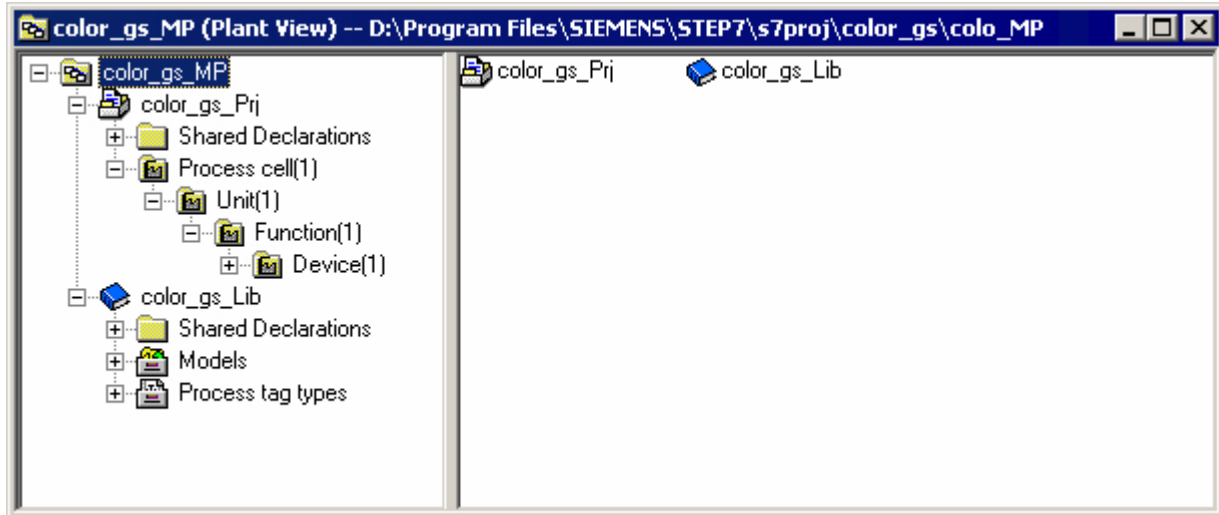
Note

Please note the following:

- If the project does not open automatically, follow the instructions provided in the section "How to close and open the "color_gs" project (Page 37)".
 - To activate different views, follow the instructions provided in the section "How to work with the various views (Page 38)".
-

Result

The project appears now in the plant view of the SIMATIC Manager as follows:



4.3.3.2 How to Close and Open the "color_gs" Project

Procedure for Closing a Project

1. If you have other projects open in SIMATIC Manager, close these projects for the sake of clarity.
2. Select the menu command **Window > [Name of project]** and select the project that you want to close.
SIMATIC Manager displays the project in the foreground.
3. Select the menu command **File > Close**. The project is closed.

Procedure for Opening a Project

1. Open SIMATIC Manager.
2. If your project "color_gs" does not open automatically, select the menu command **File > Open**.
The "Open Project" dialog box opens with the "User projects" tab activated.
3. Change to the "Multiprojects" tab and select the entry "color_gs_MP".
4. Click "OK".
The project with the associated master data library opens.

4.3.3.3 How to Work in the Various Views

Introduction

Once you have opened your project in SIMATIC Manager, you can display the project in various views and switch between these views.

Procedure

Select the **View > [Name of the desired view]** command in SIMATIC Manager:

- Component view
- Plant view
- Process object view

or

Select the **Window > [Name of the project (name of the view)]** command if you already opened several projects.

4.4 Configuring the stations

4.4.1 Configuration overview

Overview

Configure the control system components which the PCS 7 "New Project" wizard has automatically inserted. This includes components such as the AS, the OS, and the associated connections.

For this purpose you must perform the following configuration steps:

Step	What?
1	Configure AS (Page 39)
2	Rename PC station (Page 42)
3	Configure OS (Page 42)
4	Set connection in NetPro (Page 44)
5	Download hardware configuration (Page 47)

Local PC station

With PCS 7, you can configure the computer on which you perform the ES configuration as a local PC station. This allows you to conveniently test the functions of external operator stations using the menu command **Start OS Simulation**, without having to download the data to the real OS. Compiling the OS is enough.

The plant configuration for this Getting Started is a single station system; the ES and OS are on one computer. In this way, the local PC station you configure represents the ES and the OS at the same time. You configure a local PC station in a multiple station project in the same way.

4.4.2 Procedure

4.4.2.1 How to configure the AS

Requirements

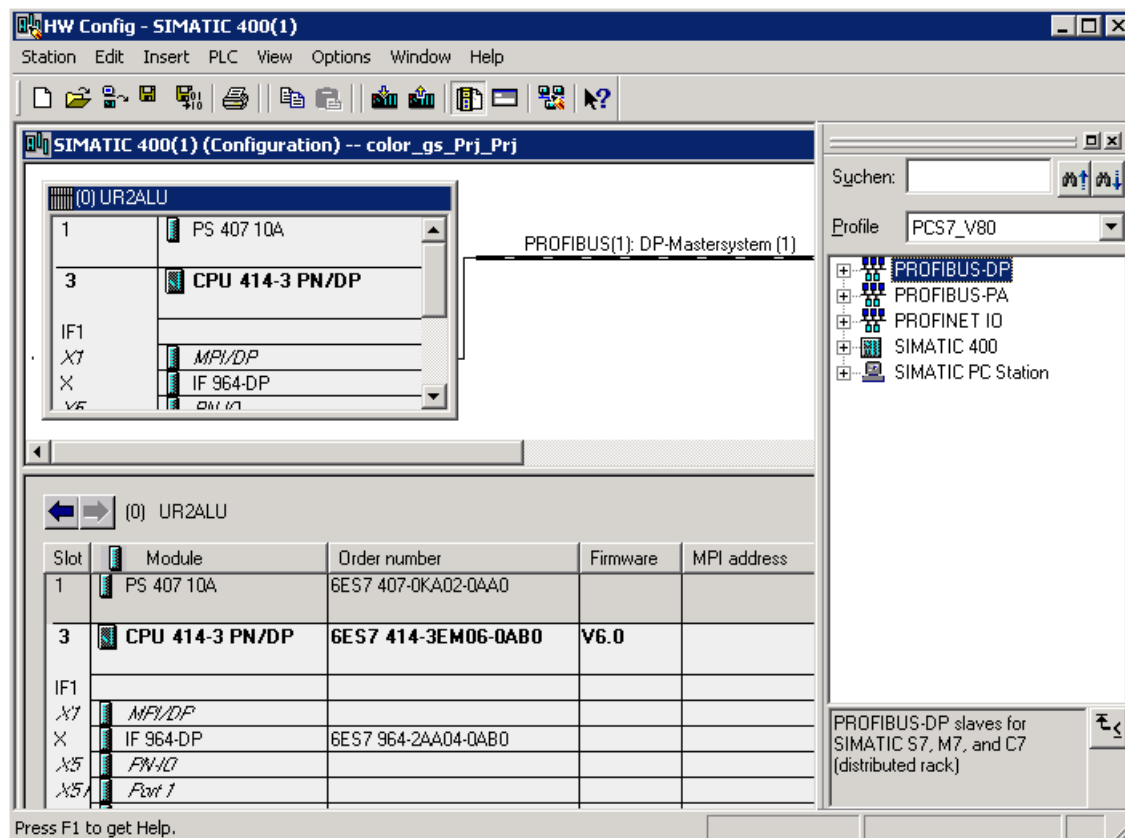
- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\SIMATIC 400(1)" folder in the tree view.
2. Select the "Hardware" object in the detail view, followed by the menu command **Edit > Open Object**.
HW Config opens and the hardware structure of your plant is displayed.

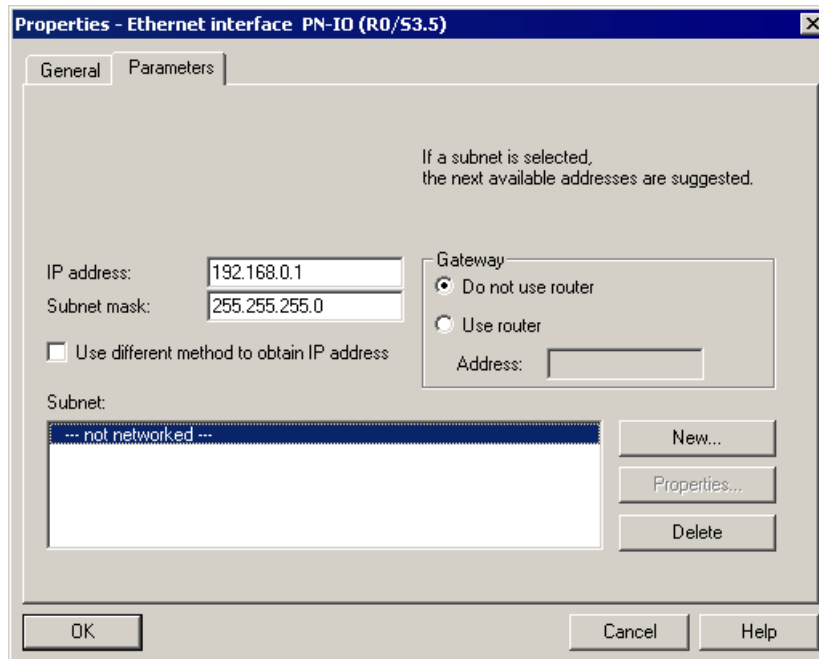
Note

Select the View > Catalog menu command if the hardware catalog is not displayed.
The hardware catalog opens and the "PCS7_Vxx" profile is enabled.

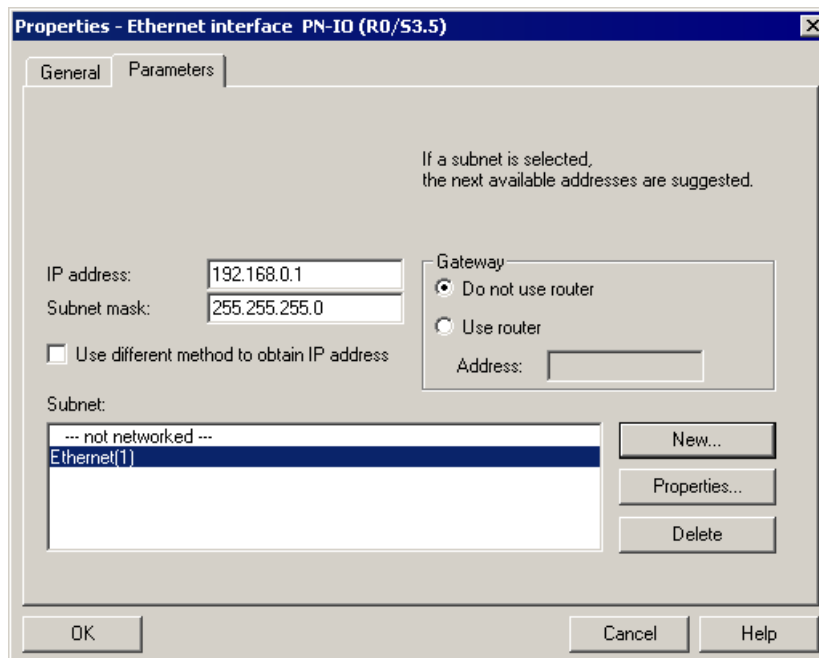


3. Select the X5 slot (PN/IO module) and then select the menu command **Edit > Object Properties**.
The "Properties - PN-IO(R0/S3.5)" dialog box opens.
4. Select the "General" tab.
5. Click "Properties" in the "Interface" group.
The "Properties - Ethernet Interface PN-IO(R0/S3.5)" dialog box opens.
6. Enter an available IP address within the address range of your computer in the "IP address" input box.

7. Enter the correct subnet mask of your computer in the "Subnet mask" input box.



8. Click "New..." to create a new network connection.
The CPU uses this network connection to communicate with the ES.
The "Properties - New Industrial Ethernet Subnet" dialog box opens.
9. Click "OK" to apply all the default settings.
The "Ethernet(1)" entry is entered in the "Subnet" list and is already selected.



10. Click "OK".
Your settings are applied and the dialog box closes.

4.4 Configuring the stations

11. Click "OK".
Your settings are applied and the dialog box closes.
12. Select the menu command **Station > Save and Compile**.
13. Close HW Config.

4.4.2.2 How to Rename the PC Station

Requirements

- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\SIMATIC PC Station(1)" object in the tree view.
2. Select the menu command **Edit > Object Properties**.
3. In the "Name" input box, enter the name of the local computer as it appears in the network.
You can find this name in the "Station" box of the Station Configuration Editor started from the taskbar.
4. Activate the "Computer name identical to PC station name" check box in the "Computer name" area.
The computer name is automatically entered in the lower field.
5. Click "OK".
Your settings are applied and the dialog box closes.
The component view identifies the PC station symbol with a yellow arrow.

Note

If the PC station is not labeled with a yellow arrow, refresh the screen display by pressing the <F5> key.

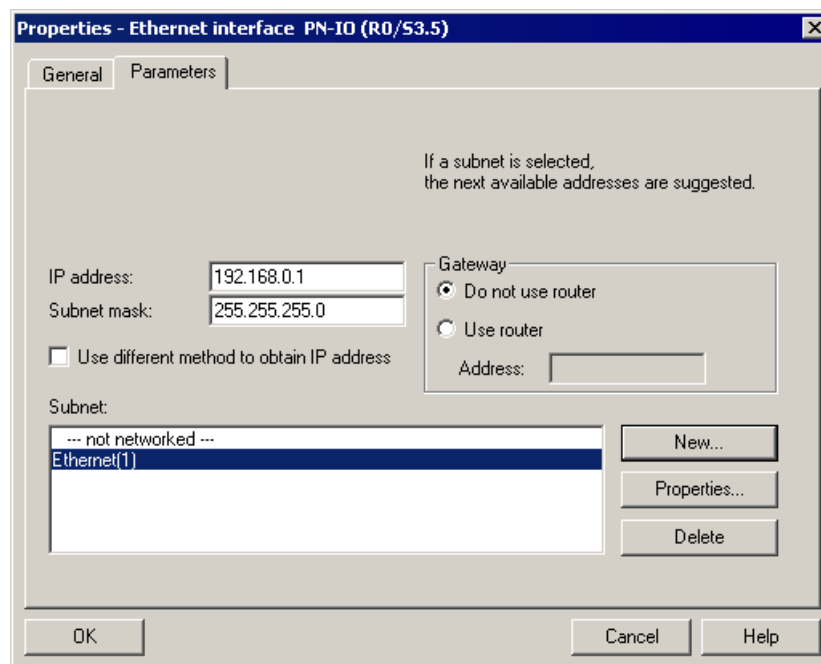
4.4.2.3 How to configure the PC station of the OS

Requirements

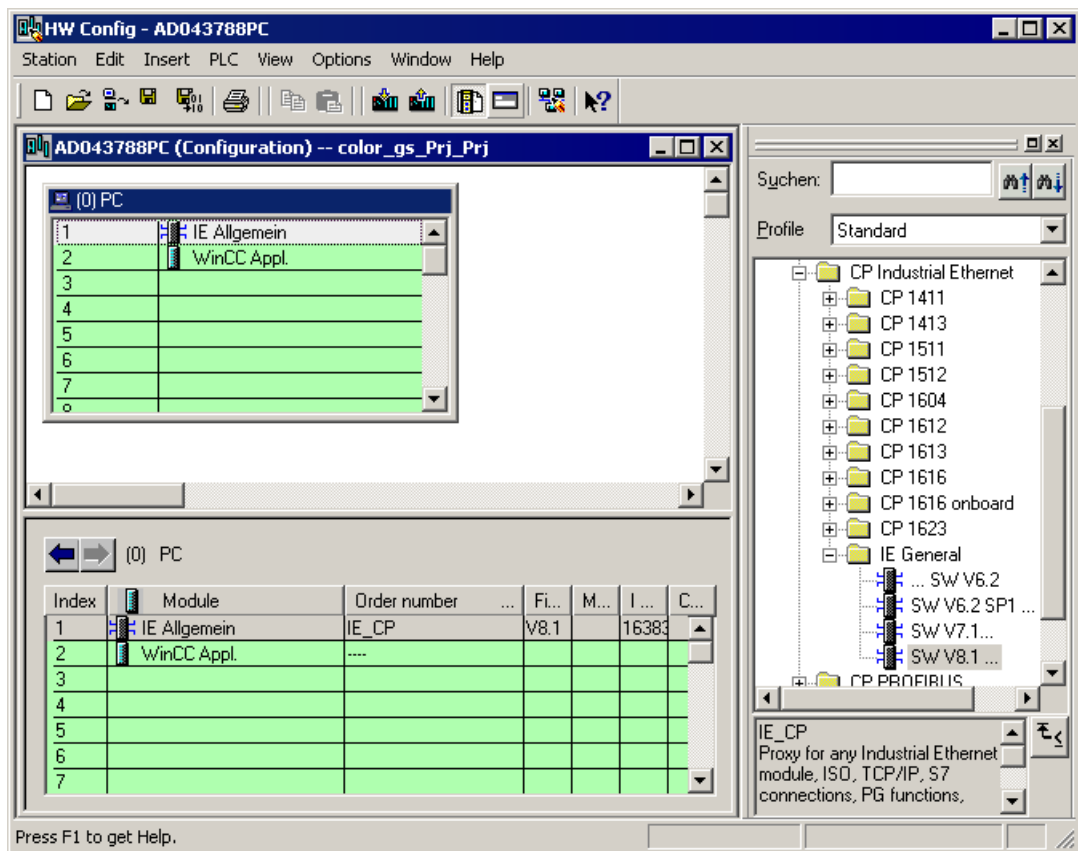
- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\[name of the PC station]" folder in the tree view.
2. Select the "Configuration" object in the detail view, followed by the menu command **Edit > Open Object**.
HW Config opens and the components of the OS are displayed.
HW Config opens with the settings you made when configuring the AS:
 - The hardware catalog is open.
 - The "PCS7_Vxx" profile is active.
3. Select the following CP from the hardware catalog: "SIMATIC PC Station\CP Industrial Ethernet\IE General\SW Vxx..." and move it to slot 1 using drag-and-drop.
The "Properties - IE interface General (R0/S1)" dialog box opens.
4. Select the "IP address is being used" check box.
5. Enter the address of your computer in the "IP address" input box.
6. Clear the "Set MAC address/use ISO protocol" check box.
7. Select the entry "Ethernet(1)" from the "Subnet" list.
This is the connection that you have already configured for the CP.



8. Click "OK" to apply your settings.
The dialog box closes and you are returned to HW Config.



9. Select the menu command **Station > Save and Compile**.
10. Close HW Config.

4.4.2.4 How to Make Settings in NetPro

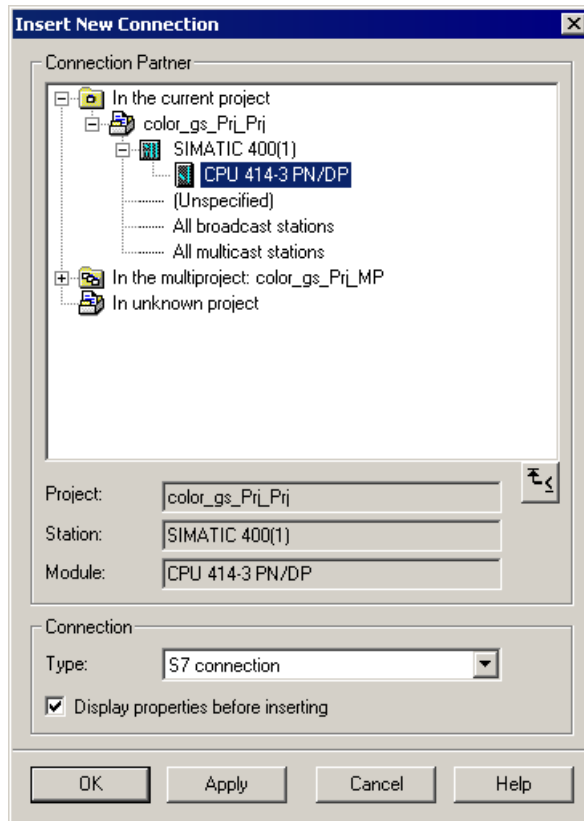
Requirements

- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

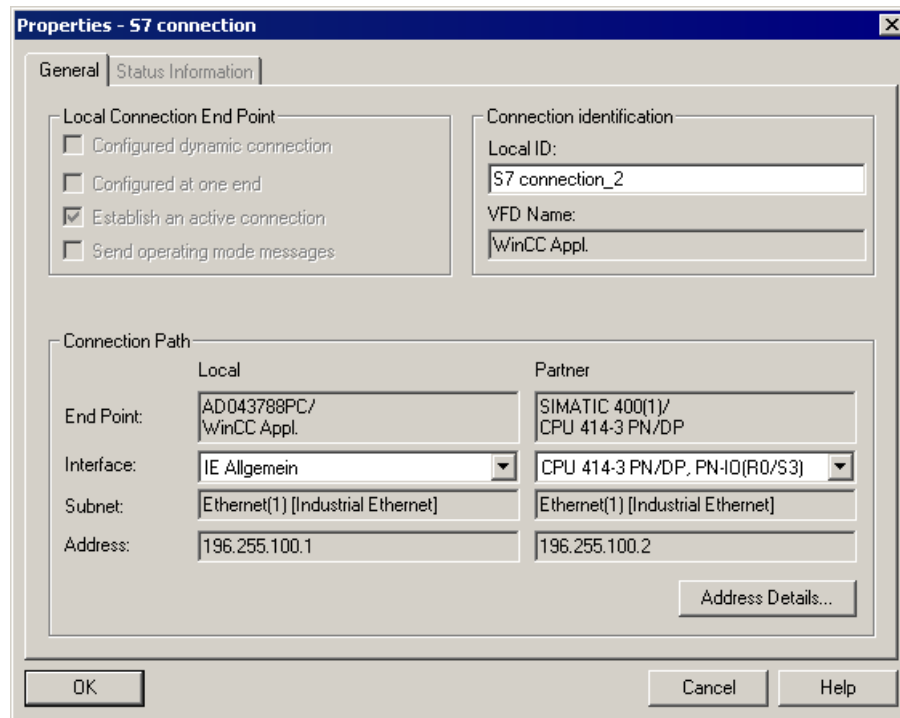
1. Select the "color_gs_MP\color_gs_Prj\[name of the local computer]\WinCC Appl." object in the tree view.
2. Select the "Connections" entry in the detail view, followed by the menu command **Edit > Open Object**.
NetPro opens.
3. Select the "WinCC Appl." object for the SIMATIC PC station.
Enter the required connection in the blank list shown in the detail view at the bottom.

4. Select the first line in the detail view at the bottom, followed by the menu command **Insert > New Connection....**
The "Insert New Connection" dialog box opens.
5. Select the CPU of your project in the tree view.
This CPU is the communication partner of the OS, which means that the OS receives the data of this automation system.
6. In the "Connection" group, check that "S7 connection" is set as the type and that the "Display properties before inserting" check box is selected.



7. Click "OK".
The "Properties - S7 connection" dialog box opens with the "General" tab activated.

8. Select the following connection partners for the connection between the CPU and OS:
 - Local: Interface "[Network adapter of the OS]", e.g., IE General
 - Partner: Interface "[CP of the AS]", e.g., CP 443-1



9. Click "OK".

The new connection is shown in the list. This connection is also displayed if you select the CPU for the AS.
10. Select the menu command **Network > Save and Compile....**

The "Save and Compile" dialog box opens.
11. Activate the "Compile and check everything" option button and click "OK".

When the compilation operation is completed, the "Outputs for consistency check" window opens.
12. If the compilation was executed without errors, close the window. If any errors are displayed, correct them based on the information in the error messages and repeat the compilation operation.
13. Close NetPro.

4.4.2.5 How to configure and download the PC station of the OS

Procedure

1. Switch to SIMATIC Manager. Select the PC station and select the menu command **PLC > Configure....**
The "Configure" dialog box opens.
2. Click "Configure".
The dialog box "Configure: <Selected Station>" dialog box opens.
3. To perform and complete remote configuration, follow the instructions in the online help of the "Configure: <Selected Station>" dialog box.
4. Click "OK" and acknowledge the subsequent information window that opens with "OK".
The configuration data are transferred to the PC station.
5. When the "Transfer successfully completed" message appears, click "Close" on the configuration screen. You must still download the network settings to this PC station in order to activate the network connections.
6. Select the PC station, followed by the menu command **PLC > Download**.
The "Delete system data completely from the automation system and replace with offline system data. Are you sure?" message dialog opens.
7. Click "Yes".
The "Stop Target Modules" message dialog opens.
8. Click "OK".
The download finishes.

4.4.2.6 How to download the hardware configuration of the AS

Introduction

After you have configured and set the hardware, you must also make this information known to the CPU. Download the hardware configuration to the CPU.

Requirements

- The CPU is in "STOP" mode.
- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\SIMATIC 400(1)" folder in the tree view.
2. Select the menu command **PLC > Compile and Download Objects..**
The "Compile and Download Objects" dialog box opens.

4.4 Configuring the stations

3. Select the check boxes in the "Compile" and "Download" columns of the "color_gs\SIMATIC 400(1)\Hardware" object.
4. Click "Start".
The message "Downloading program changes during operation can, in the case of malfunctions or program errors, cause serious damage to personnel and equipment! Make sure..." opens.
5. Click "OK".
The compile and download operation starts. The log file is opened in the text editor when the function is completed.
6. Close the text editor.
7. Click "Close" in the "Compile and Download Objects" dialog box.
The dialog box closes.
8. Start the CPU.

4.5 Working in the PH

4.5.1 Settings in the Plant Hierarchy

Plant hierarchy

Once again, it is time for a little theory:

The plant hierarchy (PH) maps the hierarchical structure of your plant exactly, for example, the plant, unit or function. The PH provides you with a variety of possible settings, the most important of which are described here:

- **Number of hierarchy levels:**
The nesting depth of these levels is determined by the plant structure. Rule: the more complex the plant structure the higher the number of hierarchy levels you require to reflect your plant structure. With the PCS 7 wizard, hierarchy folders with default names are created according to your specification.
- **Determination of the hierarchy level(s) which influence the name of plant ID (HID):**
The PCS 7 project contains many instances of the HID: Messages generated in the active process and tag names contain this HID in order to allow operators to quickly recognize a specific plant unit associated with a message or tag. Rule: the more hierarchy levels you define and the longer each individual HID part is, the longer and less recognizable the entire HID becomes.
- **Deriving the picture hierarchy from the PH:**
The process pictures are grouped in a specific hierarchy: This allows you to change from an overview picture to a lower level picture in process mode. The subordinate pictures represent a portion of the overview picture that is accurate in every detail. The hierarchy of the process pictures corresponds to how the process pictures are stored in the plant hierarchy.

4.5.2 How to Perform the Settings for the PH

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj" hierarchy level in the tree view.
2. Select the menu command **Options > Plant Hierarchy > Settings....**
The "Customize Plant Hierarchy" dialog box opens for you to set the plant hierarchy options.
3. Enter the value "4" in the "Number of hierarchy levels" field.
This setting allows up to four hierarchy levels to be defined.

4.5 Working in the PH

4. Enter the value "10" in the "Max. number of characters" input boxes for all four hierarchy levels.
This setting limits the length of the HID string to 10 characters per hierarchy level.
5. Select the "Included in HID" check box for levels 1 to 4.
6. Activate the "OS area" option button for level 2.
7. Activate the "Derive picture hierarchy from the plant hierarchy" check box.
The dialog box now appears as follows:

Level	Max. number of characters	Included in HID	With separator	OS area
1:	10	☒	☒	☐
2:	10	☒	☒	☒
3:	10	☒	☒	☐
4:	10	☒	☒	☐
5:	24	☐	☒	☐
6:	24	☐	☒	☐
7:	24	☐	☒	☐
8:	24	☐	☒	☐

Preview: 1111111111\2222222222\3333333333\4444444444\

☒ Derive picture hierarchy from the plant hierarchy
☐ Derive diagnostic screens from the plant hierarchy

☒ Maintenance Station Standard (license required)
☐ Maintenance Station Basic (overview screens only)
☐ Maintenance Station PDM (no AS diagnostics)

☒ Derive PH names from the names of the hardware components
☐ Derive PH names from the comments of the hardware components

Migrate diagnostic settings ...

OK Cancel Help

8. Click "OK" to apply your settings.
The "You have changed the "Included in HID" property. Do you want the changes to be applied to the already existing hierarchy folders?" message dialog is displayed.
9. Click "Yes".
This accepts all the settings.

4.5.3 Structure in the Plant View

Plant hierarchy of the example project

You already specified four hierarchy levels with the PCS 7 "Create new project" wizard. As a result, you will find the following hierarchy folders in the tree view of your project:

- Plant - level 1
- Unit - level 2
- Function - level 3
- Device - level 4

The names of the hierarchy folders are default names assigned automatically by PCS 7 when the project is created.

For your "color_gs_MP" project, you must, adapt this structure to the individual requirements of the "color_gs" project, change the default names, and insert new hierarchy folders. This provides you with a clear structure and makes it easier to navigate through your project. You can also treat all the objects as individual units.

In Getting Started we have specified the following hierarchy folder names for the various components of the plant:

Default name	Hierarchy folder	Technological assignment
Plant	Plant1	Complete plant
Unit	RMT1	Raw materials tank 1
Function	FC111	Flow control (dosing)
Function	LI 111	Level indicator for raw material tank 1
Function	NP 111	Pump control
Function	NK 111	Valve control
Function	NK 112	Valve control
Function	NK 113	Valve control
Function	NK 114	Valve control
Device	ADDIT	Support chart for checking the process values

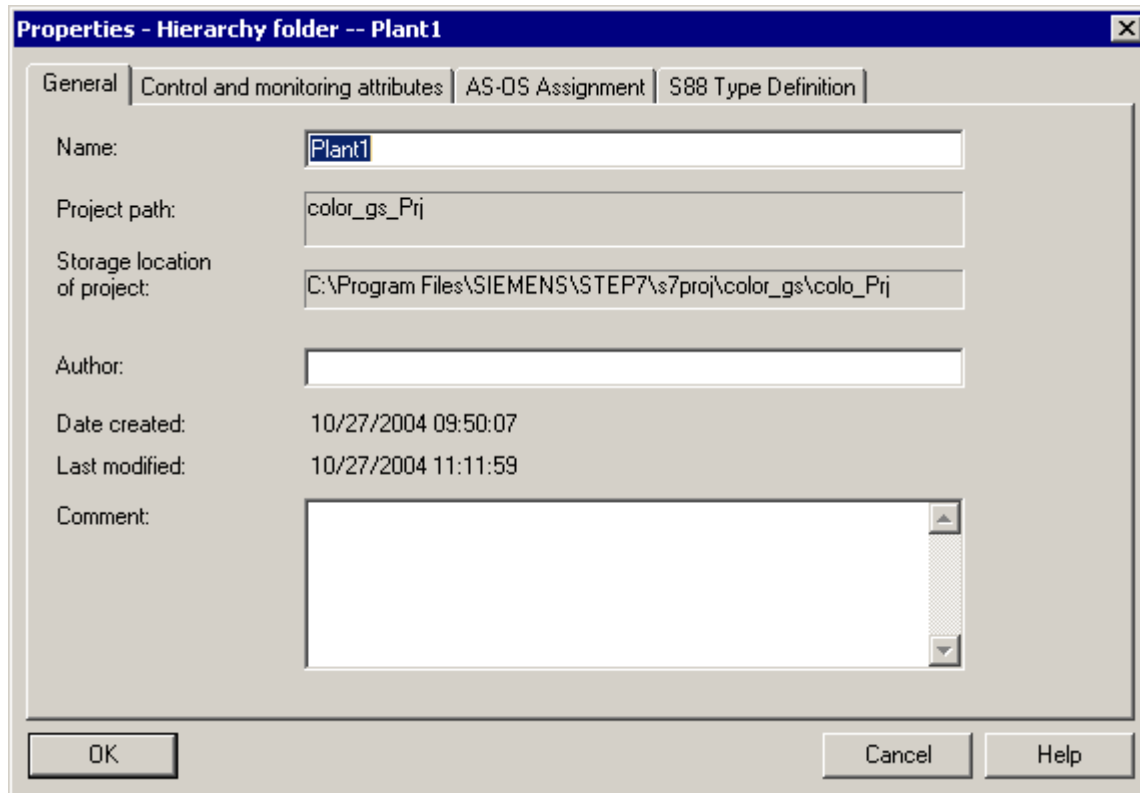
4.5.4 How to Adapt the Default Names

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure for renaming the "Plant" folder

1. Select the hierarchy folder "color_gs_MP\color_gs_Prj\Plant(1)".
2. Select the menu command **Edit > Object Properties....**
The "Properties - Hierarchy Folder" dialog box opens with the "General" tab activated.
3. Enter the name "Plant1" in the "Name" input box.

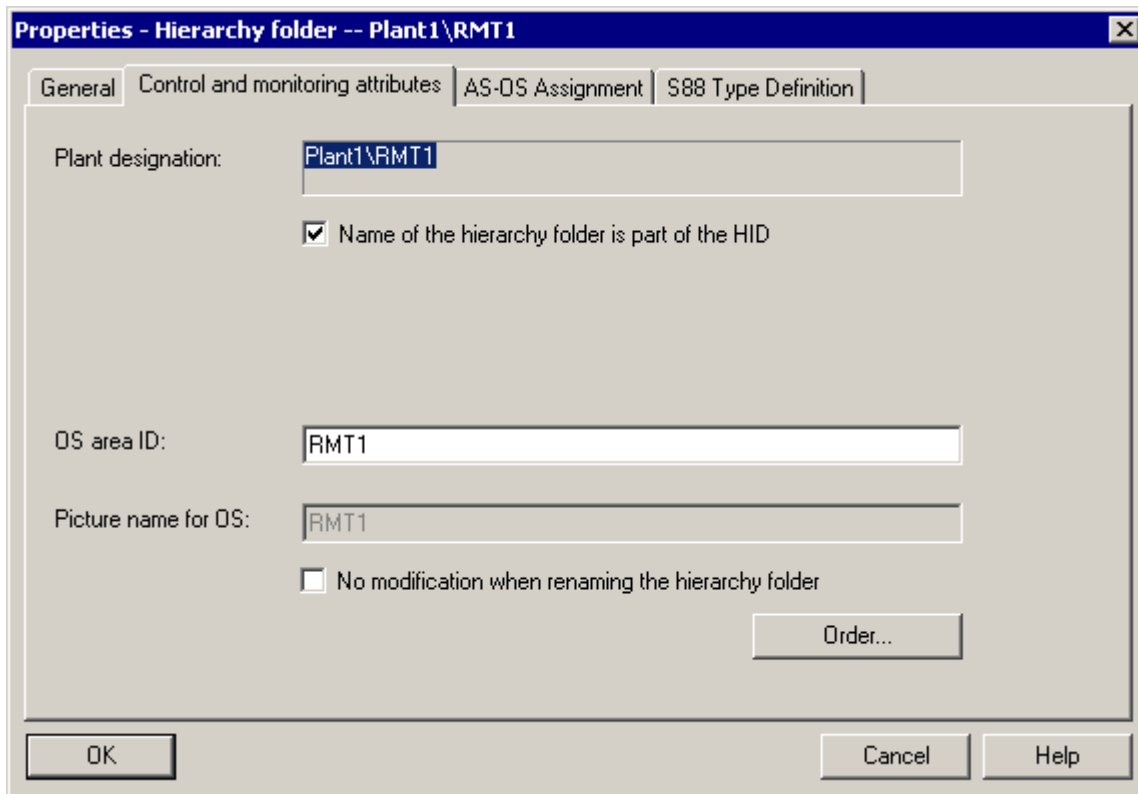


4. Click "OK" to apply your settings.
The dialog box closes and the name of the hierarchy folder is changed to "Plant1".

Procedure for renaming the "Unit" folder

1. Select the hierarchy folder "Unit (1)".
2. Select the menu command **Edit > Object Properties....**
The "Properties - Hierarchy Folder" dialog box opens with the "General" tab activated.
3. Enter the name "RMT1" in the "Name" input box.

4. Switch to the "Control and monitoring attributes" tab.
The "No modification when renaming the hierarchy folder" check box is deactivated by default. This ensures that the text for the OS area ID is always changed according to the name of the hierarchy folder.



5. Click "OK" to apply your settings.
The dialog box closes and the name of the hierarchy folder is changed to "RMT1".

Procedure for renaming additional folders

1. Select the hierarchy folder "color_gs_MP\color_gs_Prj\Plant1\RMT1\Function(1)".
2. Select the menu command **Edit > Object Properties....**
The "Properties - Hierarchy Folder" dialog box opens.
3. Enter the name "FC111" in the "Name" input box.
4. Click "OK".
Your settings are applied and the dialog box closes.
5. Select the folder "color_gs_MP\color_gs_Prj\Plant1\RMT1\FC111\Location(1)".
6. Select the menu command **Edit > Object Properties....**
The "Properties - Hierarchy Folder" dialog box opens.
7. Enter the name "ADDIT" in the "Name" input box.
8. Click "OK".
Your settings are applied and the dialog box closes.

4.5.5 How to Insert Additional Hierarchy Folders

Requirements

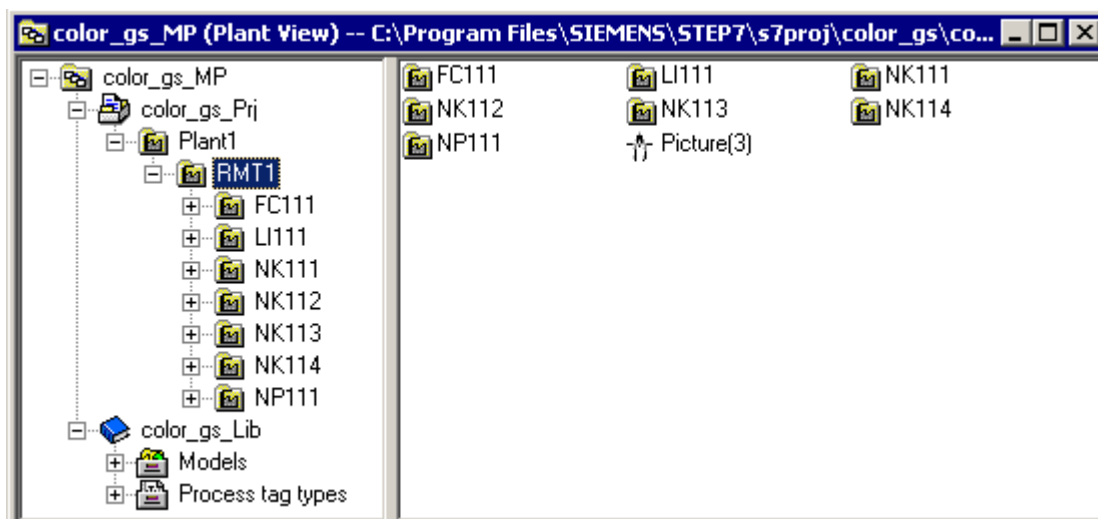
- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "RMT1" folder.
2. Select the menu command **Insert > Technological Objects > Hierarchy Folder**.
The program generates a new hierarchy folder named "Function [consecutive number]".
3. Change the name to "LI111".
4. Press Enter.
5. Repeat steps 1 to 4 to create additional hierarchy folders:
 - NP111 – motor control
 - NK111 – valve control
 - NK112 – valve control
 - NK113 – valve control
 - NK114 – valve control

Result

Your plant hierarchy should now look like this:



4.5.6 How to Check the Assignment of AS/OS to the PH

Assignment of the hierarchy folders

The individual components of the plant are assigned to specific automation systems and specific operator stations. Each hierarchy folder of the plant hierarchy is given exactly this information. This is only important if you have more than one automation system or operator station in your project.

In the "color_gs" project, you have only one automation system and one operator station. As a result, all the hierarchy folders are automatically assigned.

Procedure for checking the assignment

1. Select the "RMT1" hierarchy folder, followed by the menu command **Edit > Object Properties**.
The "Properties - Hierarchy folder" dialog box opens.
2. Select the "AS-OS Assignment" tab.
Here you will find the following assignment:
 - In the "Assigned AS (chart folder)" list, you will see the automation system that processes the data.
 - In the "Assigned OS" list, you will see the operator station on which the data are displayed.
3. Close the dialog box.

4.6 The current status...

4.6.1 The Current State of your Project

Completed Configuration Tasks

Up to now, you have made the following settings for your project:

- You have created the "color_gs" project in SIMATIC Manager.
- You have configured the hardware components in HW Config.
- You have downloaded the hardware configuration from HW Config to the CPU.
- You have configured and loaded the PC station of the OS.
- You have entered settings in the plant hierarchy.
- You have mapped the plant structure of the "color_gs" project in the plant hierarchy.

Creating CFCs

5.1 CFC Charts and the CFC Editor

The Theory – What are CFC Charts and What is the CFC Editor?

The overall process of a plant is described by continuous sequences. For this purpose, you must create CFCs in the CFC Editor of PCS 7.

You create CFCs by inserting blocks from the *PCS 7 Library Vxx* into the CFCs. These include single blocks, for example, blocks for closed-loop control of a process or for monitoring measured values. The inputs and outputs of these blocks are then interconnected and assigned parameters directly in the CFC Editor. The user-friendly graphic user interface of the CFC Editor assists you in this task.

PCS 7 also provides process tag types in the standard library. They represent full CFCs for various process tags such as motors and valves.

You retrieve the CFCs in the plant hierarchy. To keep the structure of the project clear, the CFCs are always stored in the hierarchy folders according to their relevance in the process.

Identification of CFCs

CFCs are identified by the following icon leading their name: 

5.2 Working with libraries

5.2.1 CFC Charts and the Master Data Library

A brief theoretical introduction to the master data library

When creating CFC charts, you are working with the master data library. DO NOT copy any blocks and process tag types directly from the PCS 7 standard library to the CFC charts of your project. Create the blocks and process tags as required in the master data library and copy these object from this library to the CFC charts.

What are the advantages of the master data library?

Use of the master data library ensures that the **the same** version of a block is used in a project and that there can be no confusion. This especially important if there is more than one project engineer working on a project with a multiproject.

The use of the master data library also provides you with another convenient PCS 7 function: the hiding of libraries. This function allows you to hide all libraries except for the master data library, for example, in order to prevent inconsistency and errors within the project.

One other advantage of using master data libraries is that they are archived automatically when you archive the multiproject.

5.2.2 How to Store Objects in the Master Data Library

Changes to blocks

You can change the properties of the block in the master data library. For example, you can adapt messages specifically to your project requirements. Each block instance that is created when you insert a block in a CFC automatically has the modified properties.

This means that you only have to modify the block once in the master data library and not repeatedly for each individual block instance.

Modifications to blocks that are intended for a specific CFC are made directly in the block instance in the CFC. This includes, for example, parameters for inputs and outputs, such as setpoints and limit values.

Master data library and process tag types

You can also store the process tag types provided by PCS 7 in your master data library. The following occurs in the background: all the blocks included in this process tag type, are automatically entered in the block folder of your master data library.

Basic procedure

Step	Action
1	Open library (Page 60)
2	Store all blocks in your master data library (Page 61) The PCS 7 wizard automatically generates the master data library when a project is created.
3	Store process tag types in the master data library (Page 63)

5.2.3 Working with the Master Data Library

Creating a master data library for a large project requires detailed planning before the CFC charts are actually created. In this Getting Started, we will provide you with all the blocks you require for the "color_gs" project. These objects are listed in the table below.

Legend for the tables

- Object name
This is an alphanumeric code for the block that is displayed in PCS 7.
- Symbolic name
Short descriptive name for the block
- Meaning
Short description of the purpose of this block
- Type of block
Defines the block category
- Associated CFC
Returns all CFCs where the block is installed

Blocks in the master data library

Store the required blocks in your master data library. You need the following blocks for the "color_gs" project:

Object name	Symbolic name	Meaning	Type of block	Associated CFC
FB1809	DoseL	Dosing of materials (quantity and flow)	Dosing block	CFC_FC111
FB1823	Integral	Generates the time integral of an input value	Mathematical block	CFC_LI111 CFC_FC111
FB1845	MonAnL	Monitors an analog measured value	Monitoring block	CFC_LI111
FB1866	OpDi01	Manipulates a digital value	Operator control block	CFC_FC111 CFC_SETP
FB1869	Pcs7AnIn	Processes an analog input value signal	Channel block	CFC_LI111 CFC_FC111

Object name	Symbolic name	Meaning	Type of block	Associated CFC
FB1870	Pcs7AnOu	Processes an analog output value signal	Channel block	CFC_FC111
FB1874	PIDConL	Continuous PID controller	Controller block	CFC_FC111
FC360	Mul04	Multiplies input values and returns the result at the output	Mathematical block	CFC_FC111 CFC_LI111

Process tag types in the master data library

Store the required process tag types in your master data library. You need the following process tag types for the "color_gs" project:

Process tag type (CFC)	Meaning	Assigned CFC
Motor_Lean	CFC for a motor	CFC_NP111
Valve_Lean	CFC for a valve	CFC_NK111

5.2.4 How to Open the Libraries

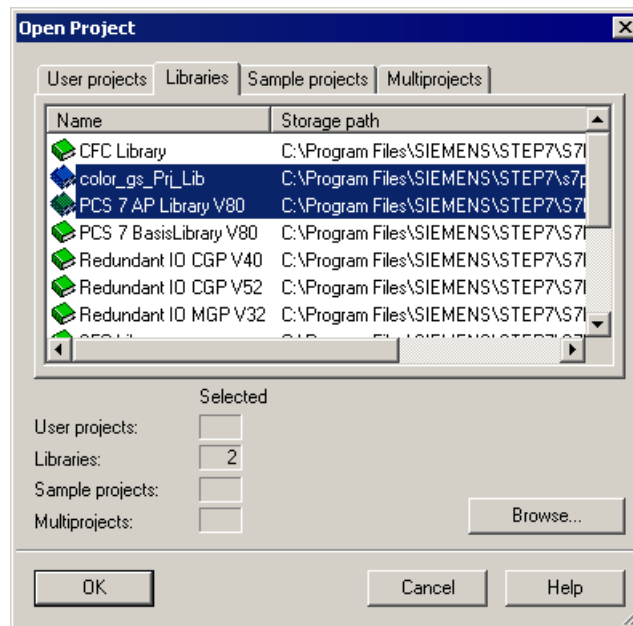
Requirement

SIMATIC Manager is open.

Procedure

1. Select the menu command **File > Open....**
The "Open Project" dialog box opens.
2. Select the "Libraries" tab.

3. Select the "PCS 7 AP Library Vxx" and "color_gs_Lib" libraries in the list.



4. Click "OK".
Both libraries are opened in the component view.

5.2.5 How to Store Blocks

Requirements

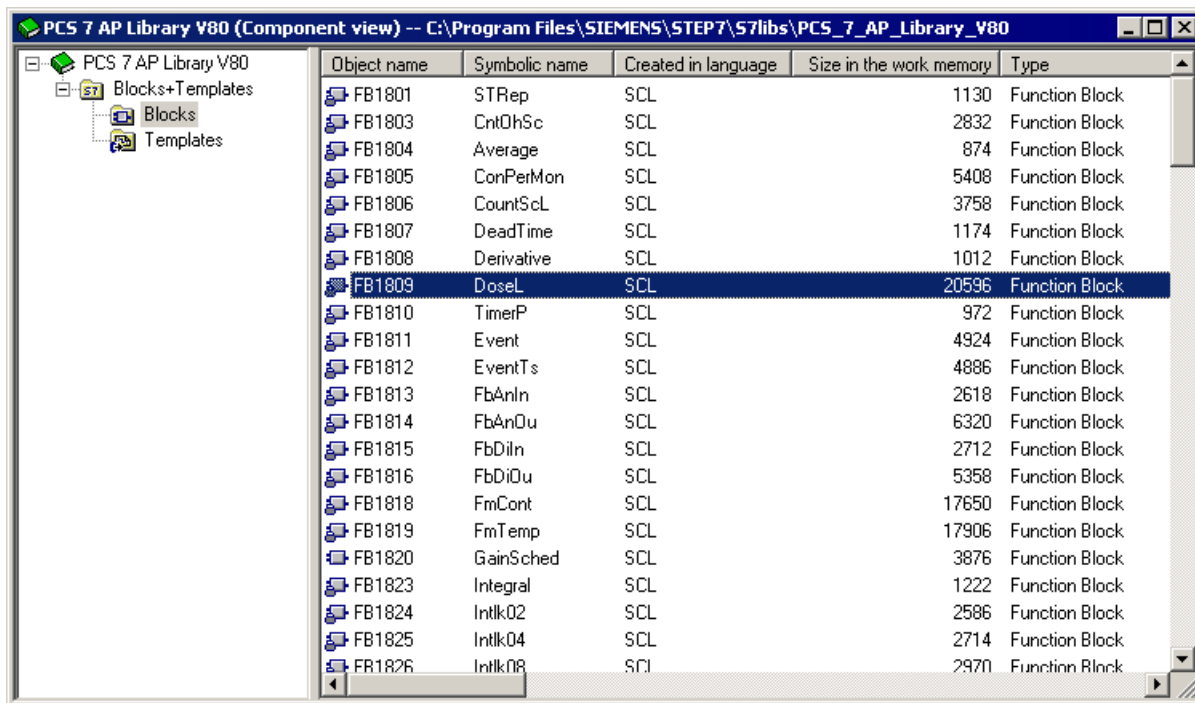
- SIMATIC Manager is open.
- The PCS 7 library "PCS 7 AP Library Vxx" is open and the component view is activated.
- The "color_gs_Lib" master data library is open and the component view is activated.

Procedure

1. Select the menu command **Window > PCS 7 AP Library Vxx (Component view)**.
This opens the PCS 7 standard library.
2. Select the "PCS 7 AP Library Vxx\Blocks + Templates\Blocks" item in the tree view.
The detail view shows all blocks available in the PCS 7 standard library.
3. Select the menu command **View > Details**.
Both the object names - that is, the short names - and the symbolic names of the blocks will now be displayed. This gives you more detailed information.

4. In the detail view, select the required blocks according to the following list:

- FB1809 - DoseL
- FB1823 - Integral
- FB1845 - MonAnL
- FB1866 - OpDi01
- FB1869 - Pcs7AnIn
- FB1870 - Pcs7AnOu
- FB1874 - PIDConL
- FC260 - ChkREAL
- FC360 - Mul04



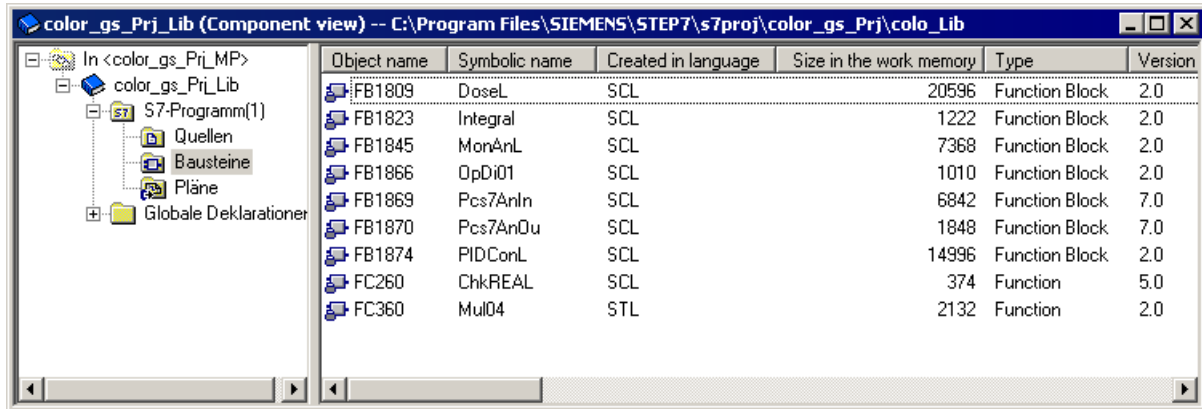
5. Select the menu command **Edit > Copy**.

6. Select the menu command **Window > color_gs_Lib (Component view)**.
This opens the master data library.

7. Select the item "In <color_gs_MP>\color_gs_Lib\S7 program(1)\Blocks" in the tree view.

8. Select the menu command **Edit > Paste**.

All of the selected blocks are inserted.



5.2.6 How to Store Process Tag Types

Introduction

In the following, you will store process tag types in the "Charts" directory of your master data library in the component view. You will then copy your master data library from the "Templates" directory to the "Process tag types" directory in the plant view.

Requirements

- SIMATIC Manager is open.
- The PCS 7 library "PCS 7 AP Library Vxx" is open and the component view is activated.
- The "color_gs_Lib" master data library is open and the component view is activated.

Procedure

1. Select the menu command **Window > PCS 7 AP Library Vxx (Component view)**.
This opens the component view of the PCS 7 standard library.
2. Select the "PCS 7 AP Library Vxx\Blocks + Templates\ Templates" folder in the tree view.
The detail view shows all chart templates available in the PCS 7 standard library.
3. Select the following charts in the detail view:
 - "Motor_Lean"
 - "Valve_Lean"
4. Select the menu command **Edit > Copy**.
5. Select the menu command **Window > color_gs_Lib (Component view)**.
This opens the master data library.

6. Select the item "<color_gs_MP>\color_gs_Lib\S7 program(1)\Charts" in the tree view.
7. Select the menu command **Edit > Paste**.
All of the process tag types selected are inserted.
8. Close the "PCS 7 AP Library Vxx".
9. Open the plant view of "color_gs_lib".
10. Select the "<color_gs_MP>\color_gs_Lib\ Process tag types)" folder in the tree view.
11. Switch to the component view.
12. Select the "<color_gs_MP>\color_gs_Prj_Lib\S7 program(1)\Charts" folder in the tree.
13. Select the "Motor_Lean" and "Valve_Lean" charts in the detail view.
14. Select the menu command **Edit > Cut**.
15. Go to the "<color_gs_MP> \ color_gs_Lib \ Process tag types" folder in the plant view.
16. Select the menu command **Edit > Paste**.

Note

As soon as a process tag type is stored in the master data library, all the individual blocks contained in this process tag type are automatically stored in the "Blocks" folder. If you select the "<color_gs_MP>\color_gs_Lib\ S7 program(1)\ Blocks" folder in the tree view, you will see in the detail window all the blocks that you yourself have inserted or that were automatically stored there when process tag types were copied.

5.2.7 Showing and Hiding Libraries

Introduction

You can hide libraries you do not require. This makes working with the catalog in the CFC Editor clearer and less prone to errors. Since you have already stored all the necessary blocks and process tag types in your master data library, you work exclusively with this master data library when creating the "color_gs" project.

You can show libraries again quickly if you need them again.

5.2.8 How to Hide and Show Libraries

Note

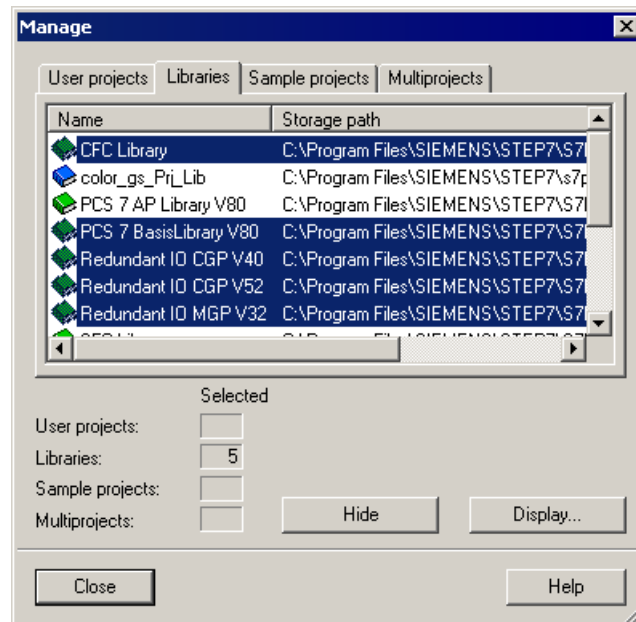
Make sure that you actually have all the required blocks and charts in your master data library.

Requirement

SIMATIC Manager is open.

Procedure for Hiding Libraries

1. Select the menu command **File > Manage....**
The "Manage" dialog box opens.
2. Select the "Libraries" tab.
3. Select all the libraries in the list with the exception of the following:
 - Master data library "color_gs_Prj_Lib"
 - PCS 7 library "PCS 7 AP Library Vxx"
 - SFC Library (x3)
 - Standard library



4. Click "Hide".
All selected libraries are removed from the list.
5. Click "Close".
You have now hidden all the libraries that you do not want to use. They will no longer be displayed in the catalog of the CFC Editor.

Procedure for Showing Libraries

1. Select the menu command **File > Manage....**
The "Manage" dialog box opens.
2. Select the "Libraries" tab.
3. Click "Display...".
The "Browse" dialog box opens.

4. Select the "...\\SIEMENS\\STEP7\\S7LIBS\\ [Name of the library] object in the tree view.
The library is displayed in the right pane.
5. Click "OK".
The dialog box closes and the selected library is displayed and selected in the list of libraries in the "Manage" dialog box.
6. Repeat steps 3 through 5 if you wish to show libraries again.
7. Click "Close". The dialog box closes.

5.3 CFCs in the PH

5.3.1 Working with CFC Charts

Introduction

Once you have made the preparations for creating the CFC charts by filling your master data library, you can now start creating the CFC charts.

Basic procedure for creating CFC charts

Step	Action
1	Create empty CFC charts in the plant hierarchy
2	Insert individual blocks in an empty CFC chart
3	Interconnect the inputs and outputs of blocks and assign parameters to them

CFC Charts in the PH

The PCS 7 "New Project" wizard has already created a CFC chart in your plant hierarchy. This is stored in the "ADDIT" folder. This CFC chart does not yet contain any blocks. You have to insert them in the CFC Editor.

In addition, you require other charts for the "color_gs" project, which you insert in the plant hierarchy and then edit in the CFC Editor.

It is also important that you assign brief descriptive names for all CFC charts of the "color_gs" project to keep your project easy to understand.

5.3.2 Which Charts do you Need in the "color_gs" Project?

CFC Charts in the Example Project

The following CFCs are needed for the "color_gs" project:

- CFC_SETP - for specification of process values
- CFC_FC111 – for closed-loop control of dosing amount and dosing speed
- CFC_LI111 – for control and simulation of the liquid level
- CFC_NP111 – for motor control
- CFC_NK111 to CFC_NK114 – for valve control

Each chart has a process-related meaning. To fully understand the part of the plant you are configuring in Getting Started, you should understand the process-related meaning of the individual CFCs. We provide a brief description of each individual chart below.

Some Details about Creating CFC Charts

You will create the CFC_SETP, CFC_FC111 and CFC_LI111 charts yourself. PCS 7 makes the CFC_NP111 and CFC_NK11x available to you as a complete CFC in the form of a process tag type. This will illustrate the great advantage of using process tag types, which thus far you have only stored in your master data library.

Note

In the "color_gs" project, the names of the CFCs are assigned according to the name of the associated hierarchy folder and, thus, also the name of the associated process tag. As a result, unique identification is always possible.

5.3.3 Process-Related Meaning of the "CFC_SETP" CFC Chart

CFC_SETP

CFC_SETP is used to check the process value. The blocks mean the following in this case:

- The PARA_DOS_RM1_QTY block is a substitute block. It sets the flow and should be connected to DOSE and to CTRL_PID.
- The PARA_DOS_RM1_SEL block specifies the target reactor.

5.3.4 Process-Related Meaning of the "CFC_FC111" CFC Chart

CFC_FC111

CFC_FC111 is used for controlling the dosing quantity and dosing speed. The blocks mean the following in this case:

- The "Pcs7AnIn" block provides the currently dosed volume at the "PV_Out" output and transfers this measured value to the "PV (process value)" input of the "DoseL" block.
- The "PIDConL" block returns the manipulated variable of the flow.
- "DoseL" returns the setpoint for the flow (manipulated value for the "PIDConL" block) and checks the dosing quantity.

- The manipulated variable for the valve is sent to the "MV" output of the "PIDConL" block and is fed to the "MV_Trk" input of the "PIDConL" block in the absence of manipulated variable feedback from the process.
- The "Pcs7AnOu" block outputs the manipulated variable to the valve.

5.3.5 Process-Related Meaning of the "CFC_LI111" CFC Chart

CFC_LI111

CFC_LI111 is used for controlling and simulating the fill level. The blocks mean the following in this case:

- The "Pcs7AnIn" block reads in the fill level of the raw material tank and outputs the current value at "PV_Out" output.
- The "PV_Out" output is interconnected with the "OutTrk" input of the "Integral" block.
- The "Out" output is interconnected with the "PV" input of the "MonAnL" block.
- The "Mul04" block is used to simulate the quantity which is taken from the reservoir at the given point in time.

5.3.6 Process-Related Meaning of the "CFC_NP111" CFC Chart

CFC_NP111

CFC_NP111 is used for pump controlling. The blocks mean the following in this case:

- The "Pcs7DiIn" block supplies the current state of the pump - on or off - at the "PV_Out" output.
- This value is interconnected to the "FbkRun" input (feedback ON) of the "MotL" block where it is evaluated.
- The plant operator or an upstream controller controls the "MotL" block.
- The "Pcs7DiOu" block takes the control command from the "OosAct" output of the "MotL" block and outputs this to the pump in the process.

5.3.7 Process-Related Meaning of the "CFC_NK11x" CFC Chart

CFC_NK11x

CFC_NK11x is used for valve control. The blocks mean the following in this case:

- The "Pcs7DiIn" block returns feedback on the status of the valve - open or closed - to the "VlvL" block.
- The "VlvL" block switches the valve according to the setting made by an external controller or by an operator: The control command is passed on from the "OosAct" output via the "Pcs7DiOu" output driver to the valve.

5.3.8 Procedure

5.3.8.1 How to Rename CFC Charts in the PH

Requirements

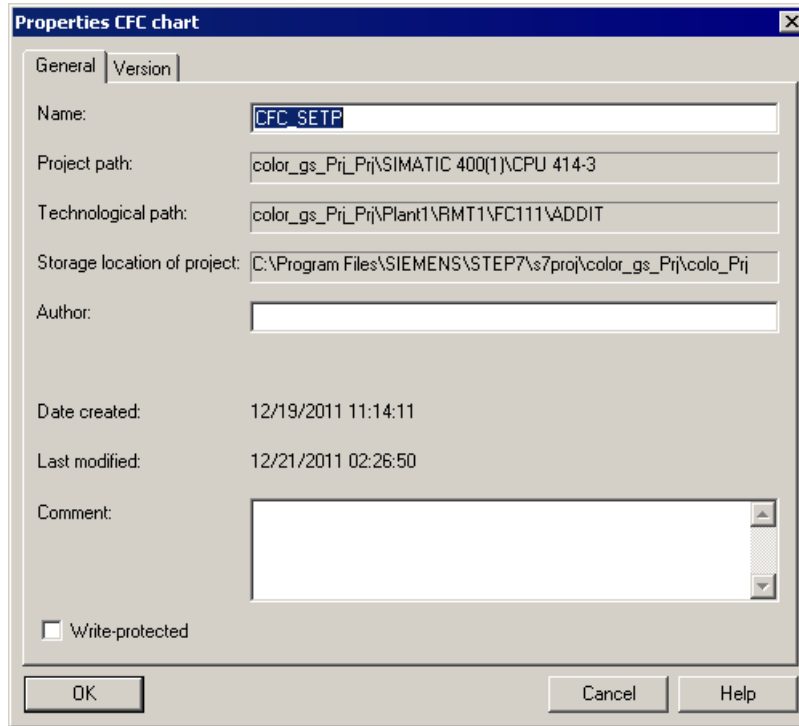
- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

A CFC you created is already in the ADDIT folder. All you need to do now is rename it.

1. Select the "color_gs_MP\color_gs_Prj\Plant1\RMT1\FC111\ADDIT" folder in the tree view.
2. Select the object "CFC(1)" in the detail window.
3. Select the menu command **Edit > Object Properties**.
The "Properties CFC" dialog box opens with the "General" tab activated.

4. Enter the name "CFC_SETP" in the "Name" input box.
The name of the chart in real projects usually relates to a user-specific system for the identification of process tags.



5. Click "OK" to apply your settings.

5.3.8.2 How to Insert New CFC Charts in the PH

CFCs to be inserted

You must insert the following CFCs in the form of new, empty CFCs:

- "CFC_FC111"
- "CFC_LI111"

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\Plant1\RMT1\FC111" folder in the tree view.
2. Select the menu command **Insert > Technological Objects > 2 CFC**.
The CFC "CFC(1)" is inserted. When you insert new charts, PCS 7 first assigns the default name "CFC" followed by a consecutive number and activates the input mode for a new name.
3. Enter the name "CFC_FC111" and press the Enter key.
4. Select the "color_gs_MP\color_gs_Prj\Plant1\RMT1\ LI111" folder in the tree view.
5. Select the menu command **Insert > Technological Objects > 2 CFC**. The CFC "CFC(1)" is inserted.
6. Enter the name "CFC_LI111" and press the Enter key.

5.3.8.3 How to insert the "Motor_Lean" process tag type

Introduction

You have already stored the "Motor_Lean" process tag type in your master data library. You now only need to insert this process tag type into the plant hierarchy in your "color_gs" project.

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Lib\Process tag types" item in the tree view.
The detail window displays the process tag types you have added to the master data library.
2. Select the "Motor_Lean" CFC, followed by the menu command **Edit > Copy**.
3. Select the "color_gs_MP\color_gs_Prj\Plant1\RMT1\ NP111" folder in the tree view, followed by the **Edit > Paste** menu command. The "CFC_NP111" CFC is inserted into the hierarchy folder and selected.
4. Select the menu command **Edit > Object Properties**.
The "Properties CFC" dialog box opens.
5. Change the default name "Motor_Lean" to "CFC_NP111" in the "Name" input box.
6. Click "OK" to apply your settings.

5.3.8.4 How to insert the "Valve_Lean" process tag type

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

Follow exactly the same procedure as for the "MOTOR" process tag type:

1. Select the "VALVE" process tag type in the detail window of the "color_gs_MP\color_gs_Lib\Process tag types" folder.
2. Insert the "VALVE" process tag type in the following folders using the menu commands **Edit > Copy** and **Edit > Paste**:
 - color_gs_MP\color_gs_Prj\Plant1\RMT1\NK111
 - color_gs_MP\color_gs_Prj\Plant1\RMT1\NK112
 - color_gs_MP\color_gs_Prj\Plant1\RMT1\NK113
 - color_gs_MP\color_gs_Prj\Plant1\RMT1\NK114
3. Rename the inserted process tag types according to the table below.

Hierarchy folder	Rename to:
../RMT1/NK111	CFC_NK111
../RMT1/NK112	CFC_NK112
../RMT1/NK113	CFC_NK113
../RMT1/NK114	CFC_NK114

4. Exit the plant view.

Additional information

A detailed description is available in the section
"How to insert the "MOTOR" process tag type" (Page 72).

5.4 The current status...

5.4.1 Current Status of Your Project

Completed Configuration Tasks

In preparation for the actual creation of CFCs, you have now completed the following configuration tasks:

- You have stored all the necessary blocks and process tag types in the master data library.
- You have hidden libraries that you do not require for the "color_gs" project so that only the "color_gs_Lib" master data library is still visible.
- You have renamed and inserted new CFCs in the plant hierarchy.
- You have inserted the "Motor_Lean" process tag type in the plant hierarchy.

5.5 Working with the CFC Editor

5.5.1 Introduction to the CFC Editor

CFC Editor

The CFCs are actually edited, e.g., blocks are inserted and their parameters assigned, in the CFC Editor. Double-clicking on a CFC opens the CFC Editor. The editor always opens in the view in which it was closed the last time you worked with it.

The CFC Editor is separated into the following display areas:

- **CFC**
If you have opened an empty CFC, you will simply see an empty space here. This is where you insert blocks as required to describe continuous processes. Afterwards, you assign parameters and interconnect the blocks.
- **Catalog with blocks, libraries and CFCs**

All the work that you do with the CFC Editor is saved automatically by PCS 7.

Additional information

Detailed information about the CFC Editor is available in the CFC online help and in the *Process Control System PCS 7, CFC for SIMATIC S7* Manual.

5.5.2 CFC Chart in the CFC Editor

CFC

Each CFC can consist of up to 26 chart partitions. A new CFC consists of only one chart partition. Only one chart partition is necessary for the "color_gs" project. Each chart partition, in turn, consists of six sheets.

You can select between two different views using buttons in the toolbar:

- A single sheet:

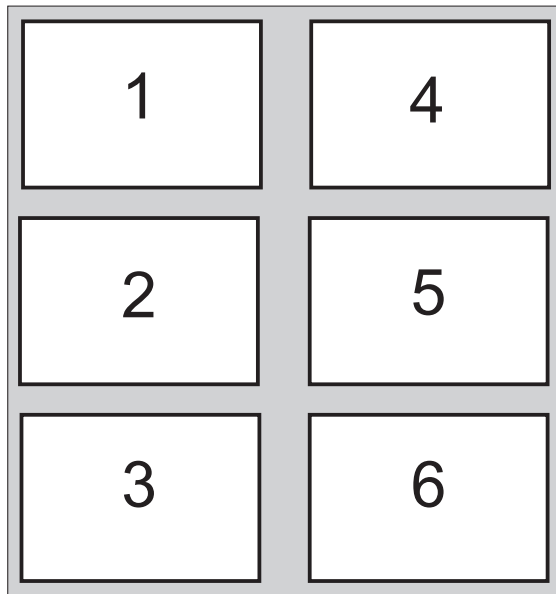
- Overview with six sheets:


The status bar shows you on which sheet of which chart partition you are located.

Change from the overview to a single sheet

By double-clicking on the required sheet you can change from the overview to the single view.

The single sheets in the overview are arranged in the displayed order:



Additional information

Detailed information is available in the CFC online help and in the *Process Control System PCS 7, CFC for SIMATIC S7* Manual.

5.5.3 Catalog in the CFC Editor

Opening the Catalog

If it is not already open, open the catalog with the menu command **View > Catalog**.

Organization of the catalog

In the catalog you will see four tabs:

- **Blocks** - here you will find the blocks sorted according to block families. You work with this tab in the "color_gs" project in order to place the PARA_DOS_RM1_QTY block from the "Operate" directory in the "CFC_SETP" chart.
- **Charts** - here you will find all the charts you created in the plant hierarchy, for example, CFC_FC111, CFC_LI111. The CFC that is currently open and displayed in the CFC Editor is labeled by a small open folder.
- **Libraries** - These contain all PCS 7 standard libraries and your master data library. You have already executed the "hide" function to hide all libraries in the ""color_gs" project which you do not require to configure the system. This means that you can only see the "color_gs_Lib" library.
- **Unplaced blocks** - here you will find blocks that are not displayed in a CFC. Within the "color_gs" project, this tab is not displayed since there are no "unplaced blocks" in your project.

Additional information

Detailed information is available in the CFC online help and in the *Process Control System PCS 7, CFC for SIMATIC S7* Manual.

5.5.4 Overview of the Configuration Steps for CFC Charts

Overview

To create CFC charts, always follow the steps below in the order given:

Step	What?
1	Open chart (Page 77)
2	Insert blocks Options: • Insert blocks in "CFC_SETP" (Page 78) • Insert blocks in "CFC_FC111" (Page 81) • Insert blocks in "CFC_LI111" (Page 86)
3	Assign parameters to blocks • Rename blocks • Specify input/output values
4	Interconnect blocks (Page 91)

The "Insert blocks" step is skipped for process tag types. You now only have to configure and interconnect the process tag types.

Information from the online help for the block

Note

If you need additional information on the blocks, for example, the functions of the individual block inputs, select a block in the library or directly in the CFC chart and press the <F1> key. The online help for this block opens immediately.

5.5.5 How to Open the "CFC_SETP" CFC Chart

Introduction

To be able to place blocks in your CFCs, you must now open the CFC.

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\Plant1\RMT1\ FC111\ ADDIT" folder in the tree view.
2. Select the "CFC_SETP" object in the detail window and then select the menu command **Edit > Open Object**. The CFC editor opens. You can now edit the open chart.

5.5.6 Assignment of Block Parameters in CFC Charts

Assignment of Block Parameters

Each block has a number of different I/Os that are displayed in a table of the properties dialog box. Click the column heading of the table to quickly find the inputs/outputs in this dialog box. The column is then sorted in ascending or descending order.

The I/Os of a block can be both visible or invisible: You can only see invisible parameters in the properties of the block but not in the representation in the CFC chart. In the properties of the block, you can specify which I/Os in the CFC chart will be visible and which will be invisible. In the "Not Displayed" column, you need to deactivate the check box of the relevant I/O to make the I/O visible in the CFC chart. This function helps to make a CFC chart easier to read. In the "color_gs" project, you will accept the default settings.

5.5.7 How to Insert the Blocks into the "CFC_SETP"

Requirements

- The "CFC_SETP" CFC is open in the CFC Editor -
Save in folder: "color_gs_MP\color_gs_Prj\Plant1\RMT1\ FC111\ ADDIT".
- The catalog is open.

Procedure

1. Select the "Libraries" tab in the catalog.
This is where the library "color_gs_Lib" is displayed.
2. Open the "color_gs_Lib\S7 program(1)\Blocks\Operate" folder in the tree view.

3. Move the "OpDi01 - FB1866" block to the CFC using drag-and-drop. This is used to select the reactor to which the raw material is pumped.



4. Close the chart.

Note

If a block is shown in blue or light gray after you have inserted it and if no block I/Os are displayed, it is covering an underlying block or extends beyond the edge of the sheet.

In this case, you must move the block with the mouse so that it does not cover any other block and is within the limits of the sheet.

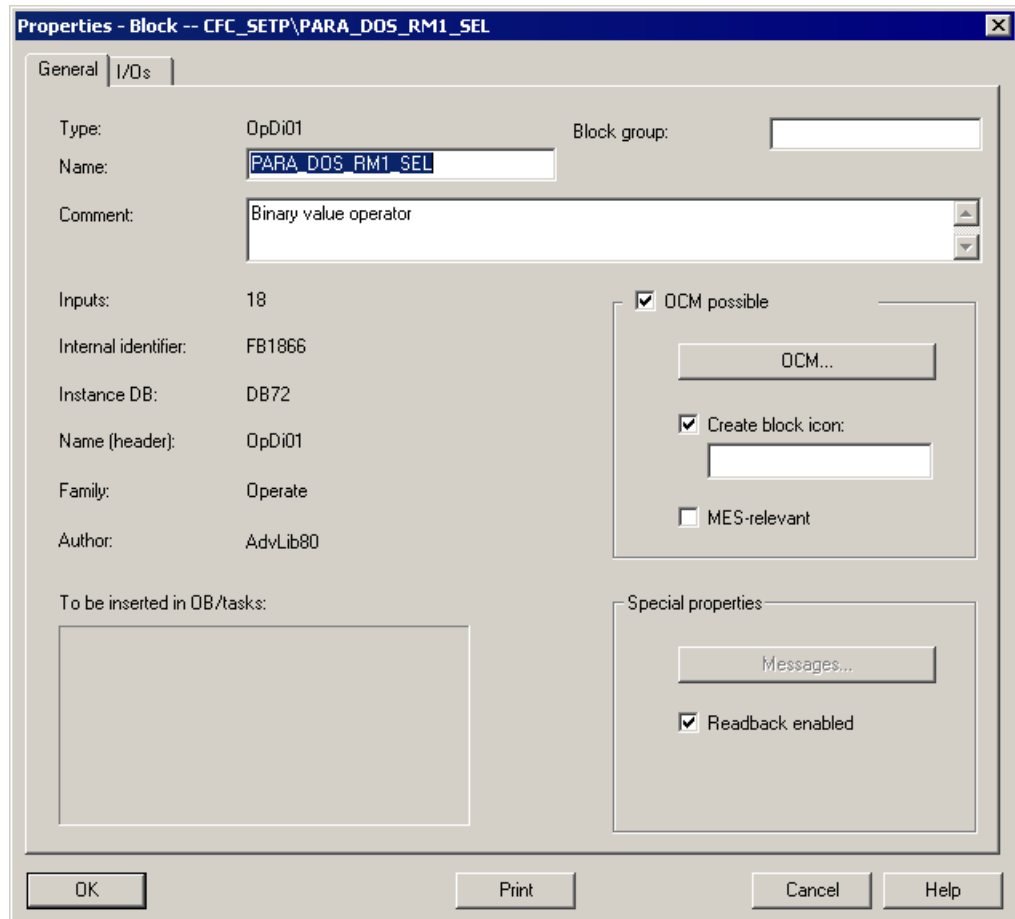
5.5.8 How to Assign Parameters for the Blocks in "CFC_SETP"

Requirements

- The "CFC_SETP" CFC is open in the CFC Editor - Save in folder: "color_gs_MP\color_gs_Prj\Plant1\RMT1\FC111\ADDIT".
- All blocks are inserted.

Procedure

1. Select the "OpDi01" block and then select the menu command **Edit > Object Properties....**
The "Properties - Block" dialog box opens with the "General" tab activated.
2. Enter the name "PARA_DOS_RM1_SEL" in the "Name" input box.
The "OCM possible" check box is selected by default.



3. Switch to the "I/Os" tab.
Here you can assign parameters for all the I/Os of a block. You will find the names of all inputs and outputs in the "Name" column.
4. Position the cursor in the "Value" column of the "Out.Value" I/O and enter the value "0".

5. Click "OK" to apply the settings.

The name "PARA_DOS_RM1_SEL" is displayed in the header of the block in the CFC. When you create the process pictures, you will interconnect the I/Os of the blocks from the CFCs with objects in the process pictures. The tag name is formed from the plant hierarchy, the CFC name, and the block name. You will find the "PARA_DOS_RM1_SEL" name again as part of the tag name.

The values of the inputs/outputs are applied.

Block	Name in project	I/O	Meaning	Value	Unit
OpDi01	PARA_DOS_RM1_SEL	Out.Value*	The output of the process value is verified.	0	
* Invisible in CFC.					

6. Close the CFC.

Do not create unnecessary block icons

In the "Properties - Block" dialog box of the the "General" tab, "Create block icons" determines whether a block icon is created for use in WinCC. Do not set the check mark for blocks with inputs and outputs that cannot be configured.

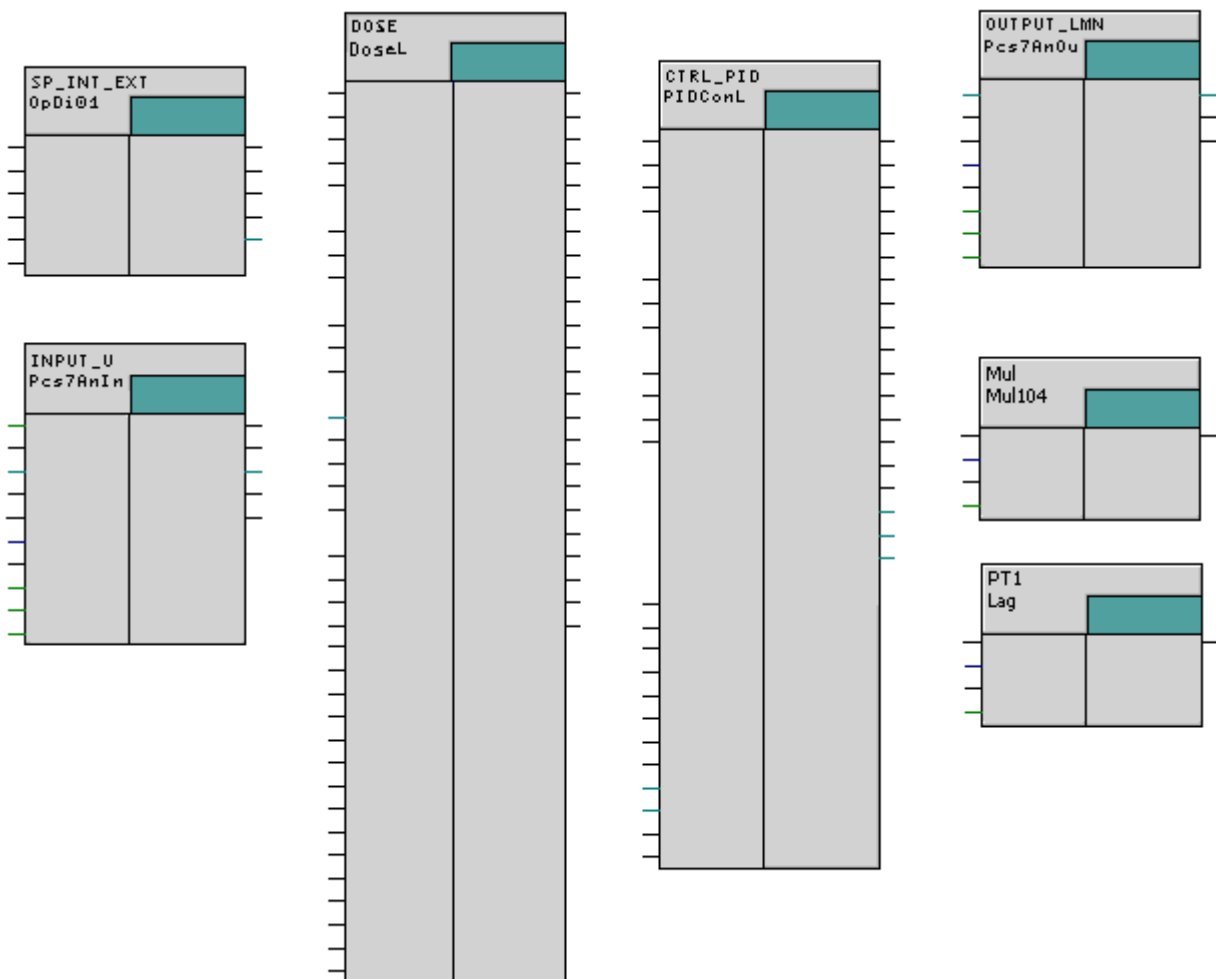
5.5.9 How to Insert the Blocks into the "CFC_FC111"

Requirements

- The "CFC_FC111" CFC is open in the CFC Editor -
Save in folder: "color_gs_MP\color_gs_Prj\Plant1\RMT1\ FC111\".
- The catalog is open, and the "Libraries" tab is visible.
- The "color_gs_Lib\S7 program(1)\Blocks" folder is open in the tree view.

Procedure

1. Insert the following blocks using drag-and-drop:
 - "Channel" folder: Pcs7AnIn - FB1869: Signal processing of an analog input value
 - "Dosage" folder: DoseL - FB1809: Dosing of raw material
 - "Math" folder: Mul04 - FC360: Multiplies input values and returns the result at the output
 - "Control" folder: PIDConL: Fill level monitoring and visualization of the level in the process mode
 - "Channel" folder: Pcs7AnOu - FB1870: Processes an analog output value signal
 - Folder "Operate": OpDi01 - FB1866: Manipulating a digital value
 - "Math" folder: Lag - lag function: Smoothing the input value (low-pass filter)
2. Arrange the blocks in the CFC as shown below:



3. Close the chart.

5.5.10 How to Assign Parameters for the Blocks in the "CFC_FC111"

Requirements

- The "CFC_FC111" CFC is open in the CFC Editor -
Save in folder: "color_gs_MP\color_gs_Prj\Plant1\RMT1\ FC111\".
- All blocks are inserted.

Procedure

1. Open the "General" tab and the "I/Os" tab in the "Object Properties" dialog box for each listed block.
2. Enter the parameters for all blocks according to the table below.

Block	Block name in the project	I/O	Meaning	Value
Pcs7AnIn	INPUT_U	Mode	Value status and measuring type	16#00000203
		PV_In	Process value (raw value)	16#0203
		PV_InUnit	Unit of measure for process value	1348
		SimOn.Value	1 = Simulation on	1
		SubsPV_In	Substitute value	15.0
DoseL	DOSE	CR_A_DC	Creep flow: Delay time for incoming alarms [s]	5.0
		CR_AH_Lim	Creep flow: Limit high alarm	5.0
		CR_Hyst	Creep flow: Hysteresis for alarm limit	0.2
		DQ_AH_Tol	Overdosage: Limit high alarm	3.0
		DQ_ExHiAct.Value	Default for the internal \external switchover	1
		DQ_Ext.Value	Dosing quantity: External setpoint	111.0
		DQ_HiLim.Value	Limit dosing quantity	500.0
		DQ_Int	End value dosing quantity	20.0
		DQ_OpScale.High	Dosing quantity: High scale limit of bar graph	550.0
		DQ_Unit	Unit of dosing in m ³	1034
		DQ2_ExHiAct.Value	Dosing quantity: 1 = High limit for external setpoint factor for fine dosing has been reached	1
		DQ2_Ext.Value	External fine dosing dosing quantity	15.0
		DQ2_HiLim.Value	Fine dosing: Limit high setpoint	350.0
		DQ2_Int	Fine dosing dosing quantity	11.0
		Feature.Bit16		1
		Feature.Bit4	Set switch or button mode	1
		Feature.Bit6	Reset dosing quantity when dosing starts	1
		PV_AH_Lim	High display limit of the process value for the dosing volume	700.0
		PV_OpScale.High	Process value: High scale limit of bar graph	350.0

Block	Block name in the project	I/O	Meaning	Value
		SP.Value	Active flow setpoint	70.0
		SP_Ext.Value	External manipulated value	120.0
		SP_ExtAct.Value	Active external setpoint	1
		SP_ExtLi.Value	Interconnection for the internal/external switchover active	1
		SP_HiLim.Value	Coarse dosing: High limit setpoint flow	70.0
		SP_Int	Coarse dosing setpoint	180.0
		SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	0
		SP2_Ext.Value	Fine dosing external setpoint	15.0
		SP2_HiLim.Value	Fine dosing: High limit setpoint flow	15.0
		SP2_Int	Fine dosing setpoint	9.0
		TI.Value	Reset time	30.0
Mul04	MUL	In2.Value	Value to be multiplied	1
PIDConL	CTRL_PID	AutModLi.Value	Interconnection to automatic	1
		ModLiOp.Value	Interconnection automatic/manual active	1
		MV_HiLim.Value	High limit for manipulated value	99.0
		PV_AH_Lim	Process value alarm: High limit	70.0
		PV_AL_En	1 = Enable PV alarm limit (low)	0
		PV_AL_Lim	PV alarm limit (low)	0.0
		PV_OpScale.High	Process value: High scale limit of bar graph	70.0
		PV_WH_En	1 = Enable PV warning limit (high)	0
		PV_WL_En	1 = Enable PV warning limit (low)	0
		PV_WL_Lim	PV warning limit (low)	0.0
		SP_Ext.Value	External manipulated value	70.0
		SP_Int	Internal manipulated value	33.0
		TI.Value	Integral action time [s]	8.0
Pcs7AnOu	OUTPUT_LMN	PV_InUnit	Unit of measure for process value	1348
OpDi01	SP_INT_EXT	SetLi.Value	Connected digital input	1
* Invisible in the CFC (parameters in structure, set with shortcut menu command Edit> Object Properties > Select Structural Element > Properties > Value)				

3. Once you have entered the parameters for all the I/Os relating to a block, click "OK" for that block.
Your settings are applied.
4. Close the chart.

Note

- Use a period as the decimal separator. For some input boxes, PCS 7 provides predetermined values that you can select from a drop-down list. This drop-down list is activated automatically when you position the cursor in the input box.
 - Assign parameters for the "Mode" I/O for the "Pcs7AnIn" block. You assign this parameter only because you have not configured any external I/O modules in this Getting Started.
-

5.5.11 How to Insert the Blocks in the "CFC_LI111"

Introduction

Now you have to create the "CFC_LI111" chart. The procedure is exactly the same as for the "CFC_FC111" chart.

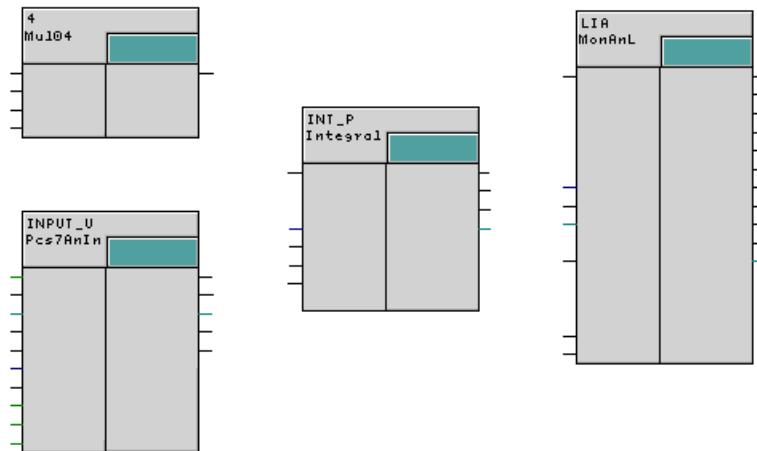
Requirements

- The "CFC_LI111" CFC is open in the CFC Editor -
Save in folder: "color_gs_MP\color_gs_Prj\Plant1\RMT1\ LI111".
- The catalog is open.
- The "color_gs_Lib\S7 program(1)\Blocks" folder is open in the tree view ("Libraries" tab).

Procedure

Drag-and-drop the following blocks to insert them, arrange them as shown in the figure and then close the chart:

- "Channel" folder: Pcs7AnIn - FB1869: This block provides a simulation value.
- "Math" folder: Integral - FB1823: This block is part of the fill level simulation in the raw materials tank. This block is used to simulate the fill level of the raw material tank.
- "Math" folder: Mul04 - FC360: This block is part of the fill level simulation in the raw materials tank. This block is used to invert the sign for the flow value.
- "Monitor" folder: MonAnL - FB1845: Fill level monitoring and visualization of the level in the process mode.



5.5.12 How to Assign Parameters for the Blocks in the "CFC_LI111"

Requirements

- The "CFC_LI111" CFC is open in the CFC Editor - Save in folder: "color_gs_MP\color_gs_Prj\Plant1\RMT1\ LI111".
- All blocks are inserted.

Procedure

1. Open the "General" tab and "Inputs/Outputs" tab in the "Object Properties" dialog box for each block.
2. Enter the parameters for all blocks according to the table below.

Block	Name in project	I/O	Meaning	Value
Mul04	4	In1.ST	Value 1 to multiply (BYTE)	0
		In1.Value	Value 1 to multiply (REAL)	0
		In4.Value	Invert sign for flow rate (process value) - Part of the fill level simulation in raw materials tank	-1.0
Pcs7AnIn	INPUT_U	Feature.Bit29	Enables a substitute value	1
		Mode	Measuring range 4 to 20 mA	16#0203
		Scale.High	High measuring range	550
		SimOn.Value	Simulation value active	1
		SimPV_In.Value	Raw materials tank level	500
		SubsPV_In	Substitute value for SimPV_In	500
Integral	INT_P	In.ST	Analog input value (BYTE)	0.0
		In.Value	Simulation of the raw material tank level	0
		OutHiLim	High limit of the output value	500
		OutTrk.ST	Predefined value used for OutTrkOn = 1 (BYTE)	0
		OutTrk.Value	Predefined value used for OutTrkOn = 1 (REAL)	0
		TI	Integration time	30
MonAnL	LIA	GradHDnEn	Gradient monitoring (high) for negative changes	0
		GradHUpEn	Gradient monitoring (high) for positive changes	0
		PV.ST	Process value (BYTE)	0
		PV.Value	Process value (REAL)	0
		PV_AH_En	PV alarm limit (high) deactivated	0
		PV_AH_Lim	High alarm limit = 490 m ³	490
		PV_AL_Lim	Low alarm limit = 5 m ³	25
		PV_Hyst	Hysteresis	1
		PV_OpScale.High	High display limit of the process value in the container	550
		PV_Unit	Unit of the PV in m ³	1034
		PV_WH_En	PV warning limit (high) deactivated	0
		PV_WH_Lim	High warning limit = 450 m ³	450
		PV_WL_Lim	Low warning limit = 7 m ³	27
		SimPV	Simulated process value	300

3. Once you have entered the parameters for all the I/Os relating to a block, click "OK" for that block.
Your settings are applied.
4. Close the CFC.

Note

Assign parameters for the "Mode" I/O for the "Pcs7AnIn" block. You assign this parameter only because you have not configured any external I/O modules in this Getting Started.

5.5.13 How to assign parameters for the blocks in "CFC_NK11x"

Requirements

- The "CFC_NK11x" CFC is open in the CFC Editor - Save in folder: "color_gs_MP \color_gs_Prj\Plant1\RMT1\ NK11x".

Procedure

1. Open the "General" tab and "Inputs/Outputs" tab in the "Object Properties" dialog box for each block.
 - Enter the parameters for all blocks according to the table below.

Block	Name in project	I/O	Meaning	Value
Pcs7DiIn	FbkClose	SimOn.Value	Simulation enabled	1
Pcs7DiIn	FbkClose	SimPV_In.Value (inverted after interconnection)	Simulation value PV	0
Pcs7DiIn	FbkOpen	SimOn.Value	Simulation enabled	1
Pcs7DiIn	FbkOpen	SimPV_In.Value	Simulation value PV	0
VlvL	Valve	Feature.Bit4	Set switch or button mode (switch mode)	1

- In the "General" tab, accept the default setting for "Create block icons" (no checkmark for the blocks Interloc, Permit and Protect).
2. Click "OK" for each block. Your settings are applied.
 3. Close the CFC.

5.5.14 How to Assign Parameters for Blocks in the "CFC_NP111"

Introduction

You have already inserted the "CFC_NP111" CFC as a process tag type. For this chart, you still need to adapt the default parameter values to your "color_gs" project.

Note

You do not have to adapt the names of the individual blocks when using process tag types.

Requirement

The "CFC_NP111" CFC is open in the CFC Editor - Save in folder: "color_gs_MP\color_gs_Prj\Plant1\RMT1\ NP111".

Procedure

1. Open the "General" tab and the "I/Os" tab in the "Object Properties" dialog box for each listed block.
 - Enter the parameters for all blocks according to the table below.

Note

Proceed as follows for the "**STRUCT**" data type (e.g., "SimOn.Value"):

- Select the "Open structure" command from the shortcut menu.
The "Structure - <I/O name>" dialog box opens.
 - Double-click the line named "Value".
-

Block	Block name in the project	I/O	Meaning	Value
Pcs7Diln	FbkRun	SimOn.Value *	Switch simulation active	1
		Feature.Bit29	Enables a substitute value	1
		SimPV_In.Value *	Simulation value PV	0
MotL	Motor	Monitor	Deactivate monitoring	0
		ModLiOp.Value *	Automatic/manual mode selection	0
		AutModOp	Disable automatic mode	0
		Feature.Bit4	Set switch or button mode (switch mode)	1

* Invisible in CFC, see "Note"

- Do not set a check mark for "Create block icons" in the "General" tab for the following blocks: Interloc, Permit, Protect.
2. Click "OK" for each block.
Your settings are applied.
 3. Close the chart.

5.5.15 How to select block icons

Introduction

In order to later use the desired block icons when creating the , process picture, you must first select them.

Procedure

1. Select the VlvL or MotL block on the respective charts in the CFC Editor.
2. Open the "Object properties" using the shortcut menu.
3. In the "Create block icon" box in the "OCM possible" area of the "General" tab, enter a number as shown below. The number indicates the orientation of the icon to its text.

Chart	Block	Number	Meaning
CFC_NK111	VlvL	2	Right of the text
CFC_NK112	VlvL	2	Right of the text
CFC_NK113	VlvL	1	Below the text
CFC_NK114	VlvL	1	Below the text
CFC_NP111	MotL	2	Right of the text

Alternatively, the desired block icons can also be selected in the process view from the "Blocks" tab or removed from one of the template charts in WinCC .

5.5.16 Interconnection of Blocks in the CFC Charts

Interconnection of Blocks

Now, you will interconnect the inputs and outputs in the charts. You can interconnect the blocks conveniently by clicking on the graphic user interface of the CFC editor. To do so, click first on the output of a block and then on the input you want to interconnect the output with. After clicking on the input, the interconnection is displayed as a line. The CFC Editor automatically draws lines in the best position. The position of the lines has no impact on the function of the interconnection.

Note

If you draw a connection incorrectly:

Click on the line of the incorrect interconnection and select the **Edit > Delete** command.

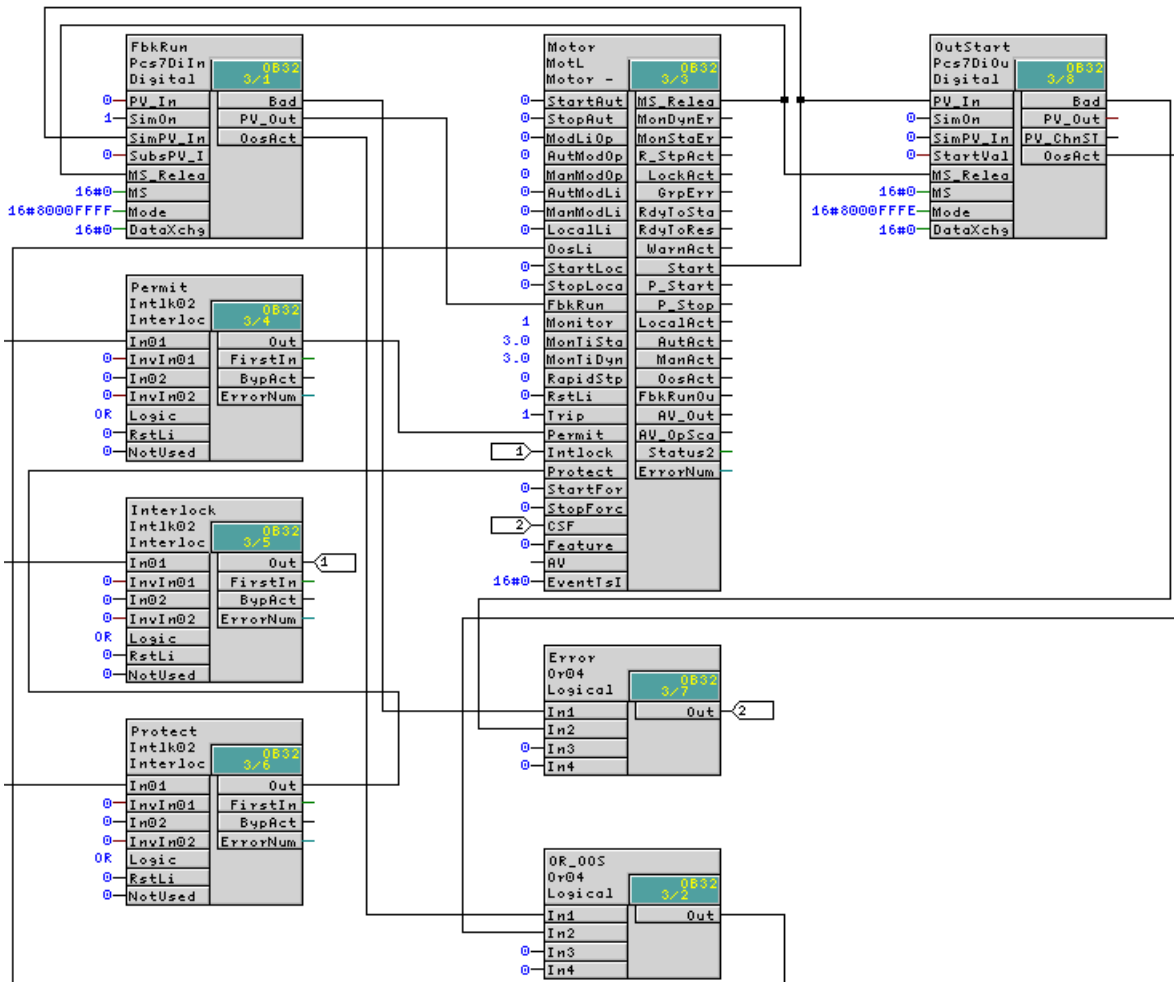
5.5.17 How to interconnect the blocks in the "CFC_NP111"

Requirements

- The "CFC_NP111" CFC is open in the CFC Editor.
- All blocks are inserted, renamed and configured.

Procedure

1. Click on the "Start" output in the middle block "Motor".
2. Now click the "SimPV_in" input on the "FbkRun" block. The CFC Editor automatically creates a line indicating the interconnection. The CFC should now appear as follows:



5.5.18 How to Interconnect Blocks in the "CFC_FC111"

Requirements

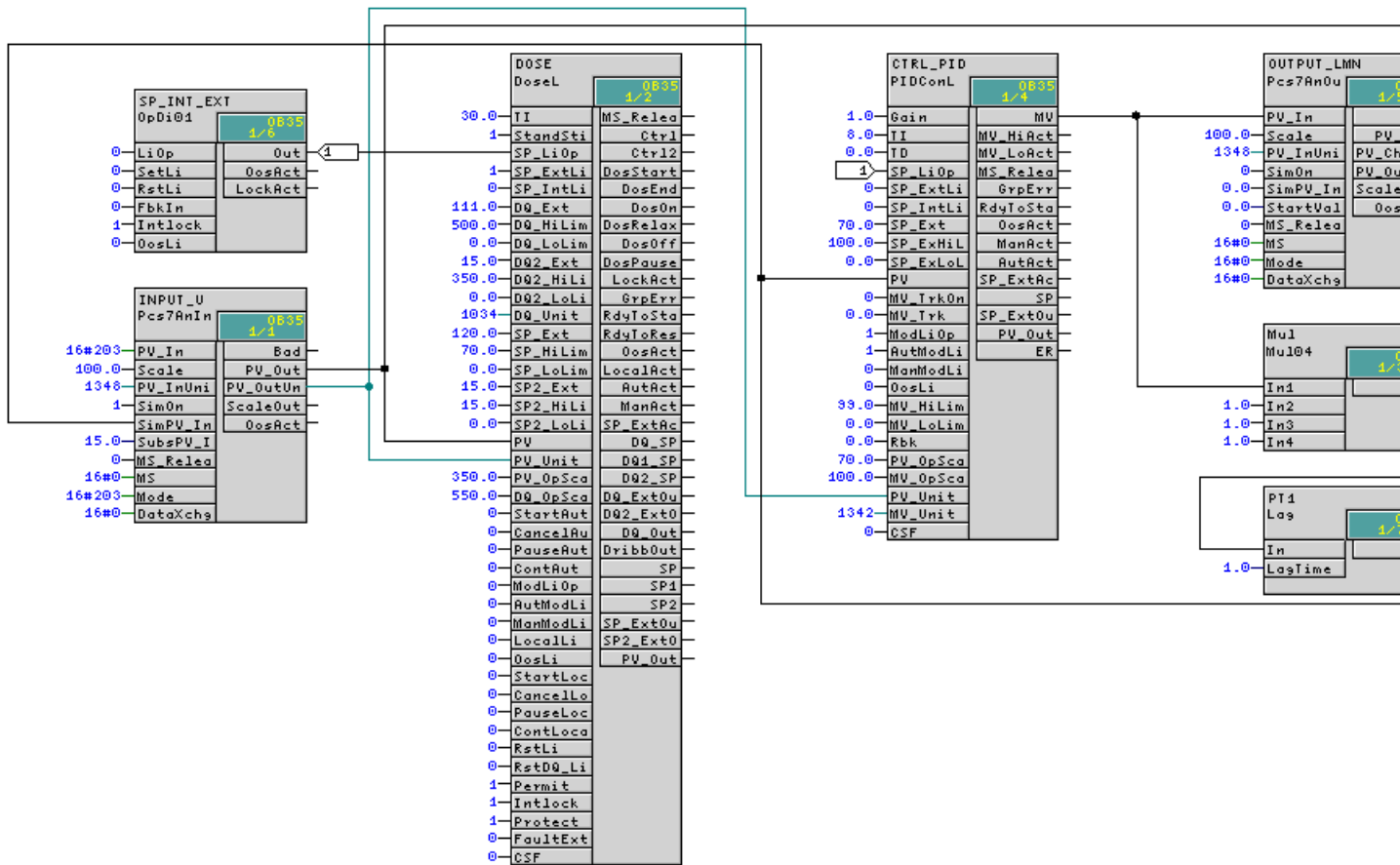
- The "CFC_FC111" CFC is open in the CFC Editor.
- All blocks are inserted, renamed and configured.

Procedure

1. Click the "Out" output on the "SP_INT_EXT" block.
2. Now click the "SP_LiOp" input on the "DOSE" block.
The CFC Editor automatically creates a line indicating the interconnection.
3. Following the same procedure, interconnect additional blocks according to the table below.
(The "4" block is located on the CFC_LI111 chart. To do this, place the two charts side by side.)

Block description	Output	Block description	Input
SP_INT_EXT	Out	DOSE	SP_LiOp
	Out	CTRL_PID	SP_LiOp
INPUT_U	PV_Out	DOSE	PV
	PV_Out	4 (in chart CFC_LI111)	In1
	PV_OutUnit	DOSE	PV_Unit
	PV_OutUnit	CTRL_PID	PV_Unit
	SimPV_In	CTRL_PID	PV
	SimPV_In	PT1	Out
CTRL_PID	MV	OUTPUT_LMN	PV_In
	MV	MUL	In1
MUL	Out	PT1	In

4. The CFC should now appear as follows:



5. Close the chart.

5.5.19 How to Interconnect Blocks in the "CFC_LI111"

Requirements

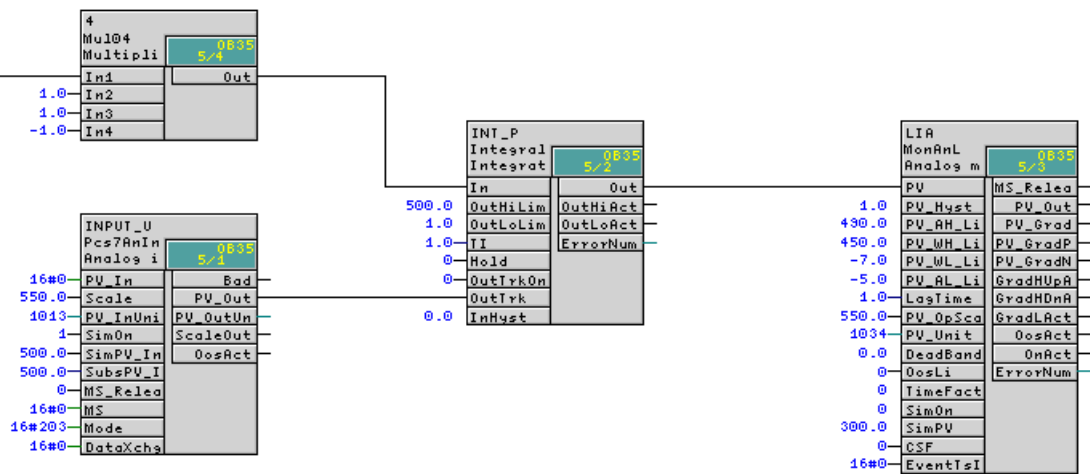
- The "CFC_LI111" CFC is open in the CFC Editor.
- All blocks are inserted, renamed and configured.

Procedure

- 1. Interconnect the blocks according to the table below.

Block description	Output	Block description	Input
INPUT_U	PV_Out	INT_P	OutTrk
INT_P	Out	LIA	PV
4	Out	INT_P	In

- 2. The CFC should now appear as follows:



- 3. Close the chart.

5.5.20 How to interconnect the blocks in the "CFC_NK11x"

Requirements

- The CFCs "CFC_NK111" to "CFC_NK_114" are open in the CFC Editor.
- All blocks are inserted, renamed and configured.

Procedure

- 1. Interconnect the blocks for each chart according to the table below.

Block description	I/O	Block description	I/O
Valve	Ctrl	FbkOpen	SimPV_in
Valve	Ctrl	FbkClose	SimPV_In (inverted)

- 2. Close the chart.

5.6 CFCs in the process object view

5.6.1 Use of the Process Object View for Valve Control

Introduction

Now work on the charts CFC_NK111 to CFC_NK114. Until now you have inserted the "VALVE" process tag type in your master data library and created the four hierarchy folders in the plant hierarchy.

Working with the process object view

To handle almost identical charts, you will now become familiar with an extremely convenient function in PCS 7: the process object view. This means that you do not need to open each individual chart in the CFC Editor and assign parameters; rather, you can modify values quickly in a table within the process object view.

The following preparations are necessary for this:

- Define the I/O in the process tag type for the process object view (Page 97)
As the process object view does not visualize all I/Os for reasons of clarity you must define the I/Os to be shown. You define this once in the process tag type in the master data library.
- Rename process tag types and their insertion into the hierarchy folder (Page 73)
You are going to copy the process tag type from the master data library to all the hierarchy folders in which you require the valve control..
- Edit parameter values in the process object view (Page 99)
The next sections are going to demonstrate the benefits of a process object view: you can edit values quickly and easily in a table.

5.6.2 Procedure

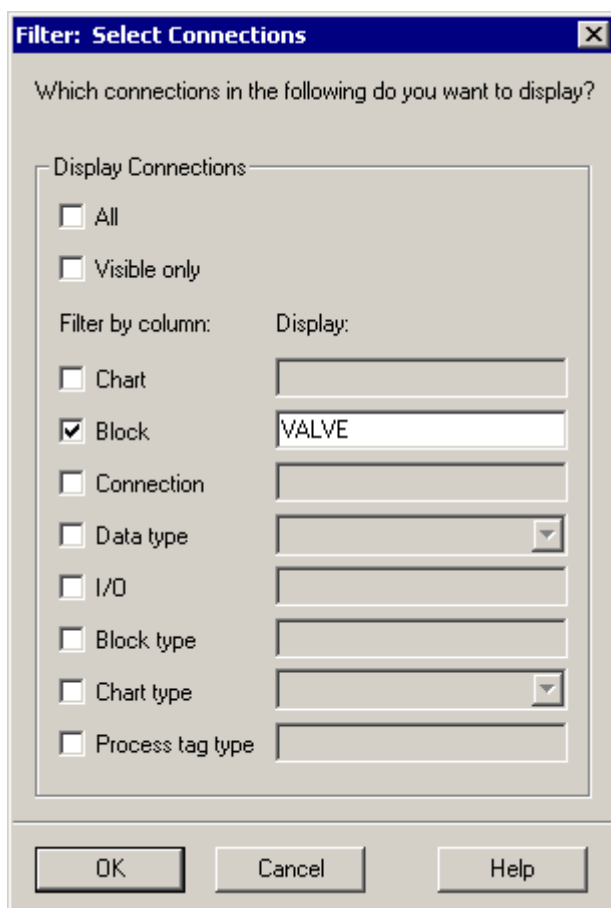
5.6.2.1 How to Define Inputs/Outputs for the Process Object View

Requirements

- The example project is open in SIMATIC Manager.
- The process object view is activated.

Procedure

1. Select the "color_gs_Lib\Process tag types\Valve_Lean" object in the tree view.
2. Select the menu command **Options > Process Objects > Select Connections....**
The "Filter: Select Connections" dialog box opens.
3. Enable the "Block" check box and enter the value "VALVE" in the input box.
By making this setting, only "VALVE" block connections will be shown.



4. Click "OK".
The "Select Connections" dialog box opens.
5. Click the column header of the "Parameter" column.
This will display all connections in the upper lines that are activated in the "Parameters" column.
6. Deactivate the check boxes of these connections.

7. Activate the check boxes in the "Parameters" column for the following connections:

- AutModLi
- Monitor
- Feature.Bit16

Note

If you click on the title of the "I/O" column, the I/Os are sorted in ascending or descending order. This makes it easier to find what you are looking for.

8. Click "OK".

The "Select Connections" dialog box closes.

9. Exit the process object view.

5.6.2.2 How to Adapt the Parameters for "CFC_NK11x"

Requirements

- The example project is open in SIMATIC Manager.
- The process object view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\Plant1\ RMT1" folder in the tree view.
2. Select the "Blocks" tab. The program updates the data.
3. Select the "Block" entry from the "Filter by column:" drop-down list.
This activates the "Display" box.
4. Enter the name of the block in the "Display" input box: "VALVE".
The program updates the table and shows you the "Valve" block for all four CFCs.

Note

If the name of the CFC is not fully displayed in the column, position the cursor between the "Chart" column and "Chart Comment" column and double-click. This adapts the column width automatically to the width of the entries.

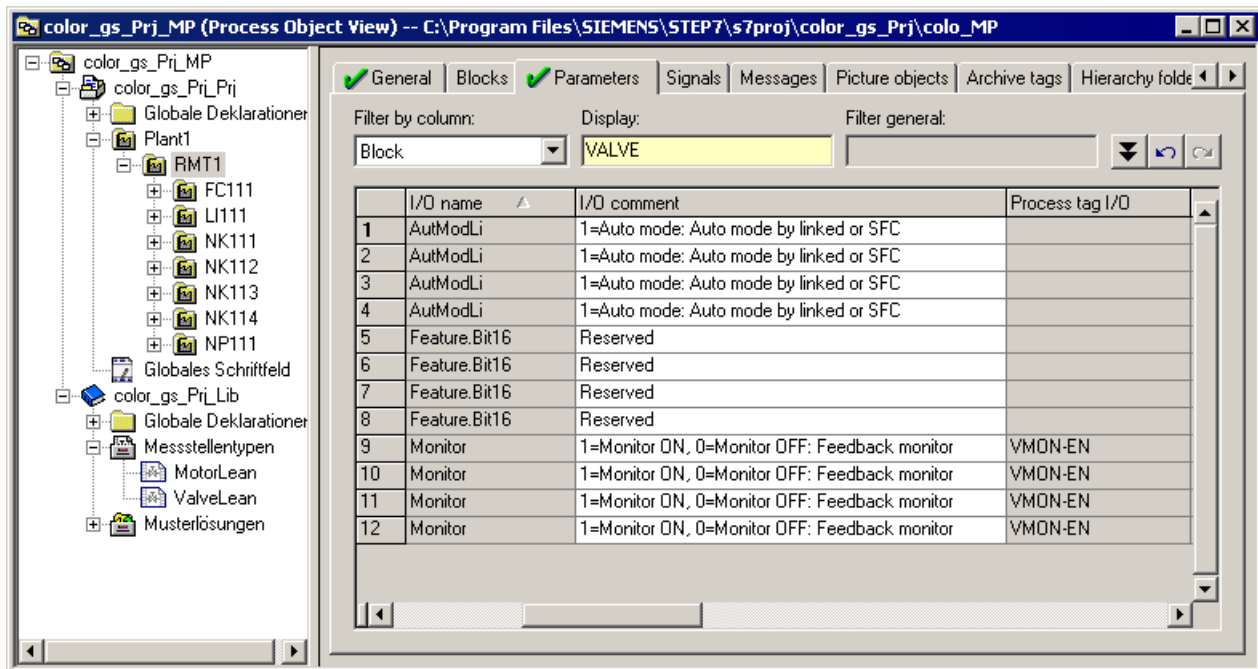
5. Enter the name "stop_valve1" in the "Block Comment" column for the "CFC_NK111" chart, and press Enter.
This updates the block comment at all connections of this chart.

6. Change the block comment for the other CFCs in the way shown in the table below.

CFC	Block comment
CFC_NK112	stop_valve2
CFC_NK113	stop_valve3
CFC_NK114	stop_valve4

7. Select the "Parameters" tab.
The program updates the data.
8. Select the "Block" entry from the "Filter by column:" drop-down list.
The program activates the "Display" field.

9. Enter the name of the block in the "Display" input box: "VALVE".
The program updates the table. You see exactly three I/Os for each chart.



10. Go to the "Value" column and enter the values as listed in the table below.
The following applies to the "Value" column:

- Position the cursor in the appropriate field. This changes the field into a drop-down list.
- Select the desired item in the drop-down list.

CFC	I/O	Meaning	Value
CFC_NK111	Feature.Bit16	Specify the initial valve state (open/closed)	0
	Monitor	Disable monitoring of feedback from the process for the example	0
	AutModLi	Switch the valve to automatic mode	1
CFC_NK112	Feature.Bit16	See above	0
	Monitor	See above	0
	AutModLi	See above	1
CFC_NK113	Feature.Bit16	See above	1
	Monitor	See above	0
	AutModLi	See above	1
CFC_NK114	Feature.Bit16	See above	1
	Monitor	See above	0
	AutModLi	See above	1

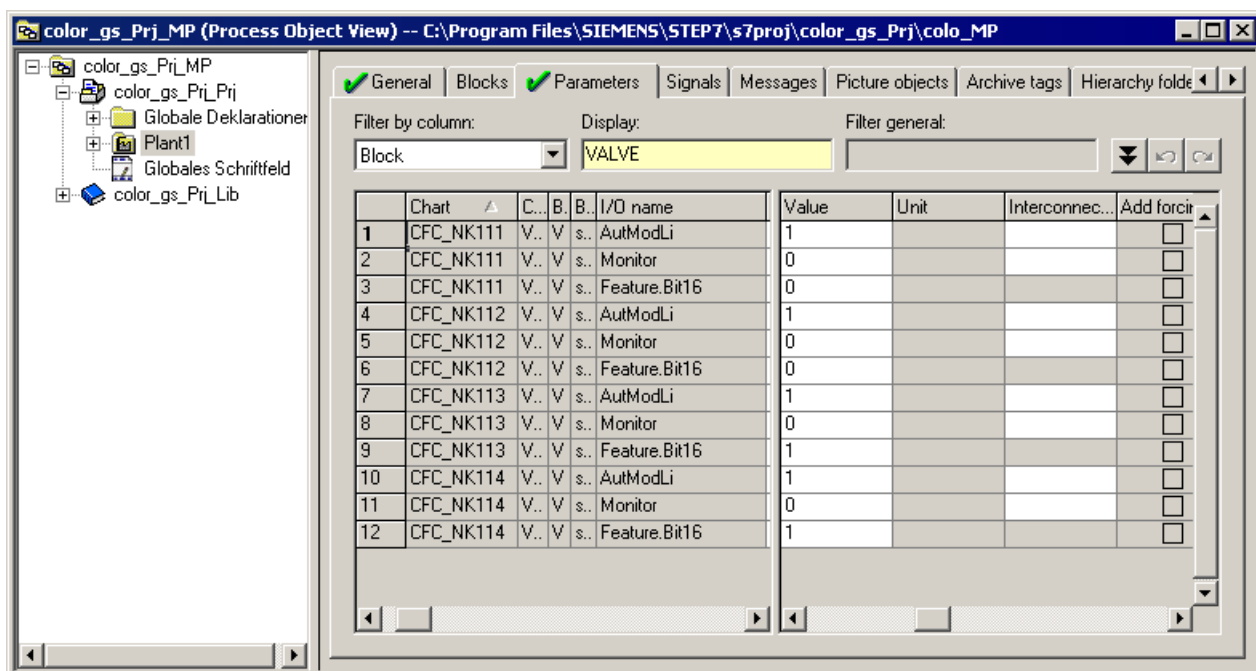
Note on the Display

Note

Depending on the size of your monitor, you may not be able to see the "Chart" column any more and, as a result, the assignment of the individual I/Os to a chart becomes difficult.

The process object view offers you the following options:

1. Position the cursor on the small box on the left next to the horizontal scroll bar and click. This makes a vertical marker visible in the table.
2. Hold down the mouse button and drag this vertical marker behind the "I/O" column.
3. Release the mouse button. This splits the table window and you can navigate in the right side with the horizontal scroll bar in the table, while the chart names are displayed on the left side.



5.6.2.3 How to Delete Interconnections to Addresses

Introduction

You use process tag types from the PCS 7 Library in your project for the NK111 to NK114 valve controls and the NP111 motor control. These process tag types have default interconnections to input/output modules. Because you are working without real input/output modules in this Getting Started, a warning message appears during compilation. You have to delete these interconnections to avoid the warnings.

Requirement

- The example project is open in SIMATIC Manager.
- The process object view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\Plant1\ RMT1" folder in the tree view.
2. Open the "Signals" tab.
The program updates the data.
3. Click in the column header of the "Signal" column to sort the entries in the column.
4. Select all entries in the column "Signal" and press the key .
5. Close the process object view.

5.7 The current status...

5.7.1 Current Status of Your Project

Completed Configuration Tasks

You have completed the following tasks during CFC configuration:

- You have inserted blocks in the CFC Editor, assigned parameters for the blocks and interconnected them.
- You have used the process object view to assign parameters to the same process tag types.

Creating SFCs

6.1 Overview of SFC Charts

The Theory – What is SFC?

The SFC (Sequential Function Chart) editor enables you to graphically configure and commission sequential control systems. A sequential control system enables a status-driven or event-driven sequence of production processes. The sequential control system controls the functions created with CFC based on sequences and executes them selectively.

An SFC offers two independent versions of sequential control systems for different application scenarios:

- SFC
- SFC type with SFC instances

SFC

An SFC is a standardized interface for controlling the SFC with the user program or by the operator. The sequential control system accesses the blocks and signals directly and is therefore not reusable.

SFC type/SFC instance

An SFC type is a standardized interface for controlling the SFC with the user program or by the operator. You can extend the interface. The SFC type accesses only its own interface and can therefore be used as often as required as an SFC instance.

Sequencer

Sequencers enable status-dependent and event-driven execution in the SFC. The sequencers of an SFC can be controlled through start conditions defined in various ways.

- An SFC can include up to 8 sequencers.
- An SFC type can include up to 32 sequencers.

You can find additional information in the SFC documentation.

6.2 Working with the SFC Editor

6.2.1 Introduction to the SFC Editor

SFC Editor

As soon as you open an SFC, the SFC Editor opens. The SFC Editor is always opened in the view in which it was closed the last time you worked with it.

Like the CFC Editor, the SFC Editor provides you with a graphic user interface that allows the convenient creation of sequential control systems.

A sequential control system essentially consists of two basic elements:

- Transition:
A condition which controls the execution of the subsequent step. Transitions are represented by small rectangles in the SFC.
- Step:
The step consists of actions that are performed in three phases.
 - Initialization
 - Execution
 - Completion

Initialization is performed once as soon as the step becomes active or if execution is canceled. It is executed until the follow-up transition is satisfied. When this is the case, the completion phase of the step is performed once. When the completion phase is finished, the step becomes inactive and the follow-up step becomes active.

Steps are represented by large rectangles in the SFC.

6.2.2 Important Functions in the SFC Editor

Important Functions in the SFC Editor

In the following section, we introduce you to the main functions of the SFC Editor that you will require for configuring the SFCs for your "color_gs" project.

You can find the buttons you need to build the sequencer in the toolbar of the SFC Editor. The buttons have the following meaning:

Button	Meaning
	When this button is activated, you can select individual objects from the SFC, such as steps and transitions. A step or transition that has been selected is highlighted in blue.
"Activate selection" button 	When this button is activated, the cursor transforms into a small cross and a circle with a bar. If you move the cross to a point in the chart where it is possible to insert a step or a transition, the cross

Button	Meaning
"Insert step + transition" button	becomes a "step with transition" symbol. At the same time, a green line indicates where the "step with transition" is to be inserted.
	When this button is activated, you can insert an alternative branch. This means that either one or the other branch is executed, depending on the transition defined.
"Insert alternative branch" button	

None of the other buttons are used in the "color_gs" project.

Additional information

Detailed information about the SFC Editor is available in the corresponding SFC Editor online help and in the *Process Control System PCS 7, SFC for SIMATIC S7* Manual.

6.2.3 Properties of Steps and Transitions

Introduction

In order to edit the names and values of the steps and transitions, you will work in the "Properties" dialog box. You do not need to reopen the dialog box every time for each step and transition. Instead, you can move directly to the next transition or the next step and to transitions and steps of an alternative branch in this dialog box.

Navigation Buttons

The following navigation buttons are available to you:

Button	Meaning
	You use this to change to the next transition/step
"Down arrow" button	
	You use this to change to the previous transition/step
"Up arrow" button	
	You use this to change to the adjacent transition/step
"Right arrow" button	
	
"Left arrow" button	

"Properties" dialog box

The dialog box has different tabs. The tabs are introduced briefly below.

Tab in "Properties" dialog box for a step:

- General - Here you make general settings, such as changing the name of the step.
- Initialization - The action you define here will be processed only once when you activate the step.
- Processing - The action you define here will be processed cyclically until the next transition will be met.
- Completion - The action you define here will be processed only once when you complete the step.

Tab in "Properties" dialog box for a transition:

- General - Here you make general settings, such as changing the name of the transition.
- Condition - In this tab you enter the condition at which the sequencer moves to the next transition.

6.2.4 Overview of the Configuration Steps for SFC Charts

Overview

To create SFCs, you perform the steps listed below:

Step	What?
1	Move SFC (Page 108)
2	Rename SFC (Page 109)
3	Open SFC (Page 110)
4	Define the technological structure of the sequential control system (Page 110)
5	Rename steps (Page 113)
6	Name transitions (Page 115)
7	Configure steps (Page 118)
8	Configure transitions (Page 123)
9	Optimize the run sequence (Page 126)

6.2.5 How to Move an SFC Chart

Introduction

The SFC "SFC(1)", which is created by the PCS 7 "New Project" wizard when you created the "color_gs" project, is stored in the "ADDIT" hierarchy folder. Since the charts are stored in the plant hierarchy according to their relevance, you will need to move the SFC created automatically by the PCS 7 Wizard to the relevant hierarchy folder.

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\Plant1\RMT1\ FC111\ ADDIT" folder in the tree view.
2. Select the object "SFC(1)" in the detail window.
3. Select the menu command **Edit > Cut**.
4. Select the "color_gs_MP\color_gs_Prj\Plant1\RMT1" folder in the tree view.
5. Select the menu command **Edit > Paste**.
The SFC is added to the selected folder.

6.2.6 How to Rename the SFC Chart

Introduction

To keep the naming consistent and clear within your project, you will need to change the default names.

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\Plant1\ RMT1" folder in the tree view.
2. Select the object "SFC(1)" in the detail window.
3. Select the menu command **Edit > Object Properties**.
The "Properties SFC Chart" dialog box opens and the "General" tab is selected.
4. Change the default name "SFC(1)" to "SFC_RMT1" in the "Name" box.
5. Click "OK" to apply your settings.

6.2.7 How to Open the "SFC_RMT1" SFC Chart

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "color_gs_MP\color_gs_Prj\Plant1\ RMT1" folder in the tree view.
2. Select the "SFC_RMT1" object in the detail view, followed by the menu command **Edit > Open Object**. The SFC Editor opens The "Start" and "End" steps and transition 1 already exist.

6.2.8 Technological Structure of the Sequential Control System

Technological Sequence

The following section provides you with an overview of the technological sequence of the individual steps and transitions in the sequential control system for the "color_gs" project:

Name of the Step	Function
START	Defaults: Start the dosing controller in automatic mode Set aggregates to automatic mode
DOSE_REA1 DOSE_REA2	Query: Should reactor 1 or reactor 2 be dosed?
INIT_LINE1 INIT_LINE2	Controllers: Open the valves of the relevant branch Turn the pump on
INIT_1_OK INIT_2_OK	Query: Is the pump switched on? Is the controller set to "External setpoint"?
INIT_DOSE	Controllers: Specify dosing rate setpoint Set dosing controller to automatic mode Specify dosing volume setpoint Start dosing procedure
INIT_OK	Query: If the setpoint of the course dosing quantity less than the dosing quantity?
SLOW_DOWN	Checking whether the engine is still running

Name of the Step	Function
END_DOSE	Query: Dosing ended?
CLOSE_LINE	Controllers: Close all valves Turn the pump off Switch dosing controller to manual mode Set dosing rate to 0 Stop dosing
CLOSE_OK	Query: Is the pump switched on?
END	Reset: Close valves Switch off motor

The plant operator can use the operator station to start, control and monitor this chart.

6.2.9 How to Create the Sequential Control System in the SFC Chart

Introduction

When you created the "color_gs" project with the PCS 7 wizard, PCS 7 automatically created an SFC.

When you open a new SFC in the SFC Editor, a sequencer with the following elements is displayed in the SFC:

- START" step
- Transition 1
- END" step

When you insert steps and transitions, the SFC Editor assigns continuous numbers. You then replace these numbers with descriptive, plant-specific names.

You now edit the "SFC_RMT1 SFC from the "color_gs"project with the SFC Editor.

Procedure

1. Select the "SFC_RMT1" SFC in the SFC Editor.
2. Select the menu command **View > Toolbar** if the toolbar buttons for inserting steps and transitions are hidden.
This opens the toolbar.

3. Click "Insert step + transition".



The cursor transforms into a small cross and a circle with a bar.

4. Position the cursor under transition 1, wait until a green line appears, and then insert the object by clicking it.
Step "3" and transition "2" are then incorporated into the SFC.

5. Click "Insert alternative branch".



6. Position the cursor under step "START", wait until a green line appears, and then insert the object by clicking it.

An alternative branch is inserted directly below step "START": In doing so, the transitions "3" and "4" are parallel and step "4" is set underneath.

7. Click "Insert step + transition".

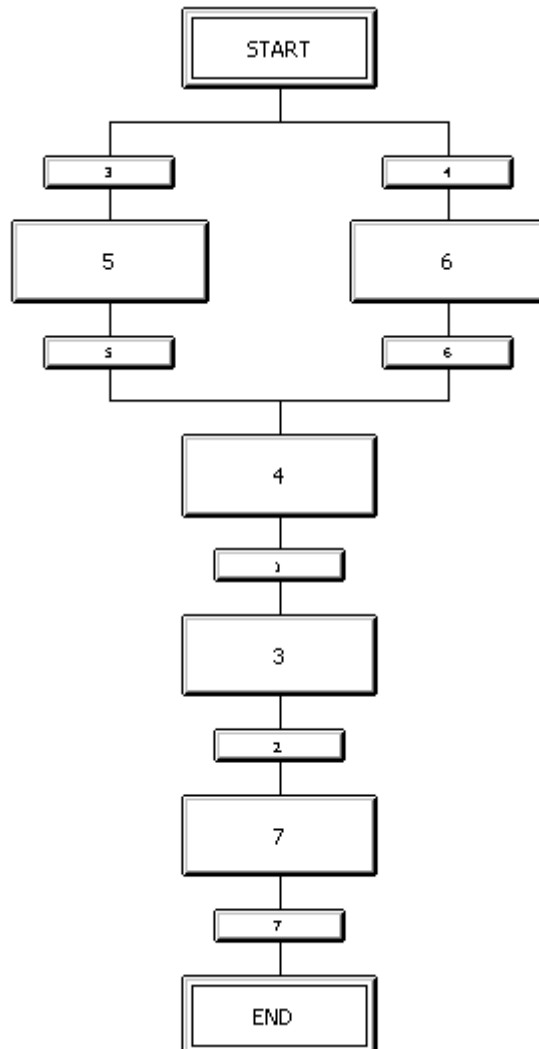


8. Place the cursor at the following positions and insert a step and transition:

- Underneath transition 3: Step 5 and transition 5 are inserted
- Underneath transition 4: Step 6 and transition 6 are inserted
- Underneath transition 2: Step 7 and transition 7 are inserted

Result

Your SFC should now appear as follows:



6.2.10 How to Rename Steps

Requirements

- The "SFC_RMT1" SFC is open in the SFC Editor.
- All steps and transitions have been inserted

Procedure

1. Click "Select".



2. Select step "5".
3. Select the menu command **Edit > Object Properties**.
The "Properties" dialog box opens and the "General" tab is selected.
The default entry "5" is already selected in the "Name" box.
4. Change the entry "5" in the "Name" input box to "INIT_LINE1".

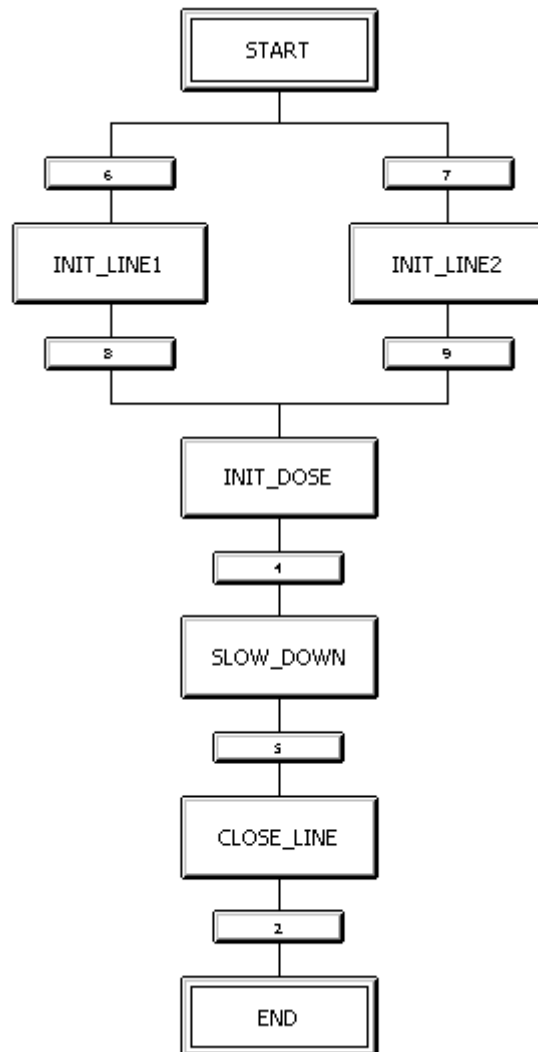
5. Click "Apply".
The new name is saved.
6. Click the "Down arrow".
This brings you to step "4".
7. Change the "4" in the "Name" input box to "INIT_DOSE" and click "Apply".
8. Navigate to the other steps using the arrow buttons and change the names in accordance with the table below. Each time you enter a new name, complete the change by clicking "Apply".

Default name	New name
3	SLOW_DOWN
7	CLOSE_LINE
6	INIT_LINE2

9. Click "Close".
This saves your settings and closes the "Properties" dialog box.

Result

The changed names of the individual steps are displayed in the SFC.



6.2.11 How to Rename Transitions

Introduction

Just as you renamed the steps, you must also replace the default names of all transitions with descriptive, plant-specific names. Use the same procedure as you did for changing the names of the steps.

Requirement

The "SFC_RMT1" SFC is open in the SFC Editor.

Procedure

1. Select transition "3", followed by the menu command **Edit > Object Properties**.
The "Properties" dialog box opens and the "General" tab is selected.
2. Change the default name in the "Name" box to a plant-specific name.
The plant-specific names are listed in the table below.

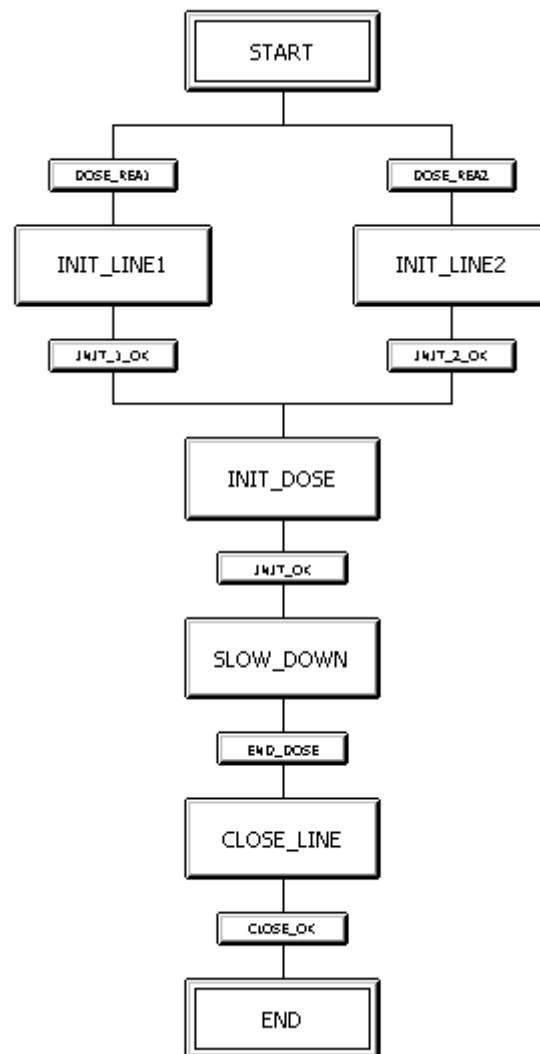
Default name	New name
3	DOSE_REA1
5	INIT_1_OK
1	INIT_OK
2	END_DOSE
7	CLOSE_OK
4	DOSE_REA2
6	INIT_2_OK

3. Each time you enter a name, complete the change by clicking "Apply".
4. Use the arrow buttons to move from one transition to the next.
5. Click "Close".
This saves your settings and closes the "Properties" dialog box.

Result

The changed names of the transitions are displayed in the SFC.

Your SFC should now appear as follows:



6.3 Setting parameters

6.3.1 How to Assign Parameters to the Steps of the SFC Chart

Introduction

From SFC, you assign values to the block inputs of the CFCs. The initial settings for the sequence of the dosing process are made with the first "START" step.

Each step for which you have defined an action is displayed in dark gray. This means that you can see at a glance whether or not a step has already had parameters assigned.

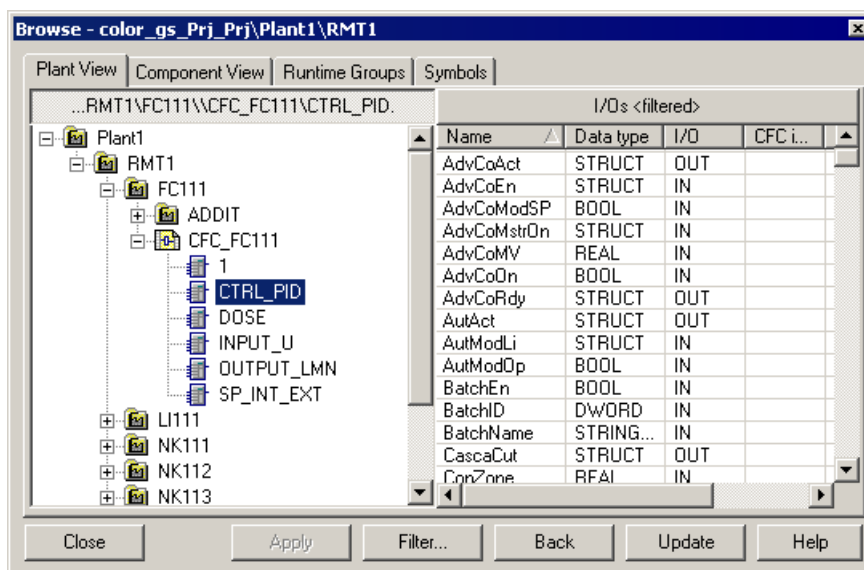
Requirements

- The "SFC_RMT1" SFC is open in the SFC Editor.
- The names of the steps and transitions have been adapted.

Procedure

1. Double-click step "START".
The "Properties" dialog box opens and the "General" tab is selected.
2. Switch to the "Initialization" tab.
This tab displays an empty list with what are known as statement lines; the cursor is positioned in the left column of the first line.
3. Click "Browse".
The "Browse" dialog box opens with the "Plant View" tab activated. In this dialog, the plant hierarchy is displayed in the left section and the I/Os of the block you have selected in the plant hierarchy are shown in the right section.

4. Select the "Plant1\RMT1\FC111\CFC_FC111\ CTRL_PID" block in the tree view. The section on the right side shows all corresponding block connections.



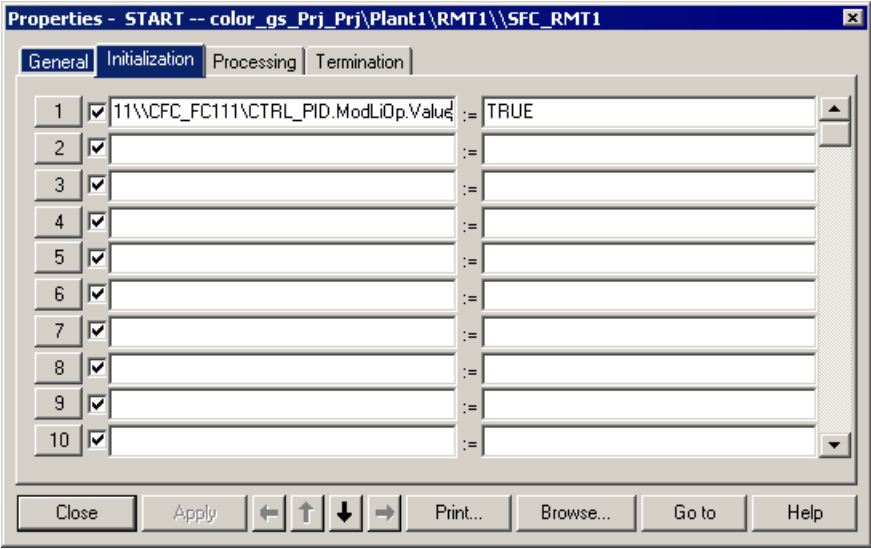
5. Right-click the "ModLiOp" input and select the "Open structure" command from the shortcut menu.
6. Select the "Value" line in the "Structure - ModLiOp" dialog box and click "Apply". The "Browse" dialog box goes to the background and the selected block interface along with its full path is entered in line 1. The cursor is automatically positioned in the right column of line 1.

Note

If you cannot read the names of the block I/Os, increase the width of the column.

7. Enter the value "1" in this input box.

8. Click "Apply".
The value "1" is automatically replaced by "TRUE". The first assignment in the "Start" step is now complete. The dialog box now appears as follows:



9. Click the button with the number "2".
This button appears directly before the statement line. The cursor is then positioned in the left column of the second line.
10. Repeat steps 3 through 9 to define the remaining addresses for step "START". You will find the information you require in the table 'Entries in the "Properties - START" dialog box' below.
11. Click "Apply".
12. Click the arrow button to navigate to the other steps and enter the addresses according to the tables below.

Note

The addresses in the table are specified in the following format:
[chart folder\chart name\block.I/O].

The "Plant1\RMT1" component is omitted because it is identical for all objects. This keeps the table easy to understand. As soon as you insert an additional plant or unit in the "color_gs" project, you must, of course, also pay attention to the assignment of the chart to the plant hierarchy.

Note

When entering the addresses, verify that you have selected the required step based on the title bar of the "Properties" dialog box.

If you have inadvertently closed the "Properties" dialog box, double-click on the step you are currently editing to reopen the dialog box.

Table 6-1 Entries in the "Properties - START" dialog box

No.	Column 1	Column 2	Meaning
1	FC111\CFC_FC111\ CTRL_PID.ModLiOp.Value	TRUE	Activate automatic mode
2	FC111\CFC_FC111\ CTRL_PID.AutModLi.Value	TRUE	Controller automatic mode
3	FC111\CFC_FC111\ CTRL_PID.SP_ExtLi.Value	TRUE	Select external setpoint
4	FC111\CFC_FC111\ DOSE.ModLiOp.Value	TRUE	Activate automatic mode
5	FC111\CFC_FC111\ DOSE.AutModLi.Value	TRUE	Dosing automatic mode
6	FC111\CFC_FC111\ DOSE.StartAut.Value	FALSE	Dosing stop; no start
7	FC111\CFC_FC111\DOSE.RstDQ_Li.Value	TRUE	Reset dosing quantity via interconnection
8	LI111\CFC_LI111\INT_P.OutTrkOn.Value	TRUE	Tracking
9	LI111\CFC_LI111\INT_P.Hold.Value	FALSE	Hold output value
10	NK111\CFC_NK111\ Valve.AutModOp	TRUE	Valve in automatic mode
11	NK112\CFC_NK112\ Valve.AutModOp	TRUE	Valve in automatic mode
12	NK113\CFC_NK113\ Valve.AutModOp	TRUE	Valve in automatic mode
13	NK114\CFC_NK114\ Valve.AutModOp	TRUE	Valve in automatic mode
14	NP111\CFC_NP111\ Motor. AutModOp	TRUE	Motor in automatic mode

6.3.2 Parameters for the Steps

Parameters for the step "INIT_LINE1" on the "Initialization" tab

The following table shows the parameters for the "INIT_LINE1" step:

No.	Column 1	Column 2	Meaning
1	NK111\CFC_NK111\Valve.OpenAut.Value	TRUE	Open valve
2	NK112\CFC_NK112\Valve.OpenAut.Value	TRUE	Open valve
3	NK113\CFC_NK113\Valve.OpenAut.Value	TRUE	Open valve
4	NP111\CFC_NP111\Motor.StartAut.Value	TRUE	Switch on motor
5	FC111\CFC_FC111\DOSE.RstDQ_Li.Value	FALSE	Do not reset dosing quantity via interconnection

Parameters for the step "INIT_LINE2" on the "Initialization" tab

The following table shows the parameters for the "INIT_LINE2" step:

No.	Column 1	Column 2	Meaning
1	NK111\CFC_NK111\Valve.OpenAut.Value	TRUE	Open valve
2	NK112\CFC_NK112\Valve.OpenAut.Value	TRUE	Open valve
3	NK114\CFC_NK114\Valve.OpenAut.Value	TRUE	Open valve
4	NP111\CFC_NP111\Motor.StartAut.Value	TRUE	Switch on motor

Parameters for the step "INIT_DOSE" on the "Initialization" tab

The following table shows the parameters for the "INIT_DOSE" step:

No.	Column 1	Column 2	Meaning
1	FC111\CFC_FC111\CTRL_PID.AutModLi.Value	TRUE	Controller to automatic
2	FC111\CFC_FC111\DOSE.StartAut.Value	TRUE	Dosing to automatic
3	LI111\CFC_LI111\INT_P.OutTrkOn.Value	FALSE	No tracking for integrator
4	NP111\CFC_NP111\Motor.StartAut.Value	TRUE	Motor to automatic
5	FC111\CFC_FC111\CTRL_PID.MV_TrkOn.Value	FALSE	Manipulated value tracking

Parameters for the step "INIT_DOSE" on the "Processing" tab

The following table shows the parameters for the "INIT_DOSE" step:

No.	Column 1	Column 2	Meaning
1	FC111\CTRL_PID.SP_Ext.Value	FC111\DOSE.SP1.Value	Controller's external setpoint is the coarse dosing flow setpoint of the dosing block

Specify run time - "INIT_DOSE" Step

1. Switch to the "General" tab.
2. Enter the value "8s" in the "Minimum" input box in the "Run times" group.
3. Click "Apply". PCS 7 automatically changes the value to "T#8s".

Parameters for the step "SLOW_DOWN" on the "Processing" tab

The following table shows the parameters for the "SLOW_DOWN" step

No.	Column 1	Column 2	Meaning
1	Plant1\RMT1\FC111\ \CFC_FC111\CTRL_PID.MV_TrkOn.Value	FALSE	Controller to automatic
2	Plant1\RMT1\FC111\ \CFC_FC111\CTRL_PID.SP_Ext.Value	Plant1\RMT1\FC111\ \CFC_FC111\DOSE.SP2.Value	Controller's external setpoint is the fine dosing flow setpoint of the dosing block

Specify run time - "SLOW_DOWN" Step

1. Switch to the "General" tab.
2. Enter the value "2s" in the "Minimum" input box in the "Run times" group.
3. Click "Apply". PCS 7 automatically changes the value to "T#2s".

Parameters for the "CLOSE_LINE" step on the "Initialization" tab

The following table shows the parameters for the "CLOSE_LINE" step:

No.	Column 1	Column 2	Meaning
1	NK111\CFC_NK111\Valve.OpenAut.Value	FALSE	Close valve
2	NK112\CFC_NK112\Valve.OpenAut.Value	FALSE	Close valve
3	NK113\CFC_NK113\Valve.OpenAut.Value	FALSE	Close valve
4	NK114\CFC_NK114\Valve.OpenAut.Value	FALSE	Close valve
5	FC111\CFC_FC111\DOSE.StartAut.Value	FALSE	Switch off dosing
6	NP111\CFC_NP111\Motor.StartAut.Value	FALSE	Switch off motor
7	LI111\CFC_LI111\INT_P.Hold.Value	TRUE	Stop integrator
8	FC111\CFC_FC111\DOSE.AutModLi.Value	FALSE	Dosing: Automatic off
9	FC111\CFC_FC111\DOSE.ModLiOp.Value	FALSE	Dosing in manual mode
10	FC111\CFC_FC111\CTRL_PID.ManModLi.Value	TRUE	Controller in manual mode
11	FC111\CFC_FC111\CTRL_PID.MV_TrkOn.Value	TRUE	Manipulated value tracking

Parameters for the step "END" on the "Initialization" tab

The following table shows the parameters for the "END" step:

No.	Column 1	Column 2	Meaning
1	NK111\CFC_NK111\Valve.OpenAut.Value	FALSE	Close valve
2	NK112\CFC_NK112\Valve.OpenAut.Value	FALSE	Close valve
3	NK113\CFC_NK113\Valve.OpenAut.Value	FALSE	Close valve
4	NK114\CFC_NK114\Valve.OpenAut.Value	FALSE	Close valve
5	NP111\CFC_NP111\Motor.AutModOp	FALSE	Switch off motor
6	FC111\CFC_FC111\CTRL_PID.AutModLi.Value	FALSE	Controller in manual mode
7	FC111\CFC_FC111\CTRL_PID.ModLiOp.Value	FALSE	Controller in manual mode
8	FC111\CFC_FC111\CTRL_PID.ManModLi.Value	FALSE	Controller in manual mode
9	FC111\CFC_FC111\CTRL_PID.Man	0.0	Manual specification for the manipulated variable

6.3.3 How to Assign Parameters to the Transitions of the SFC Chart

Introduction

A transition contains the conditions according to which a sequential control system passes control from one step to the next. In principle, you assign parameters for the transitions in the same way as for the steps.

Requirements

- The "SFC_RMT1" SFC is open in the SFC Editor.
- The default names of the steps and transitions have been adapted.

Procedure

1. Double-click transition "DOSE_REA1".
The "Properties" dialog box opens and the "General" tab is selected.
2. Switch to the "Condition" tab.
This tab displays a blank list (the statement lines). The cursor is positioned in the left column of the first line. The layout of the dialog box is the same as you saw when the assigning parameters for the steps.
3. Assign the parameters for transition "DOSE_REA1".
The entries required for this are listed in the tables below. Below you can see an overview of the steps as a reminder:
 - For address 1: click the "Browse" button to open the "Browse" dialog box and select the relevant I/O
 - Enter address 2
 - Apply your settings
 - Select a new line
 - etc.
4. Select the new transition and enter the addresses.

Note

When entering the addresses, verify that you have selected the required transition based on the title bar of the "Properties" dialog box.

Just as with the parameters for steps, the addresses in the table are specified in the following format:

[chart folder\chart name\block.I/O].

The plant hierarchy is omitted.

6.3.4 Parameters for the Transitions

Parameters for the "DOSE_REA1" transition

The following table shows the parameters for the "DOSE_REA1" transition

No.	Column 1	Column 2	Column 3	Meaning
1	FC111\ADDIT\CFC_SETP\ PARA_DOS_RM1_SEL.Out.Value	=	0	Dosing in reactor 1?

Parameters for the "INIT_1_OK" transition

The following table shows the parameters for the "INIT_1_OK" transition:

No.	Column 1	Column 2	Column 3	Meaning
1	NP111\CFC_NP111\Motor.FbkRunOut.Value	=	TRUE	Motor on?
2	FC111\CFC_FC111\CTRL_PID.SP_ExtAct.Value	=	TRUE	External setpoint active?

Parameters for the "DOSE_REA2" transition

The following table shows the parameters for the "DOSE_REA2" transition:

No.	Address 1	Operator	Address 2	Meaning
1	FC111\ADDIT\CFC_SETPI\PARA_DOS_RM1_SEL.Out.Value	=	1	Dosing in reactor 2?

Close the SFC.

Parameters for the "INIT_2_OK" transition

The following table shows the parameters for the "INIT_2_OK" transition:

No.	Column 1	Column 2	Column 3	Meaning
1	NP111\CFC_NP111\Motor.FbkRunOut.Value	=	TRUE	Motor on?
2	FC111\CFC_FC111\CTRL_PID.SP_ExtAct.Value	=	TRUE	External setpoint active?

Parameters for the "INIT_OK" transition

The following table shows the parameters for the "INIT_OK" transition:

No.	Column 1	Column 2	Column 3	Meaning
1	FC111\CFC_FC111\DOSE.DQ1_SP.Value	<	FC111\CFC_FC111\DOSE.DQ_Out.Value	Setpoint of coarse dosing is less than the dosing quantity?

Parameters for the "END_DOSE" transition

The following table shows the parameters for the "END_DOSE" transition:

No.	Column 1	Column 2	Column 3	Meaning
1	FC111\CFC_FC111\DOSE.DosEnd.Value	=	TRUE	Dosing ended?

Parameters for the "CLOSE_OK" transition

The following table shows the parameters for the "CLOSE_OK" transition:

No.	Column 1	Column 2	Column 3	Meaning
1	NP111\CFC_NP111\Motor.FbkRunOut.Value	=	FALSE	Motor off?

6.3.5 How to Optimize the Run Sequence

Introduction

PCS 7 provides you with a function for optimizing the run sequence based on the data flow. You use this function when you have completed the configuration of the CFC and SFCs.

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. In the tree view, select any folder in which you have saved a CFC.
2. Select a CFC from the detail view, followed by the menu command **Edit > Open Object**.
The chart opens in the CFC Editor.
3. Select **Options > Optimize Run Sequence.....**
The message dialog "The run sequence of the blocks will be changed...." opens.
4. Click "OK".
The run sequence is optimized.
5. Close the CFC.

6.4 The current status...

6.4.1 Current Status of Your Project

Completed configuration tasks

What have you learned during the SFC configuration?

- You have worked with standard functions such as renaming and opening.
- You have created a sequential control system with graphic support.
- You have renamed and assigned parameters to the steps and transitions of the sequential control system.
- You have optimized the run sequence.

Compiling, downloading and testing the charts

7.1 Overview of Compiling, Downloading, and Testing

Overview

This tutorial will explain the following to you:

- How to compile the program you have created with CFC and SFC.
- How to download your program to the CPU.
- How to run your program in test mode.

This allows you to check the correct functionality of the charts. You already been introduced to the "Download" function when you downloaded the hardware configuration.

You perform two steps in conjunction with creating the chart:

- First, you compile and download the blocks and charts – for this task, you use the "Compile and Download Objects" function.
- Then, you test the program – you can test both in the SFC Editor and in the CFC Editor.

7.2 Procedure

7.2.1 How to Compile and Download CFC and SFC Charts

Introduction

You have created the CFC and SFCs for your "color_gs" project. These charts must be compiled and loaded in a CPU for the automation functions to be executed by the AS. The compile and download operation are started in a common dialog box and run one after the other.

Requirements

- The CPU is in "STOP" mode.
- The example project is open in SIMATIC Manager.
- The component view is activated.

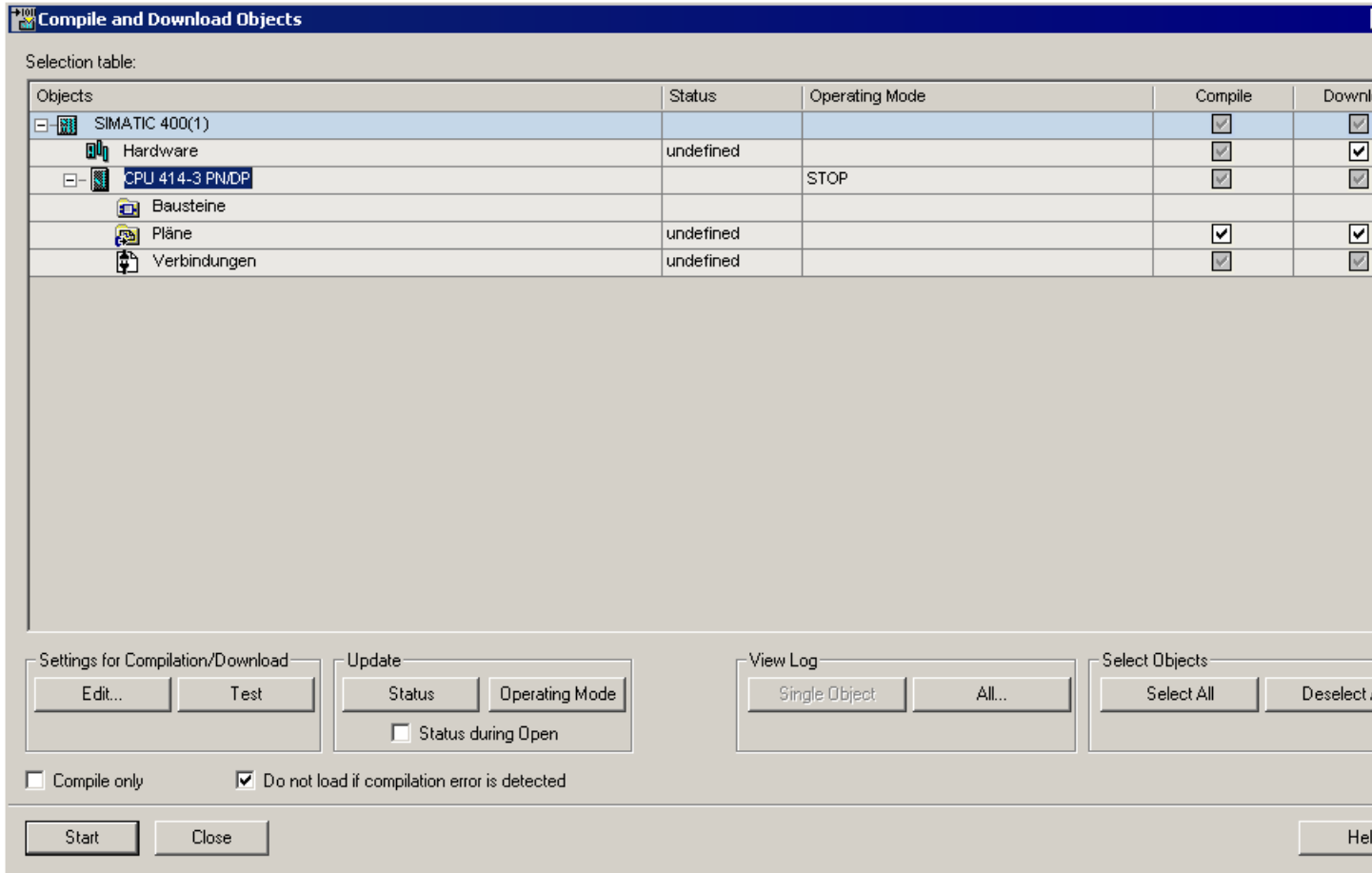
Procedure

1. Select the "color_gs_MP\color_gs_Prj\SIMATIC 400(1)" folder in the tree view.
2. Select the menu command **PLC > Compile and Download Objects**.
The "Compile and Download Objects" dialog box opens.

3. Click "+" to expand the tree view.

The view shows a structure of the "color_gs" project that is essentially the same as the component view in SIMATIC Manager.

The view shows status or operating state information for each object:



4. Select the "Compile" and "Download" check boxes for the "Charts" object.
5. Select the "Charts" entry and click "Edit..." in the "Settings for Compilation/Download" area. The "Compile Program/Download to Target System" dialog box opens with the "Compile Charts as Program" tab activated. The "Entire program" option is automatically selected since you are starting the compile and download operation for the first time.

Note

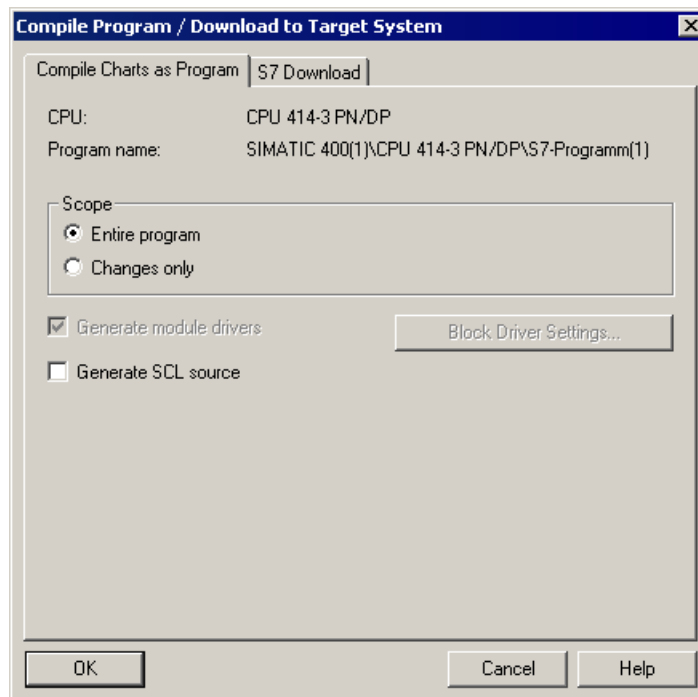
If you have discovered errors in your program during testing, you must correct your CFC and SFCs to eliminate the errors. When you restart the compiling and downloading thereafter, make sure that you select the "Changes only" option.

This will save you a considerable amount of time when compiling and downloading.

6. Activate the "Generate module drivers" check box.
This option generates the module drivers for the signal-processing blocks.

Note

You can remove empty runtime groups by selecting the menu command **Edit > Delete Empty Runtime Groups**.



7. Click "OK" to apply your settings.
The dialog box closes and the message "Remember that if you download later (...), the blocks will be deleted on the CPU" opens.
8. Click "OK".
9. Check the settings of the following check boxes in the lower area of the "Compile and Download Objects" dialog box:
 - Compile only: deactivated
 - Do not load if compilation error is detected activated
10. Click "Start" to start the compile and download operation.
The message dialog "Downloading program changes during operation can, in the case of malfunctions or program errors, cause serious damage to personnel and equipment!" Make sure..." opens.
11. Click "OK". The message dialog "If you want to download changes online, please make sure that ... Do you want to continue?" opens.

12. Click "Yes". The compile and download operation starts.

Note

The progress display indicates which step PCS 7 is currently performing, for example:

- "Compiling and downloading object"
 - "Compiling charts as program"
-

When the operation is finished, the log file opens in a text editor.

13. Ignore the message: "...-> Object compilation was executed (with warnings).

This message is generated because you have not yet integrated I/O modules in your project.

14. Close the text editor. The status in the "Charts" line is now "downloaded".

Note

If warnings or errors are shown in the log file following compilation, select the "Charts" object in the tree view and click "Single Object". This opens the "Logs" dialog box. There you can view the detailed warnings and error messages.

15. Click "Close" in the "Compile and Download Objects" dialog box.

The dialog box closes.

16. Start the CPU.

7.2.2 Testing the Program

Introduction

You can test your program both in the SFC Editor and in the CFC Editor. In test mode, you can watch how the values change during the course of the process. Using test mode, you can make sure that your configured sequential control system runs free of errors.

Test mode in SFC

The test is made in the SFC Editor that you already got to know when you created the SFC chart: The "Properties" dialog box plays a central role in test mode.

If you double-click on a step or a transition in the SFC chart, the "Properties" dialog box opens. Just as during creation of the SFC chart, you can use the arrow buttons to change from one step or transition to the next. In test mode, the dialog boxes also provide additional information:

- In the properties dialog of a step, you see the actual values on the left beside address 1 and the setpoints on the right beside address 2.
- In the properties dialog of a transition, you see the respective current values to the left of address 1 and to the right of address 2.

Note

You can modify all values in the white fields. Remember, however, that these values are written directly into your configuration data and therefore change the parameters of your SFC chart.

While working through the Getting Started, you will not change any values; rather, you will use the "Properties" dialog boxes only for the purpose of monitoring.

Test mode in CFC

You start the test mode in CFC in the CFC Editor. You will be able to have the process values displayed at the individual block I/Os and to monitor the changes.

7.2.3 How to Test the Program in the SFC Editor

Introduction

After you have compiled and downloaded the program you can run it in test mode. This way you can check if the sequential control system is working and the program is running correctly.

Requirements

- The example project is open in SIMATIC Manager.
- The "SFC_RMT1" SFC is open in the SFC Editor.
- The CPU is in "RUN" mode.

Working in test mode

1. Select the menu command **Debug > Test Mode**.
Test mode is activated.
 - In the title bar of the SFC Editor, the name "SFC_RMT1 - color_gs_Prj\Plant1\RMT1 ONLINE" is shown on a colored background.
 - In the lower part of the SFC Editor, you can see the status of the program, the operating mode, and the step control mode. The operating mode is set to "MANUAL" by default. The current step control mode is displayed in the drop-down list and is set to "T" by default.
 - In the lower part of the SFC Editor, there are also buttons for controlling the SFC, for example, for starting, holding, resuming.
2. Select the menu command **Debug > Step Control Mode > T or C**.
This mode activates an additional "O" command button next to the transition while the SFC is running.
The sequential control system reacts as described by the table below.
3. Click "Start" to run the program.
The SFC starts.
 - Each step that is currently being executed is displayed in light green and with a small arrow pointing right.
 - Steps that have already been worked through are displayed in dark green and with a small check mark.
 - Transitions that are active but not yet satisfied are shown on a brown background.
 - If you performed your configuration correctly, the entire SFC will be worked through to the end and all the steps will turn dark green and have a check mark beside them. Otherwise, you can click the "O" button to manually enable the next sequential control step although the transition is not met.
4. Select the menu command **Debug > Test Mode**. Test mode closes.

Characteristics of the sequential control system

If the chart...	... the sequential control system will do the following:
is free of errors	the sequential control system is executed step-by-step according to the configured parameters. You do not need the button.
contains errors	the sequential control system stops if the transition is not satisfied. You can click the "C" button to pass control to the next step regardless of whether the transition is satisfied.

7.2.4 How to Test the Program in the CFC Editor

Introduction

You can test CFCs in the CFC Editor in the same way as SFCs.

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.
- The "SFC_RMT1" SFC is open in the SFC Editor.
- The "CFC_FC111" CFC is open in the CFC Editor.

Procedure

1. Select the menu command **Debug > Test Mode** in the CFC Editor.
Test mode is activated.
2. Press the "CTRL" key and select the following blocks:
 - CTRL_PID
 - INPUT_U
 - DOSE
3. Select the menu command **Debug > Watch On**.
All block interfaces enabled for test mode in the properties of the respective block are displayed on a yellow background.
4. Switch to the "SFC_RMT1" SFC.
5. Click the "Start" toolbar button.
This starts the program.
6. Switch to the "CFC_FC111" chart.
You can monitor all changes to values in this chart: for example, the current value of the dosed volume is displayed at the "PV_Out" output of the "INPUT_U" block.

Note

Arrange the windows one beside the other to be able to watch the CFC and the SFC at the same time in test mode.

7. Select the menu command **Debug > Test Mode**.
This closes test mode.
8. Close the SFC Editor and the CFC Editor.

7.3 The current status...

7.3.1 Current Status of Your Project

Completed Configuration Tasks

By this time, you have completed almost all of the configuration steps in SIMATIC Manager and in the CFC Editor and SFC Editor. You have compiled and downloaded this configuration, and you have observed the project execute in the SFC and CFC Editors.

This enabled you to make sure that your configuration is thus far error-free. If you find that your project has errors when it runs in the test mode, it is much easier to locate the error at this stage than after the entire project is completed.

Configuring the operator station

8.1 Introduction of the OS Project Editor

Configuration

The "OS Project Editor is used to configure the OS. This needs to be adapted so that the computer settings match. Otherwise, the "button set" at the bottom of the screen cannot be seen in PCS 7.

Requirements

- The OS is compiled.
- WinCC is open.

Procedure

1. In the component view, open the editor with **OS(1) > OS Project Editor**.
2. Select the "Layout" tab.
3. Select the screen resolution and "Monitor configuration" of your monitor.
4. Click "OK" and close the OS Project Editor.

Note

If you purchased the computer on which PCS 7 is to be operated as a bundle, the settings are already made.

8.2 Operator Station in Process Mode

Purpose of the operator station

The plant operator can operate and monitor the process on the operator station (OS) in process mode. So-called process pictures are displayed to the operator for this purpose. The automation system (AS) controls the process (open-loop and closed-loop control) and the OS reads the process values from the AS and displays the values graphically in the process pictures. Warnings and alarms are also displayed in the process pictures as soon as process values reach or exceed certain specified limits. This allows the operator to identify the location in the plant at which a problem occurs.

You will create one process picture for your "color_gs" project that will allow you to monitor the fill level of the raw material tank, the status of the valves etc.

8.3 Configuration of the operator station

The operator station in the project

At the time you created a project with the PCS 7 "New Project" wizard, PCS 7 automatically created an operator station. You have already configured this operator station in HW Config. You have not, however, created a network connection for this OS as you did for the communication between the automation system and the engineering station to enable you to download data from the ES to the AS. This is not necessary for the "color_gs" project because the engineering station and the operator station are on the same computer and the operator station uses the same connection to the AS as the ES.

Process pictures in the project

The PCS 7 wizard also creates pictures automatically in the plant hierarchy, which you then configure in the OS. Larger projects have multiple process pictures for the various components of the plant. For the "color_gs" project, you only have to configure a single picture. During configuration you will nevertheless become familiar with all the basic functions of the OS. Pictures are labeled with the following icon:



8.4 Working in the SIMATIC Manager

8.4.1 Preparations in SIMATIC Manager

Overview

Before you start to configure in the OS, there are a few preliminary steps to be performed in SIMATIC Manager:

Step	What?
1	Adapt picture names and activate the function for creating block icons (Page 143)
2	Delete unnecessary pictures (Page 144)
3	Create block icons (Page 145)
4	Compile OS (Page 147)

Editing the picture properties

Since the PCS 7 "New Project" wizard has already created pictures, these pictures have default names, just like the CFC. You first have to adapt these default names to suit your project requirements by assigning short descriptive names to them.

You also need to activate the function for creating block icons.

Deleting unnecessary pictures

When you create a project with the PCS 7 wizard, pictures are automatically inserted in every hierarchy folder of the plant hierarchy. Since you only require one picture in your "color_gs" project, you must remove the unnecessary pictures from the PH.

Creating block icons

PCS 7 provides you with the "Create block icons" function. Block icons are inserted in process pictures and provide the operator with the most important information on a process tag at a glance. For example, in the block icon for a controller, the operator sees the process value (PV), the setpoint (SP) and the manipulated value (MV). The block icon for a controller is displayed in a process picture as shown below:



Compiling the OS

You must execute the "Compiles OS" function after you finish configuring all of the data in SIMATIC Manager and before you start configuring the OS data of the OS. All the data from

SIMATIC Manager, such as variables, messages, texts, plus the hardware and connection configurations must be "made known" to the OS.

Starting the OS

You have to start the OS to continue configuring it. You then perform other steps in the WinCC Explorer.

8.4.2 Procedure

8.4.2.1 How to Edit Picture Properties

Introduction

You make the following settings for editing the picture properties:

- Change the name of the picture
- Select the option for creating block icons

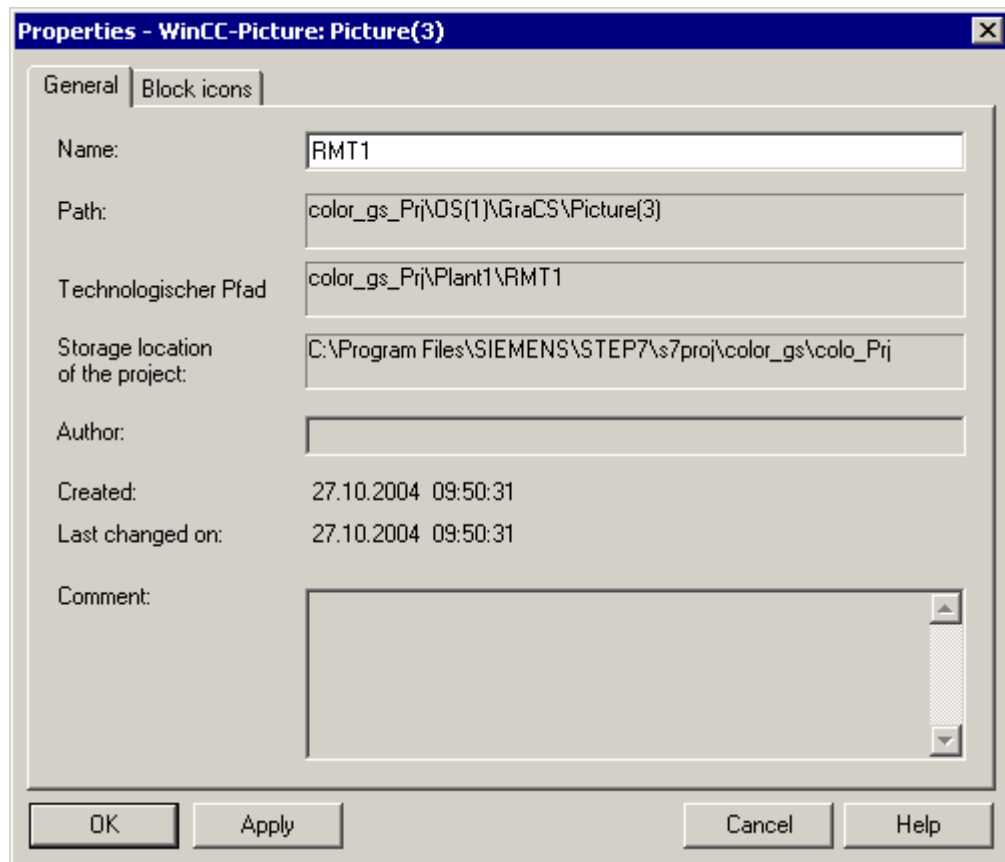
Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure for Changing the Picture Name

1. Select the "color_gs_MP\color_gs_Prj\Plant1\ RMT1" folder in the tree view.
2. Select the picture "Picture(3)" in the detail view.
3. Select the menu command **Edit > Object Properties**.
The "Properties - WinCC Picture: Picture(3)" dialog box opens with active "General" tab.

4. Change the default name "Picture(3)" to "RMT1" in the "Name" input box.



5. Click "Apply" to apply your settings.

Procedure for Activating the Option for Creating Block Icons

1. Switch to the "Block icons" tab.
2. Activate the "Derive the block icons from the plant hierarchy" check box.
3. Click "OK" to apply your settings.
The dialog box closes and the new name of the picture is displayed in the plant hierarchy.

8.4.2.2 How to Delete Unnecessary Pictures

Introduction

The PCS 7 "New Project" wizard creates a picture in every hierarchy folder by default. In the "color_gs" project, you require only one picture since all the required data can be represented clearly in one picture.

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.

Procedure

1. Select the "Plant1" folder in the tree view.
2. Select the picture "Picture(2)" in the detail view.
3. Press the key.
The "Delete" message dialog opens.
4. Click "Yes".
The picture is deleted.
5. Repeat steps 1 through 4 for the following folders in the plant hierarchy:

Name of the Folder	Name of the Picture
FC111	Picture(4)
ADDIT	Picture(5)

8.4.2.3 How to Create Block Icons

Requirements

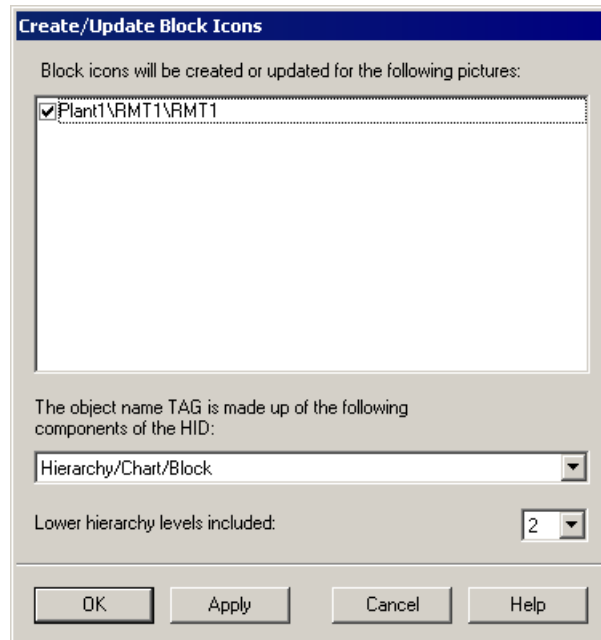
- The example project is open in SIMATIC Manager.
- The plant view is activated.
- The option for creating block icons is selected.

You can find information about these settings in the section "How to Work with Picture Properties (Page 143)".

Procedure

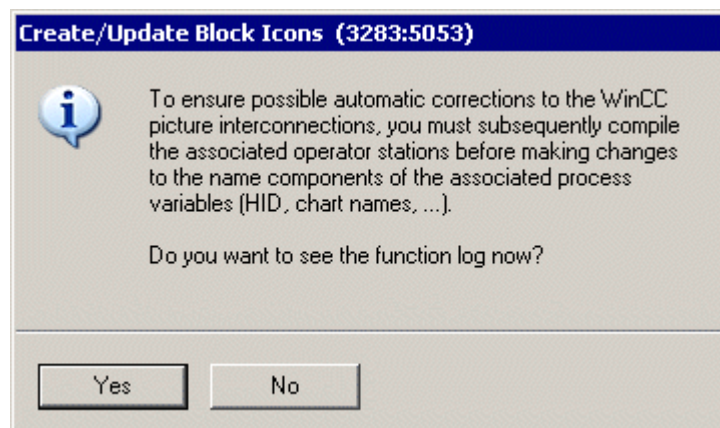
1. Select the
"color_gs_MP\color_gs_Prj\Plant1\ RMT1" folder in the tree view.
2. Select the menu command **Options > Plant Hierarchy > Create/Update Block Icons....**
The "Create/update block icons" dialog box opens. The list contains the pictures for which block icons have been created. In this Getting Started, the picture is called "Plant1\RMT1\RMT1".

3. Check the following settings:
 - Check box in front of the "Plant1\RMT1\RMT1" picture is selected.
 - The value "2" is entered in the "Lower hierarchy levels included" drop-down list.



4. Click "OK".

This triggers generation of the block icons. The message dialog "To ensure possible ..., you must subsequently compile the associated operator stations... Do you want to view the function log now?" opens.



5. Click "No".

The message window closes and block icon generation ends.

Result

At this moment you do not see any evident results of this function. Only when you open the process picture for the project "color_gs" can you see the generated block icons.

Note

If an MS Office message appears during the generation and wants to install something, cancel the messages. The generation then continues.

8.4.2.4 How to Compile the OS

Introduction

Before configuring the data in the OS, you have to compile the OS. With this function, all the data from SIMATIC Manager, such as variables, messages, texts, plus the hardware and connection configurations are "made known" to the OS. Do not confuse compiling with downloading: When you compile, the data remains on the engineering system computer – it is simply made known to the OS so that you can access this data during configuration.

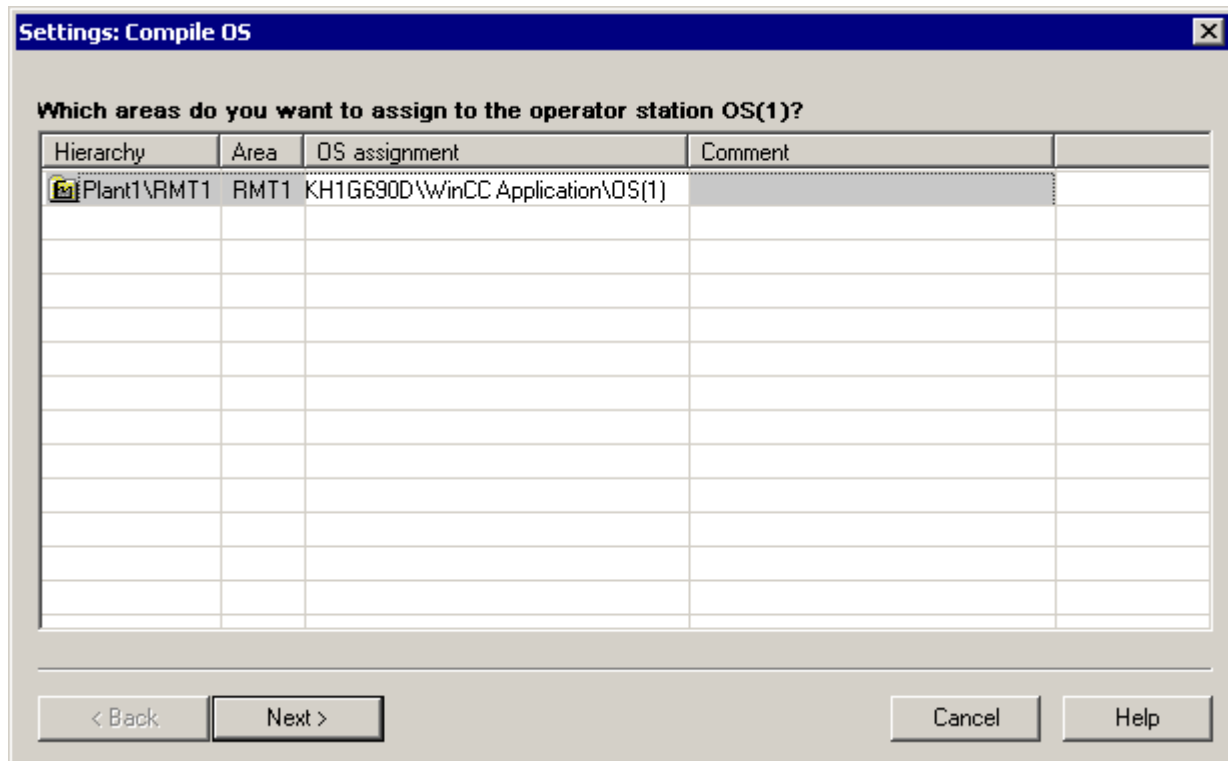
Requirements

- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

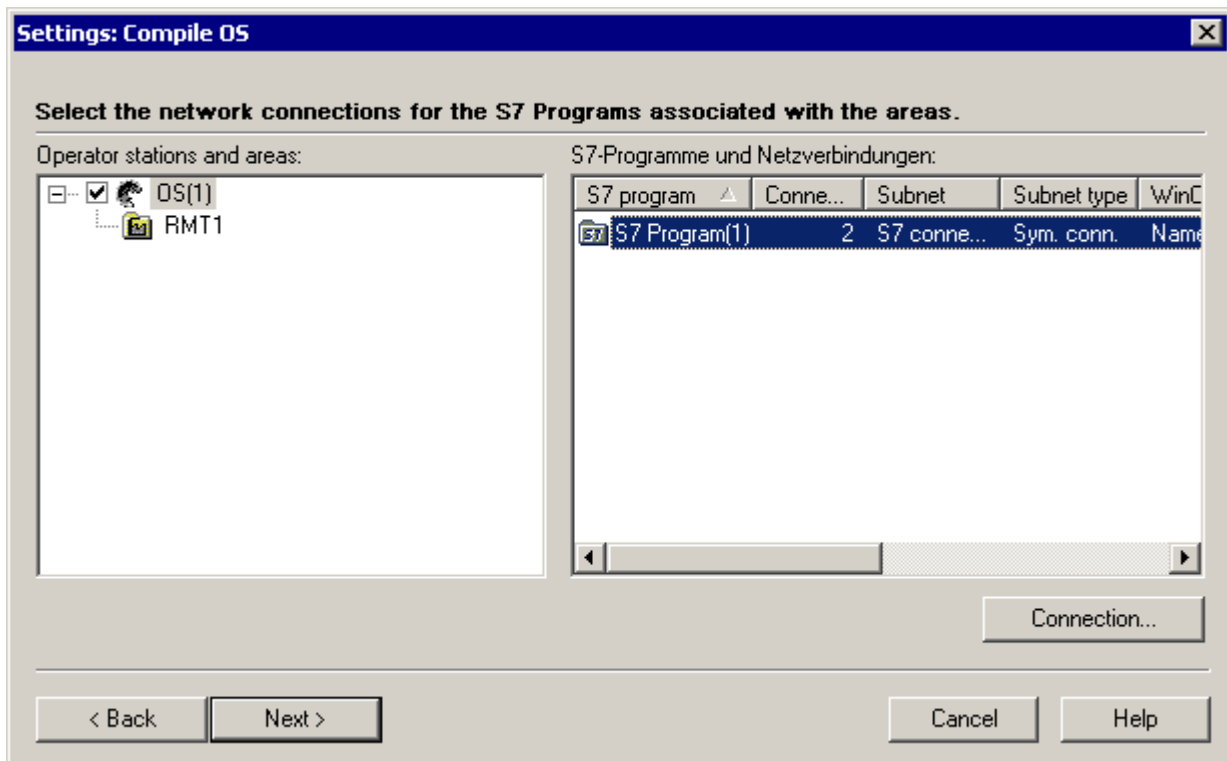
1. Select the "color_gs_MP\color_gs_Prj\[Name der SIMATIC PC-Station]" item in the tree view.
2. Select the menu command **PLC > Compile and Download Objects....**
The "Compile and Download Objects" dialog box opens.
3. Open the tree view and select the "Compile" check box for the "OS(1)" object.
4. Select the "OS(1)" object and click "Edit".

5. The "Which areas do you want to assign to operator station OS(1)?" opens. You can ignore this setting as you have not yet created more than one area / one OS in this project.



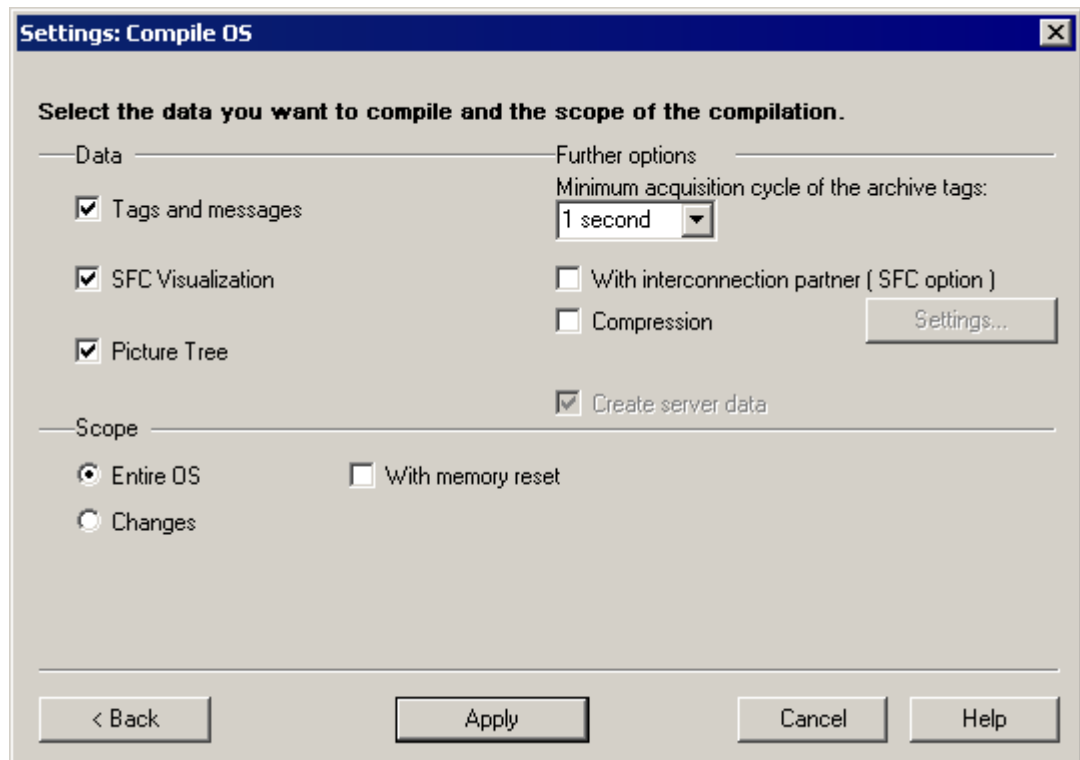
6. Click "Next >".

The "Select the network connections for the S7 programs associated with the areas" dialog box opens. In the "S7 programs and network connections" group, you will find the entry "S7 connection" and the subnet "Sym. Verb.". This is the connection that the automation system and operator station use for communication and that you already created in NetPro.



7. If no connection is displayed here, click "Connection...". Select the S7 connection you have made in NetPro from the "Select network connection" dialog box and then click "OK". The selected connection is entered.
8. Click "Next".
- The step "Select the data you want to compile and the scope of the compilation" is displayed.

9. Activate the following check boxes and option buttons as shown in the figure below:



10. Click "Apply".
11. Click "Start" in the "Compile and Download Objects" dialog box.
The message dialog "If you want to download changes online, ...Do you want to continue?" opens.
12. Click "Yes".
Compilation is started and a progress bar is displayed. When compilation is completed, the log file opens in a text editor to show you whether or not the compilation was executed without error.
13. Close the text editor.
14. Click "Close" in the "Compile and Download Objects" dialog box.

8.4.2.5 How to Start the OS

Introduction

You have now completed all the preparation steps for configuring the OS in SIMATIC Manager, and you can now start to configure the OS. To do so, first open the OS.

Requirements

- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

1. Select the following object in the tree view:
"color_gs_MP\color_gs_Prj\<Name der SIMATIC PC-Station>\WinCC Applikation\ OS(1)".
2. Select the menu command **Edit > Open Object**.
The PCS 7 OS - WinCC Explorer opens.

8.5 Working on the OS

8.5.1 Structure of the OS - WinCC Explorer

Introduction

The WinCC Explorer provides you with a series of editors that you can use to configure an OS. But for configuring the OS you will only use a few of these editors.

What is the basic structure of WinCC Explorer ?

In principle, the structure of WinCC Explorer Explorer is very similar to Windows Explorer::

- In the left pane, there is a navigation window. Here, you will find all the editors for configuring the PCS 7 OS.
- In the right pane, there is a detailed window in which detailed information on the entry selected in the navigation window is displayed.

You only work with Graphics Designer in the "color_gs" project. This is the tool you use to create process pictures. You do not require any other editors to configure the OS.

8.5.2 Function of Process Pictures

Process pictures

Process pictures are an image of the process plant for the operator. The process is operated here and system states are displayed.

The process picture you will create for the "color_gs" project already exists in the plant hierarchy in SIMATIC Manager.

You edit the process picture in the "Graphics Designer" editor. You insert the desired static and dynamic objects and interconnect them.

8.5.3 Introduction of the OS Project Editor

Configuration

The "OS Project Editor is used to configure the OS. This needs to be adapted so that the computer settings match. Otherwise, the "button set" at the bottom of the screen cannot be seen in PCS 7.

Requirements

- The OS is compiled.
- WinCC is open.

Procedure

1. In the component view, open the editor with **OS(1) > OS Project Editor**.
2. Select the "Layout" tab.
3. Select the screen resolution and "Monitor configuration" of your monitor.
4. Click "OK" and close the OS Project Editor.

Note

If you purchased the computer on which PCS 7 is to be operated as a bundle, the settings are already made.

8.5.4 How to set the OS activation for the ES

Introduction

If you want to visualize the process mode on an engineering station, you have to make the following settings.

Requirement

- WinCC is open.

Procedure

1. Select OS(1).
2. Select the menu command **Edit > Properties**.
The "Project Properties" dialog window opens.
3. Select the "Options" tab.
4. Select the "Allow activation on ES" check box.
5. Click "OK".

8.6 Working in general with the Graphics Designer

8.6.1 Introduction to the Graphics Designer

User Interface

The Graphics Designer is one of the editors of the OS. The user interface of the Graphics Designer is displayed as follows:

Menu bar	
Alignment palette - Layer palette - Color palette - Object palette - Font palette - Standard palette - Zoom palette	
Drawing area on which you insert the objects for the process picture . . .	Standard objects • Standard • Controls • Style
Libraries - Object properties - Dynamic wizard - Tags	
Status bar	

Libraries

The libraries of the Graphics Designer contain a wide selection of ready-to-use graphic elements, such as piping and valves. You can modify these elements or add to them and store them in your own project libraries so that they are available to you at any time.

Objects

The Graphics Designer distinguishes between two different types of objects:

- **Static objects**
These objects are purely drawing objects like those that you would find in a drawing program, for example lines, circles, polygons or static text.
- **Dynamic objects**
These objects are made dynamic via a connection to a block I/O (tag). In process mode, dynamic objects show the current values of a measuring point of the plant. In the "color_gs" project, you will get to know various dynamic objects.

8.6.2 How to Open a Process Picture

Introduction

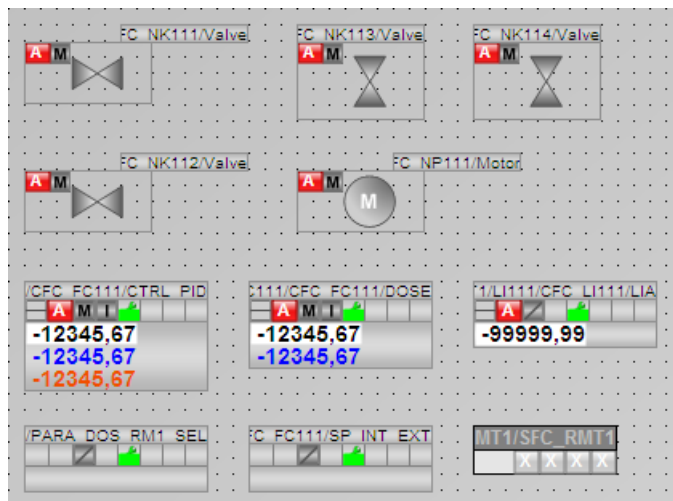
You edit the process picture in the OS. You use the "Graphics Designer" editor for this.

Requirement

The example project is open in WinCC Explorer.

Procedure

1. Select the "Graphics Designer" entry in the navigation window.
The detail view shows all the pictures belonging to the project. The pictures displayed also include the default pictures and template pictures provided by PCS 7.
Default pictures and template pictures are designated with the "@" character before the name.
2. Double-click the "RMT1.pdl" picture in the detail view.
The process picture opens in Graphics Designer. The view shows that this process picture already contains objects although you have not yet inserted any. These are the block icons that you created in the process picture with the "Create block icons" function in SISIMATIC MATIC Manager. You can also see that the block icon for the valve has been inserted both in the horizontal alignment and vertical alignment variants. These two variants are influenced by the setting in the process object view in the "Picture Objects" tab that you made when assigning parameters for the CFCs.



Note

In the example, the automatically inserted block icons (for example, for the "CTRL_PID" controller) were moved.

8.6.3 How to Open the Various Toolbars

Introduction

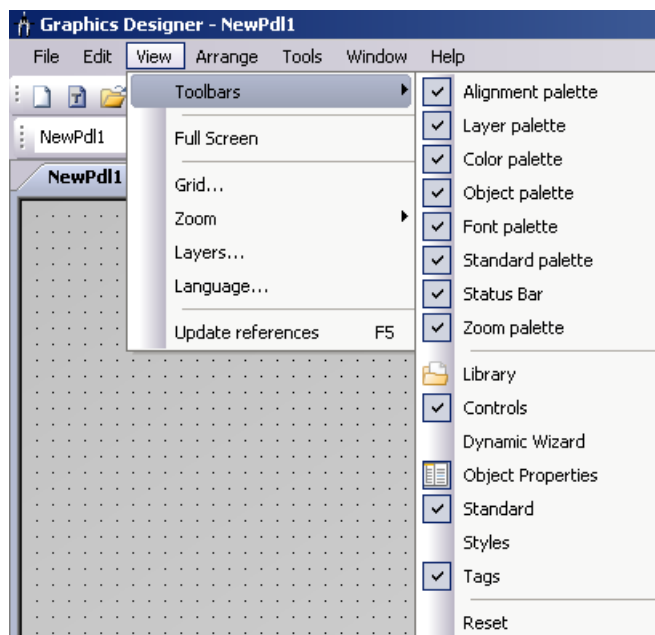
The most important toolbars and dialog boxes are open by default. If you inadvertently close toolbars or dialog boxes, you should know how to make them visible again.

Requirement

The process picture is open in the Graphics Designer.

Procedure

1. Select the menu command **View > Toolbars**.
The submenu opens. Here you see the toolbars and dialog boxes that you can show and hide in the Graphics Designer.
2. Select the check box as shown in the figure:



Result

You can find the following tab on the right-hand side of the dialog window:

- "Standard" tab
- "Controls" tab

In Getting Started, you will only use the "Standard" tab.

8.6.4 Objects in the Graphics Designer

Objects in the Graphics Designer

Before you get started on the actual configuration in the Graphics Designer, it is time for some theory relating to the various objects that you will use to create the "RMT1.pdl" process picture. These objects include the following:

- Static Objects
- Text Fields

You also receive some background information on interconnecting tags – this is the way you create the relationship between the process picture and the process tag.

8.6.5 What Are Static Objects?

Static Objects

To visualize equipment, such as a pipe or a tank, you require static objects. These objects do not change while in process mode; in other words, they are not influenced by a status or by a value of a process tag.

8.6.6 What Are Text Fields?

Text Fields

In a text field, you can enter any information that you want the plant operator to see in the process picture. You can, for example, insert a text field to allow you to label objects and to simplify the assignment of the picture objects to the process for the operator. You can enter any text in these text fields and can position the text fields anywhere in the process picture.

For the "color_gs" project, you will insert text fields with appropriate labels for all the process tags.

8.6.7 How Does Tag Interconnection Work?

Tag interconnection

Tag interconnection is a central function when you create process pictures: Objects are entered in the process picture that represent the process values of a process tag in the process mode. With the tag interconnection, you create the connection between the object in the process picture and the actual process tag. This enables the OS to receive data from the AS, to display the data in the process picture and to update the data.

8.7 Creating the process picture

8.7.1 How to Insert Pipes and a Tank into the Process Picture

Block icons are already available in your process picture. PCS 7 has inserted these symbols using the "Create/update block icons" function in the SIMATIC Manager.

In the following, you add static icons and assign them along with the automatically generated block icons.

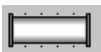
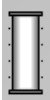
Requirements

- The "RMT1" process picture is open in the Graphics Designer.
- The block icons are available.

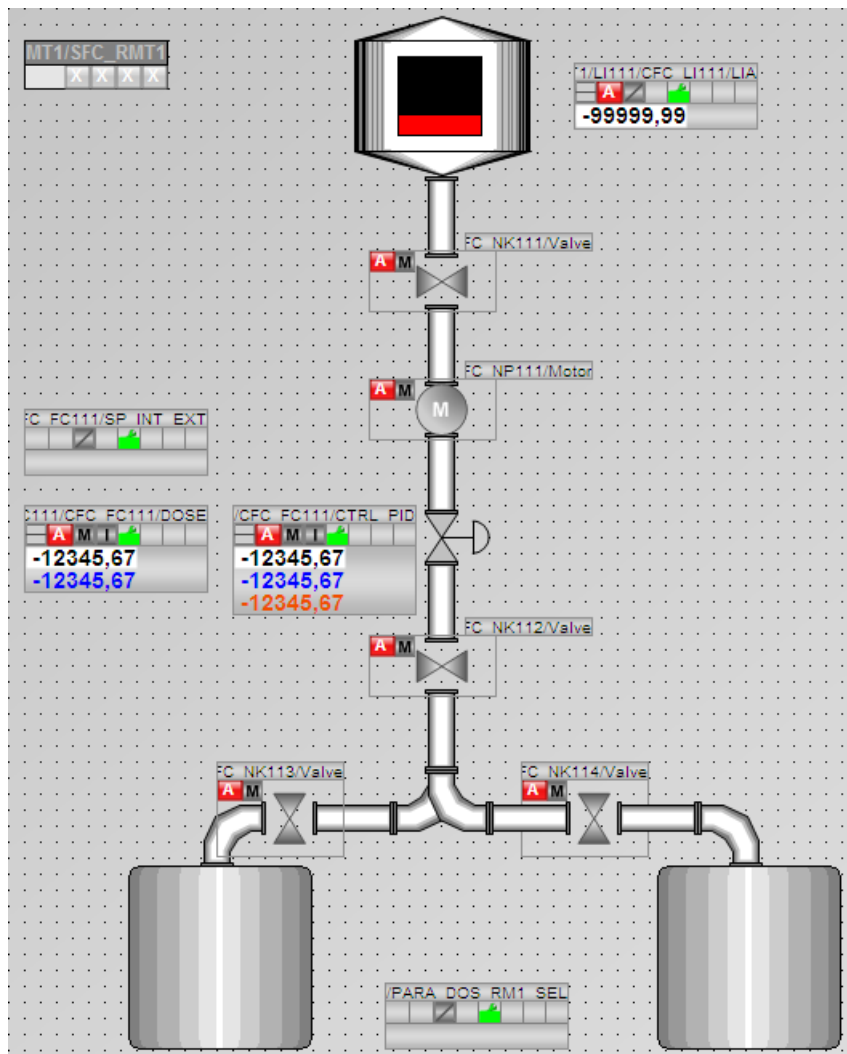
Procedure

1. Select the "Library" tab above the status bar.
The available libraries are displayed in the dialog box.
2. Select the "Global Library/PlantBlocks/Tanks/Tank4" object and move it to the drawing area using drag-and-drop. Click on the "Eyeglasses" button in the toolbar to obtain a preview of the graphic objects.

3. Drag additional objects to the drawing area as per the table below.

Name of the object	Number	Path in the library ; Object	Symbol
Horizontal pipes	3 x	Global library/Plant elements/Pipe user objects ; 3D pipe horizontal	
Vertical pipes	5 x	Global library/Plant elements/Pipe user objects ; 3D pipe vertical	
Angle	1 x	Global library/Plant elements/Pipe user objects ; 3D pipe angle 1	
Angle	1 x	Global library/Plant elements/Pipe user objects ; 3D pipe angle 2	
Angle	1 x	Global library/Plant elements/Pipe user objects ; 3D pipe angle 3	
Angle	1 x	Global library/Plant elements/Pipe user objects ; 3D pipe angle 4	
Control valve	1 x	Global library/Symbols/Valves ; 30	
Tanks representing reactors	2 x	Global library/Siemens HMI Symbol Library/Tanks ; Tank1 Note: The icon is reduced.	

4. Close the library.
5. Select an object and adjust its size and position to match the following figure:
 - You can move the object by positioning the cursor on the object, holding down the mouse button and dragging the object to the required location.
 - You can increase or decrease the size of the object by positioning the mouse pointer on the corner handles of the object, holding down the mouse button, and dragging to make the object larger or smaller.
 - Place the automatically created icons according to the following figure (see section "How to Open a Process Picture (Page 154)").



8.7.2 Labeling the Parts of the Plant

Overview

The parts of the plant are labeled in three separate steps:

Step	What?
1	Insert and Format Text Field (Page 161)
2	Set Text Field (Page 162)
3	Duplicate Text Field (Page 162)

8.7.3 Step 1 - How to Insert a Text Field

Requirements

- The "RMT1.pdl" process picture is open in the Graphics Designer.
- The static objects have been inserted.

Procedure

1. Select "Standard Objects/Static Text" in the object palette.
2. Use the mouse to navigate to the drawing area.
The cursor transforms into a small text input symbol.
3. Draw a text field next to the reactor on the left.
A rectangle is inserted and the text within it is already selected.
4. Change this text to "Reactor 1".
5. Press the Enter key to apply the text.
6. Now format the text field using the style palette:
 - Select the text field and click the "Line Weight/Invisible" entry. This hides the text field frame.
 - Select the text field and click on the "Fill pattern / Transparent" entry. The text field color is now transparent.

8.7.4 Step 2 - How to Set the Text Field

Requirements

- The "RMT1.pdl" process picture is open in the Graphics Designer.
- The text field is inserted and selected.

Procedure

1. Select the menu command **View > Toolbar > Object Properties**.
The "Properties" tab is enabled in the detail field.
2. Select the "Static Text" entry in the tree view.
The detail view shows the name of the text field and the layer.
3. Switch to the detail view and then double-click the "Static Text 1" field in the "Static" column.
You can now edit text in this field.
4. Enter the name "Reactor 1" and then press Enter.
This applies the name and displays it in the top line. If you are working on the drawing board, this name will be displayed as a tooltip whenever you move the mouse over the object.
5. Select the "Static Text/Font" entry in the tree view.
6. Switch to the detail view and then double-click the value "No" for the "Bold" attribute values.
The value changes from "No" to "Yes" and the text is assigned the "Bold" attribute.
7. Close the "Object Properties" dialog box.

Result

All changes are shown.

8.7.5 Step 3 - How to Duplicate the Text Field

Requirements

- The "RMT1.pdl" process picture is open in the Graphics Designer.
- The text field is inserted.
- The settings for text fields have been made.

Procedure

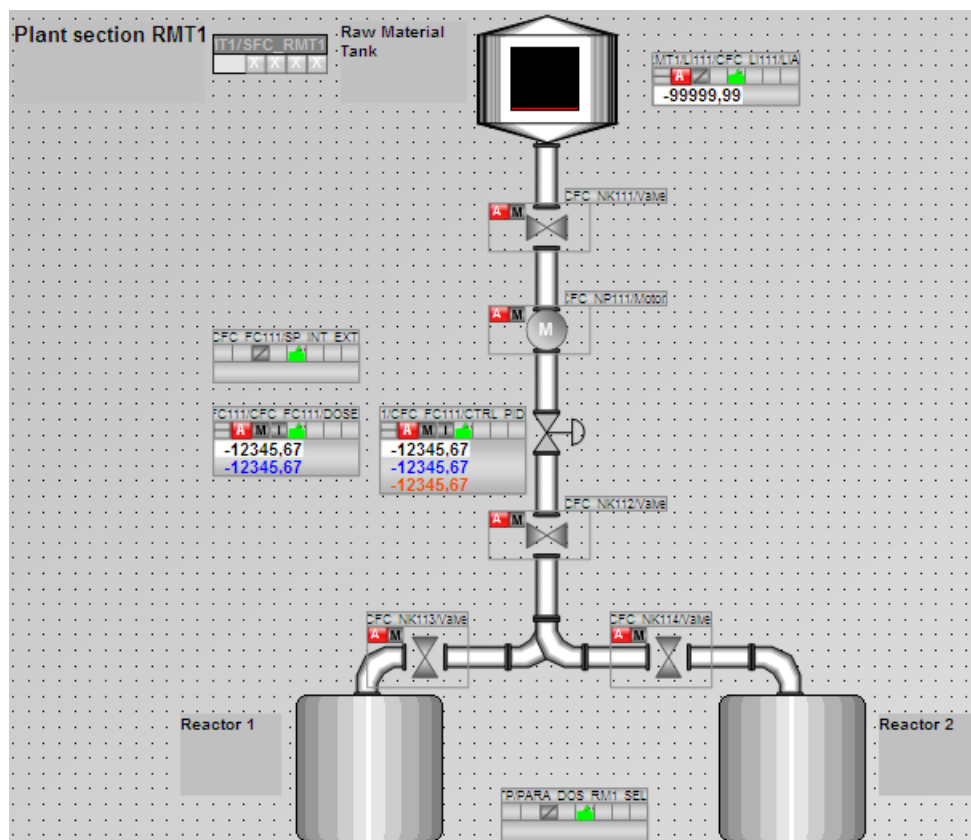
To avoid having to repeat all the settings you made for the first text field, you duplicate the existing text field and simply overwrite the existing text.

1. Select the text field if it is no longer selected, followed by the menu command **Edit > Duplicate**.
The program duplicates the text field.
2. Double-click the text field and change the text to "Reactor 2".
The duplication function automatically applies all other formats.
3. Select the menu command **View > Properties**.
4. Change the object name to "Reactor 2" in the detail view.
5. Position the text field next to the object.
6. Repeat steps 1 to 5 to create the following text fields:
 - Raw materials tank
 - Plant unit RMT 1
7. Open the properties for the text field "Plant unit RMT 1" and select the "Static Text/Font" entry in the tree view.
8. Switch to the detail view and enter the value "16" for the "Font Size" attribute.
9. Close the "Object Properties" dialog box.
10. Position the text fields as follows:
 - Raw materials tank – on the left, next to the raw material tank
 - Plant unit RMT 1 – in the upper left-hand corner of the process picture
11. Select the menu command **File > Save**.
This saves the process picture.

8.7.6 Current status of the process picture...

Result

Now that you have inserted the tank, the pipes, and the labeling, your process picture should look like the one below:



8.7.7 How to Connect the Raw Material Tank with the Process Value

Introduction

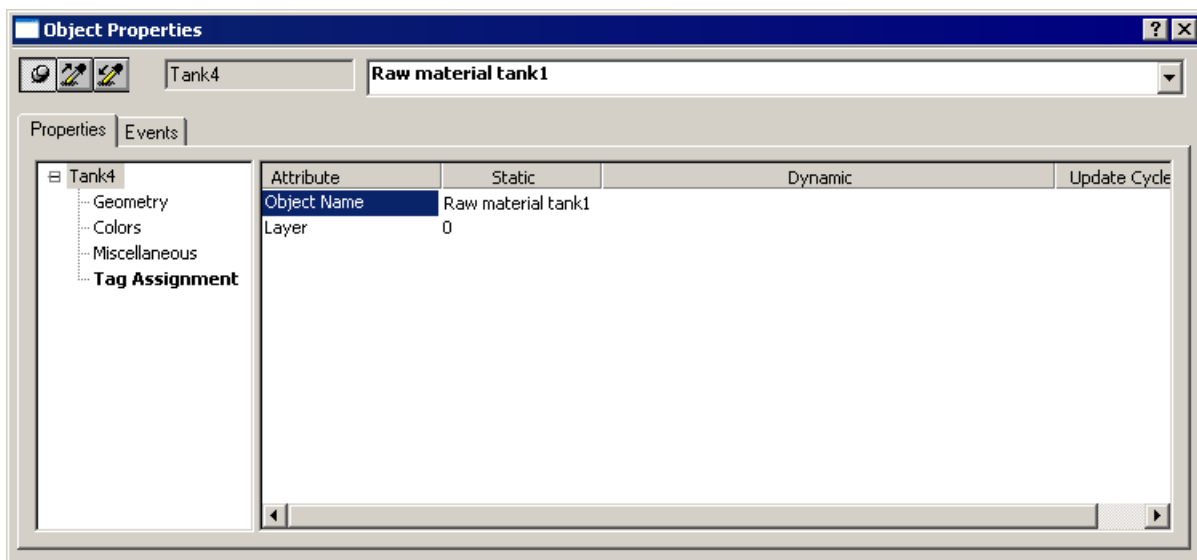
The tank you inserted in your process picture represents the raw material tank. In order to display the current fill level of the raw material tank in process mode, you now connect this tank with the relevant block.

Requirements

- The "RMT1.pdl" process picture is open in the Graphics Designer.
- The static objects have been inserted.

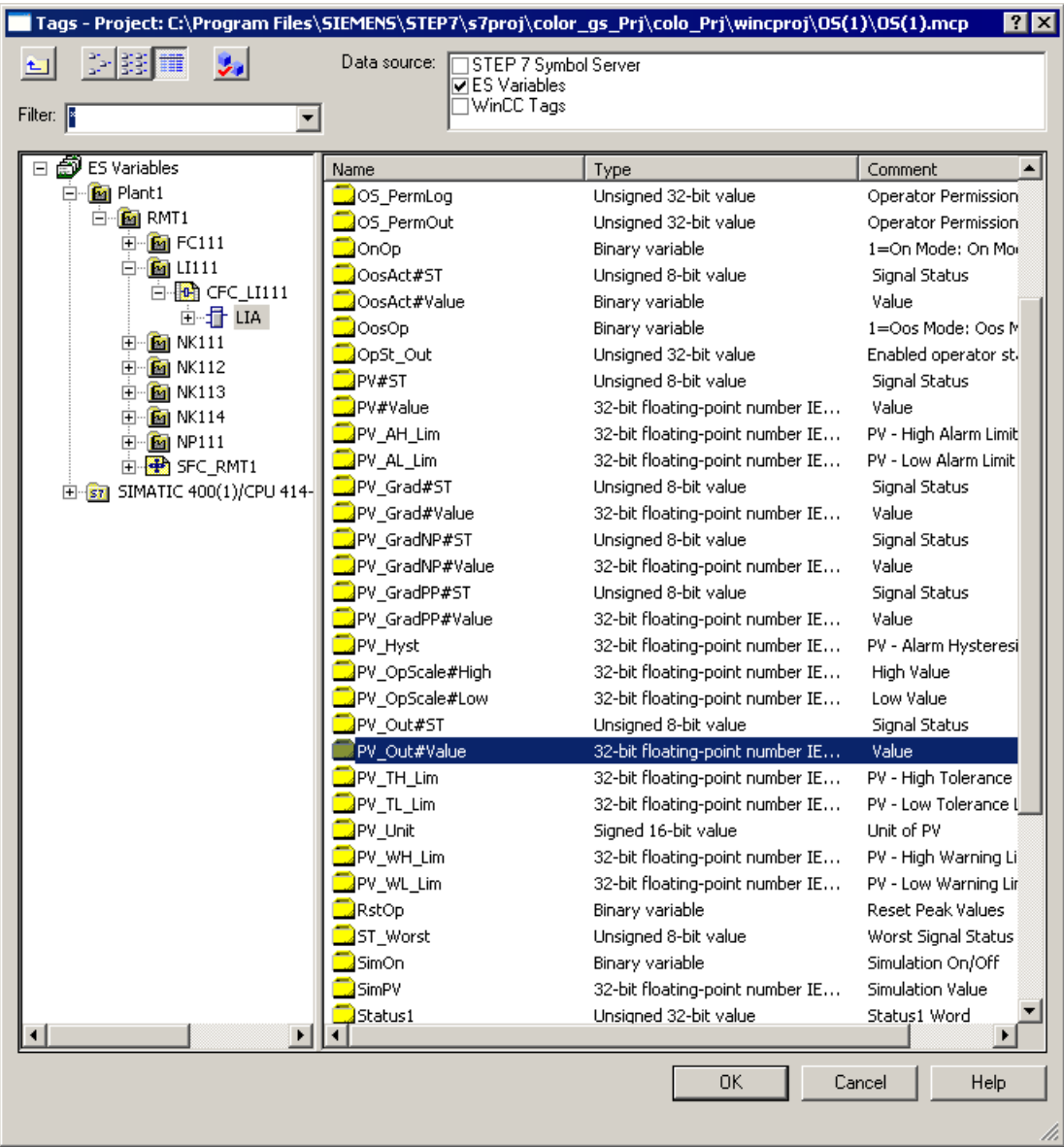
Procedure

1. Select the "Tank4" object that depicts the raw material tank.
The name of the object is shown in the tooltip that appears when you position the cursor on the object.
2. If the "Object properties" dialog box is not visible at the bottom of the screen, select the menu command **View > Toolbars > Object Properties**.
The "Properties" tab is enabled. Tank4" is selected in the tree view and the "Object name" and "Layer" attributes are displayed in the detailed window.
3. Switch to the detail view and then double-click the "Tank4" field in the "Static" column.
You can now edit text in this field.
4. Enter the name "Raw material tank1" and press the Enter key.



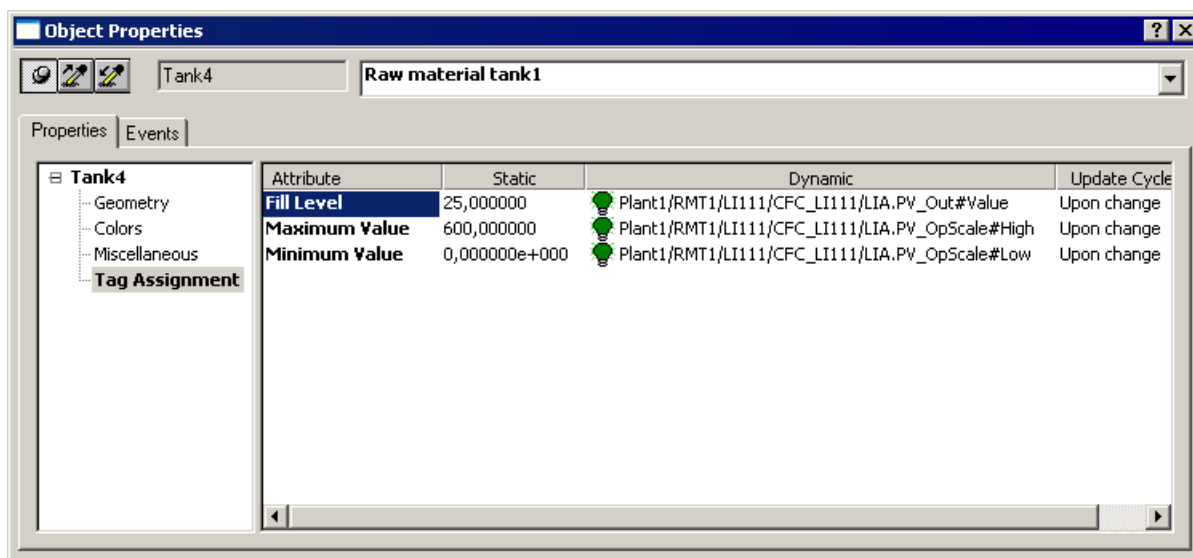
5. Select the entry "Tank4/Tag Assignment" in the tree view.
6. Switch to the detail view and position the cursor on the "Light Bulb" symbol next to the "Process" attribute and open the shortcut menu.
7. Select the menu command **Tag....**
The tag selection dialog opens.
8. Select the "ES Variables" check box in the "Data source" group and clear the "WinCC Tags" check box.
The tree view displays the ES variables.
9. Select the "ES Variables/ Plant1/RMT1/LI111/ CFC_LI111/ LIA" item in the tree view.
All ES variables are displayed in the detail view.

10.Select the "PV_Out#Value" tag in the detail view.



11. Click "OK".

This accepts the variable and its entire path in the "Dynamic" column.



12. Double-click the value "100" in the "Static" column for the "Max" attribute.

The "Enter Value" dialog box opens.

13. Enter the value "600" in the "Max" input box and then click "OK".

This applies the value.

14. Apply the parameters for the minimum value.

15. Close the "Object Properties" dialog box.

16. Select the menu command **File > Save**.

This saves the process picture.

8.7.8 Step 3 - How to Add Explanatory Text

Requirements

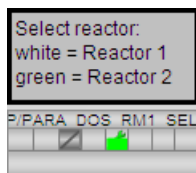
- The "RMT1.pdl" process picture is open in the Graphics Designer.
- The block icon for "PARA_DOS_RM1_SEL" is available.

Procedure

The plant operator needs to be able to understand the setting for selecting the respective reactor. You use a text field in order to provide this explanation. You have already used text fields when labeling the plant.

1. Insert a text field – use the "Standard Objects/Static Text" object to do this.
2. Enter the following text: "Select reactor: white = Reactor 1, green = Reactor 2". Press <Shift + Return> to create a line break.

3. Format the text fields using the style palette:
 - Frame invisible - "Line weight/Invisible" setting
 - Fill transparent - "Fill Pattern/Transparent" setting
4. Select the "Properties" tab.
5. Select "Display".
6. Double-click the "Global color scheme" attribute in the right-hand area of the window. "No" is now entered in the "Static" column.
7. Close the "Object Properties" window.
8. Drag still a frame around the explanatory text. Use the "Standard Objects/Rectangle" object for this purpose.
9. Format the text fields using the style palette:
 - Thickness of the frame – "Line Weight/3 Pixel" setting
 - Fill transparent - "Fill Pattern/Transparent" setting
10. Position the objects as shown in the figure below:



11. Drag a frame around all the objects using the mouse.
12. Select the menu command **Edit > Group object > Group**.
This groups all the objects into one single object and makes it easier to move them.
13. Position the objects between the reactors.

8.7.9 Step 4 - How to configure the setpoint default

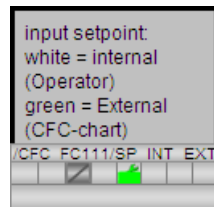
Requirements

- Graphics Designer is open.
- The block icon for "SP_INT_EXT" is available.

Procedure

Proceed as with the selection between reactor 1 and 2; the section below provides an overview of the steps:

1. Insert an explanatory text field: "Input setpoint, white = internal (operator), green = external (CFC)"
2. Format the text field using the style palette:
 - Frame: invisible – "Line Weight/Invisible" setting
 - Fill: Transparent – "Fill Pattern/Transparent" setting
3. Insert a whole frame from the object palette: "Standard Objects/ Rectangle" object
4. Format the whole frame using the style palette:
 - Line weight of frame -- "Line Weight/3 Pixel" setting
 - Fill: Transparent – "Fill Pattern/Transparent" setting

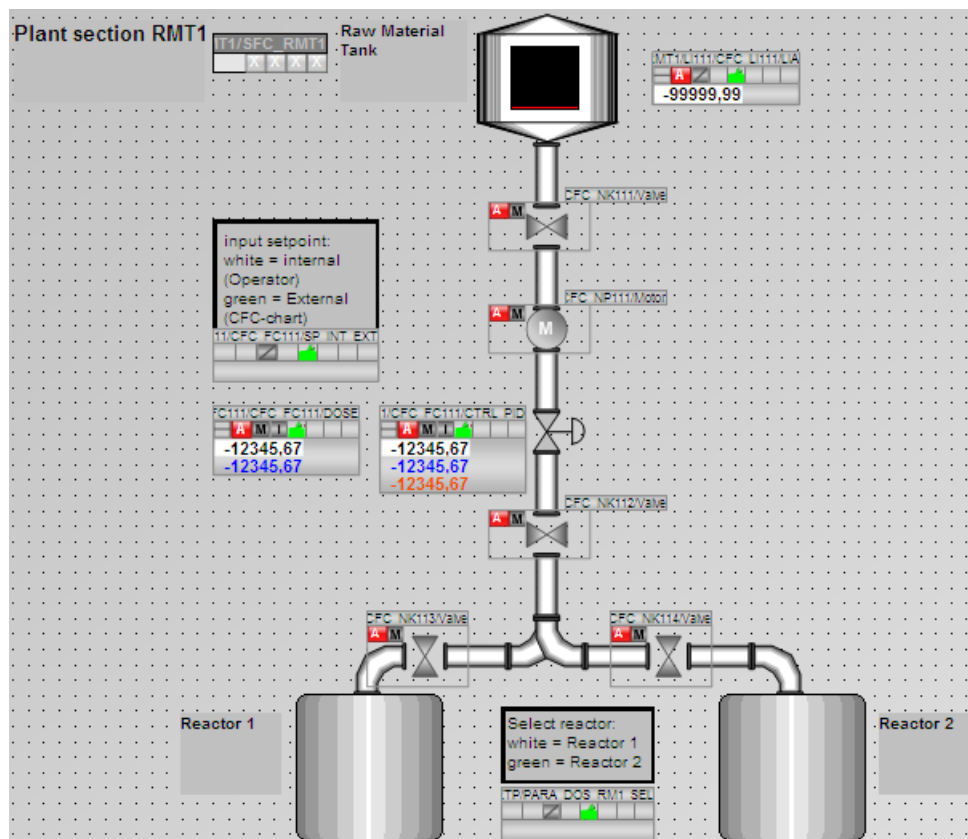


5. Position the block icon for "SP_INT_EXT" under the frame.
6. Group the objects using the menu command **Edit > Group object > Group**.
7. Position the grouped objects in the lower section on the left side.

8.7.10 How to Complete the Work

Procedure

1. Complete the positioning of all objects.
The process picture will then appear as follows:



2. Select the menu command **File > Save**.
This saves your process picture with all changes and additions.
3. Close the Graphics Designer.

8.8 The current status...

8.8.1 Current Status of Your Project

Completed Configuration Tasks

At this point, your project is complete, thus enabling you to activate process mode. You have become acquainted with the following functions during the OS configuration:

- Setting the picture properties in SIMATIC Manager
- Creating block icons
- Compiling the operator station
- Creating a process picture in the Graphics Designer with a variety of objects, for example, static and dynamic objects

Working in runtime

9.1 Planning the user interface

9.1.1 Operator Station in Process Mode

Operator control and monitoring options in process mode

In process mode, the "color_gs" project provides various options for operator control and monitoring of the process.

With the block icons, you have the following options:

- Observe the state of the valve: valve open or closed
- Observe the state of the pump: pump active or inactive
- Changing from a block icon to the associated faceplate
- Creating the dosing quantity in the faceplate

The block icons and associated text boxes provide you with have the following options:

- Selecting the reactor
- Selecting whether the setpoint is read from the CFC or whether the plant operator can specify the setpoint externally

You can also monitor the CFC and SFCs. You were already introduced to this function when testing the charts.

9.1.2 User Interface in Process Mode

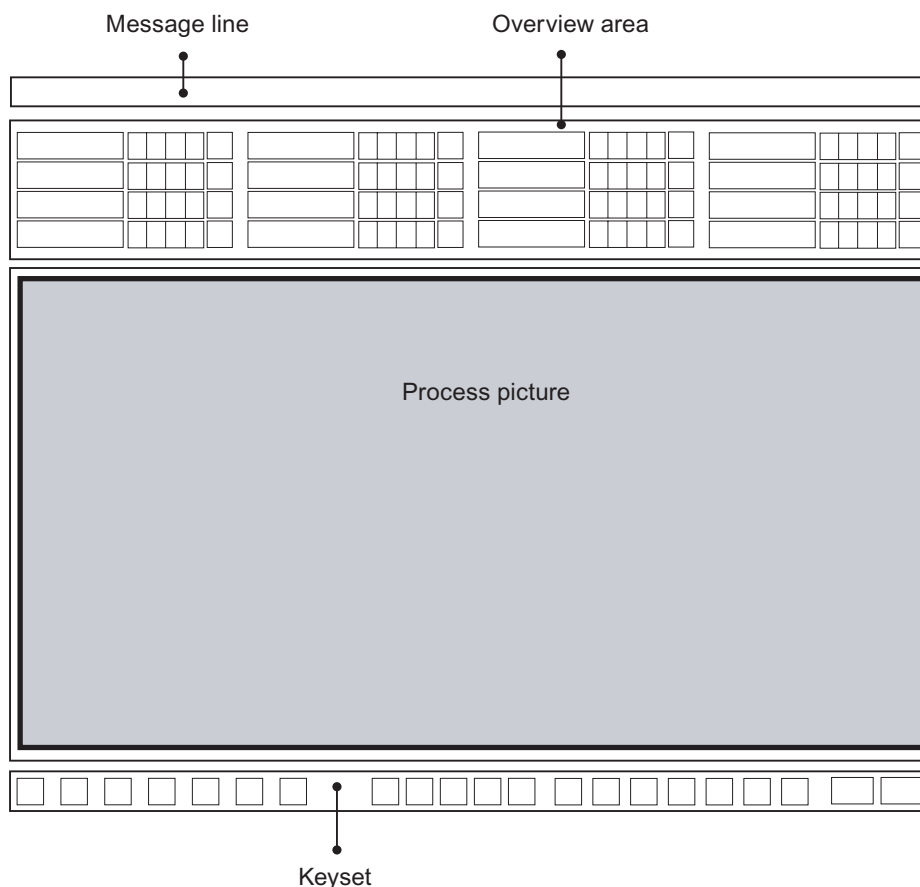
Structure

To allow you to monitor and operate the process yourself, here is a brief explanation of the user interface of PCS 7 in process mode.

The user interface in process mode is divided into four areas:

9.1 Planning the user interface

- **Message line**
Displays the most recent message with the highest priority.
- **Overview area**
Lets you select the areas of a plant and view these by means of the various command buttons. In your "color_gs" project, you have only one button, namely "RMT1" because your plant consists of only one part.
Next to each button there are four other small buttons which you can use to view alarms and warnings from the sublevel hierarchy. If you click in this area, you automatically change to the process picture in which the alarm or warning originated.
The arrow key on the extreme right opens a tree view in which you can select a sublevel of the hierarchy.
- **Process picture**
Returns the associated process picture, depending on the area you selected in the overview. In your "color_gs" project, the plant picture you created in the Graphics Designer is displayed.
- **Button set**
Can be used to call various functions which you can select in process mode. In the "color_gs" project, you will only get to know the buttons that are important for this project.



9.2 Operator control and monitoring in process mode

9.2.1 How to set the language in WinCC

Introduction

If the language selected in WinCC is not in the language used, the corresponding text content will not appear in PCS 7. Question marks are displayed instead.

Requirements

- WinCC Explorer is open.

Procedure

1. Navigate to "OS (1) > Computer" and double-click the computer name to open the "Computer properties" dialog.
2. Select the "Parameters" tab.
3. Select the "English" language in both boxes.
4. Click "OK".
5. Close the window.

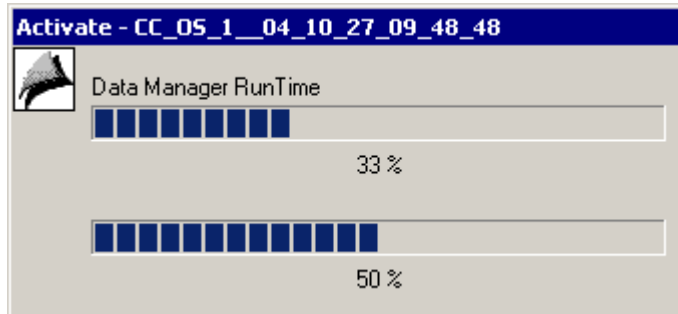
9.2.2 How to Activate Process Mode

Requirements

- WinCC Explorer is open.
- The example project is open.

Procedure for Activating Process Mode

1. Select the menu command **File > Activate**.
The progress bar and start screen open.



2. Click "RMT1" in the overview area.
This displays the process picture which you created in the Graphics Designer.

9.2.3 How to Start the Process

Introduction

To enable operator control and monitoring of all functions that you have configured, you now just have to start the dosing process.

Dosing is started using the SFC. You start the SFC directly in process mode without having to change back to SIMATIC Manager.

There are two ways to start the process:

- Using the block icon ".../RMT1/SFC_RMT1"
- Using a button in the button set

Starting using the block icon

1. Click the block icon ".../RMT1/SFC_RMT1".
The corresponding faceplate opens.



2. Click "Start".
The "SFC Operation" dialog box opens.
3. Click "OK".
The sequential control system starts and you can follow the process in your process picture.
4. Double-click a step in the SFC to view additional details about the current status of the SFC.

Starting using the button set

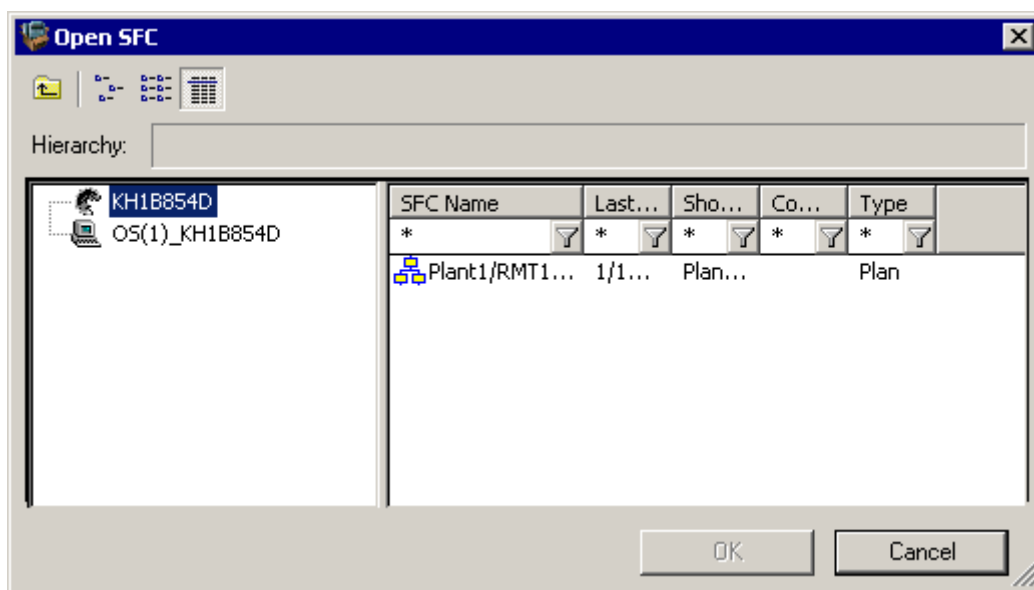
1. Click "Change Button Set":
The second button set is displayed.



2. Click "SFC Visualization".

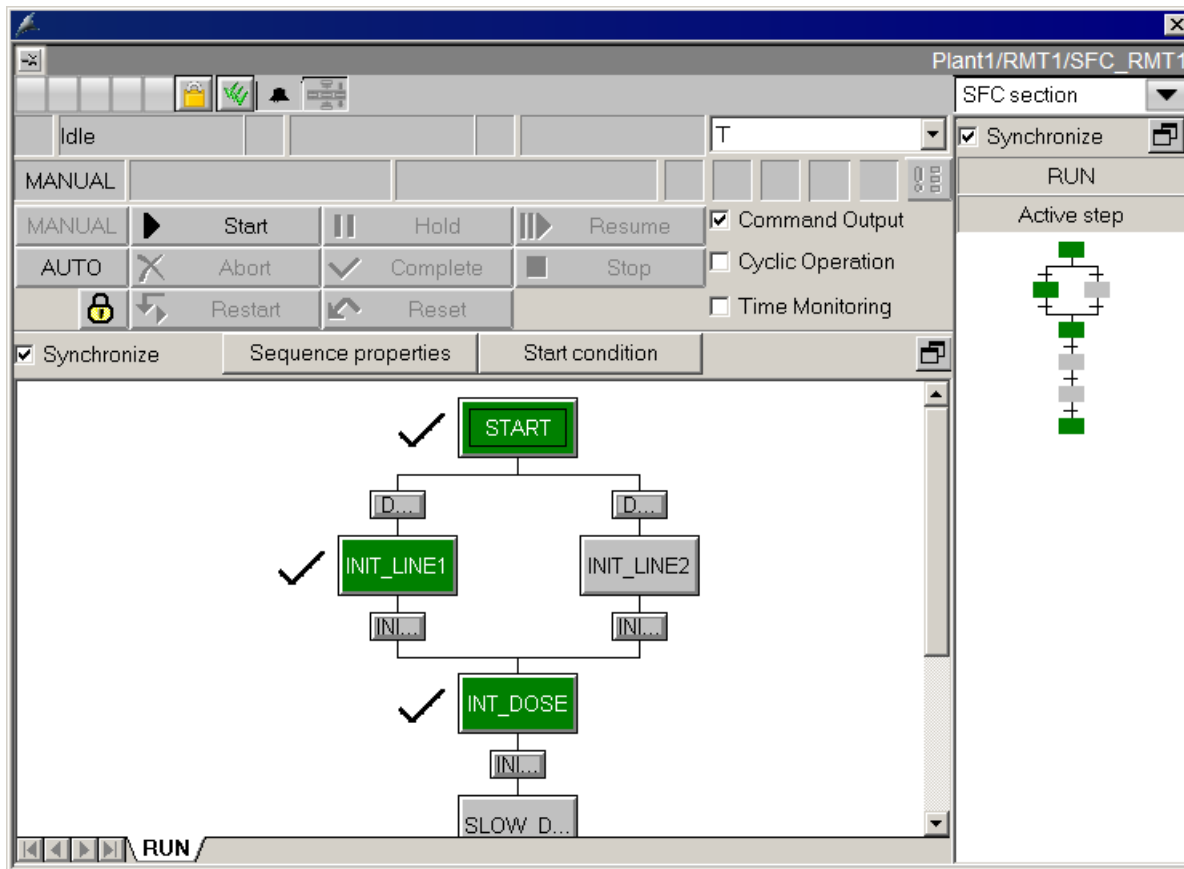


The "Open SFC" dialog box opens. Since you only have one OS and one SFC in your project, only this OS is displayed in the tree view and only the SFC in the detail window.



3. Select the "RMT1/ FC111/ SFC_RMT1"chart in the detail view and click "OK".

4. This view is comparable to the display that you worked with when testing the SFC in the SFC Editor.



5. Position this detailed display so that you can see your entire process picture.
6. Click "Start".
The "SFC Operation" dialog box opens.
7. Click "OK".
The sequential control system starts: You can monitor the process both in your process picture and in the detailed display of the SFC. The representation in the SFC is no different from the representation you know from the test mode.

Note

A simulated value is used, beginning with "INPUT_U", since a real value is not yet available.

The use of a simulated value is then indicated in WinCC by yellow hand (icon) and by a warning triangle on the tank.

Note

The symbols for alarm and warning on the block icons flash at the beginning, since the tank is slightly overfilled.

9.2.4 How to Stop the Process

Procedure

If you do not want the process to run right through to the end, you can stop it manually:

1. Click "Stop" in the detailed display of the SFC chart.
The "SFC Operation" dialog box opens.
2. Click "OK".
This stops the process.
3. Now click "Reset" and then "OK" in the "SFC Operation" dialog box.
This resets all values to the input values.

9.2.5 How to Control the Process by Means of the Process Picture

Operator process control

There are several ways of influencing the process in the process mode using the process picture:

- Select Reactor (Page 179)
- Open Faceplate (Page 180)
- Define Setpoint Value (Page 180)

9.2.6 How to Specify the Reactor

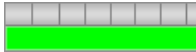
Procedure

1. Click on the "PARA_DOS_RM1_SEL" block icon.
The associated faceplate opens.
2. Click "Command".
3. Check the reactor in which you want to dose the raw material:
 - Reactor 1 selected: "Off" command
 - Reactor 2 selected: "On" command

If you want to select the other reactor, proceed as follows:

- Click "..." next to "Command".
The faceplate is expanded.
- Click "On" if the Reactor 2 should be selected.

4. Click "OK".
The new value is applied and displayed in the faceplate.
5. Close the faceplate.
Result:

Command	Reactor selection	Block icon
"Off"	Reactor 1 selected	
"On"	Reactor 2 selected	

9.2.7 How to Open the Faceplates

Procedure

1. Start the process.
2. Click on the "..._FC111/CTRL_PID" block icon.
The associated faceplate opens with the "Standard" tab activated.
3. Select other tabs from the toolbar.
The following views are of relevance to your "color_gs" project:
 - **Standard** – Here you can see, for example, the setpoint and actual value of the controller, displayed as specific values and in graphic form.
 - **Parameters** - Here you can, for example, modify certain values. You can change the limits for the graphic representation in the "Default" tab.
 - **Limits** - Here you can see, for example, the alarm limits that you defined in the CFC for this block.
4. Close the faceplate.

9.2.8 How to Change the Setpoint

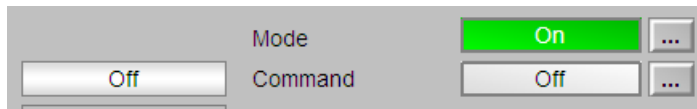
Introduction

The setpoint is changed in two steps:

- First, you define whether the process uses the external or internal setpoint.
- Then, you enter the specific setpoint.

Step 1: Specify setpoint output

1. Click on the "SP_INT_EXT" block icon.
The associated faceplate opens.



2. Click "..." next to "Command".
3. Check which setpoint is enabled:
 - Setpoint selected internally: "Off" command
 - Setpoint selected externally: "On" command

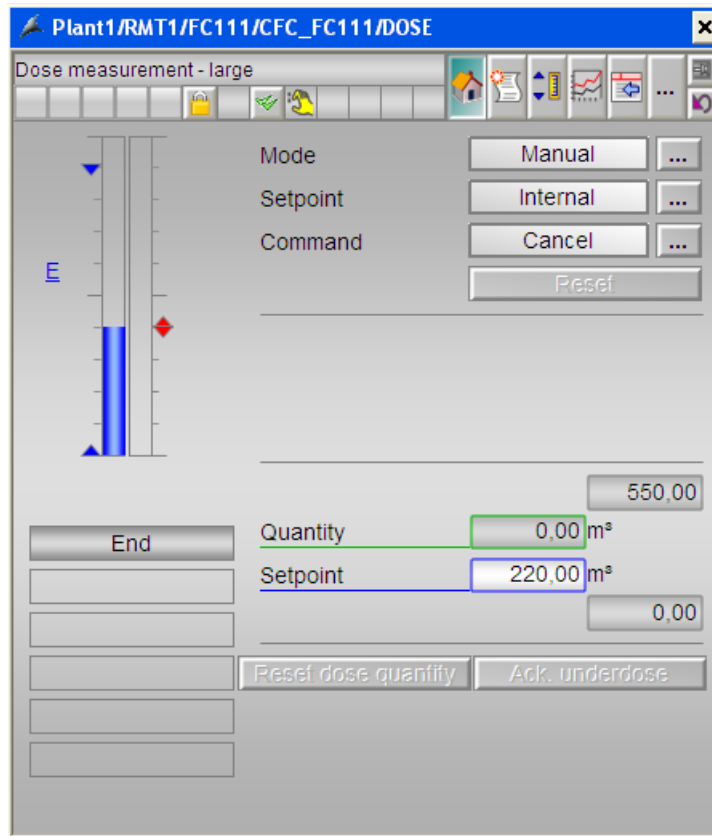
If you want to select the other setpoint, proceed as follows:

- Click "..." next to "Command".
The faceplate is expanded.
 - Click "On" if the setpoint should be selected by an external source.
4. Click "OK".
The new value is applied and displayed in the faceplate.
 5. Close the faceplate.
Result:

Command	Setpoint default	Block icon
"Off"	Setpoint selected internally	
"On"	Setpoint selected externally	

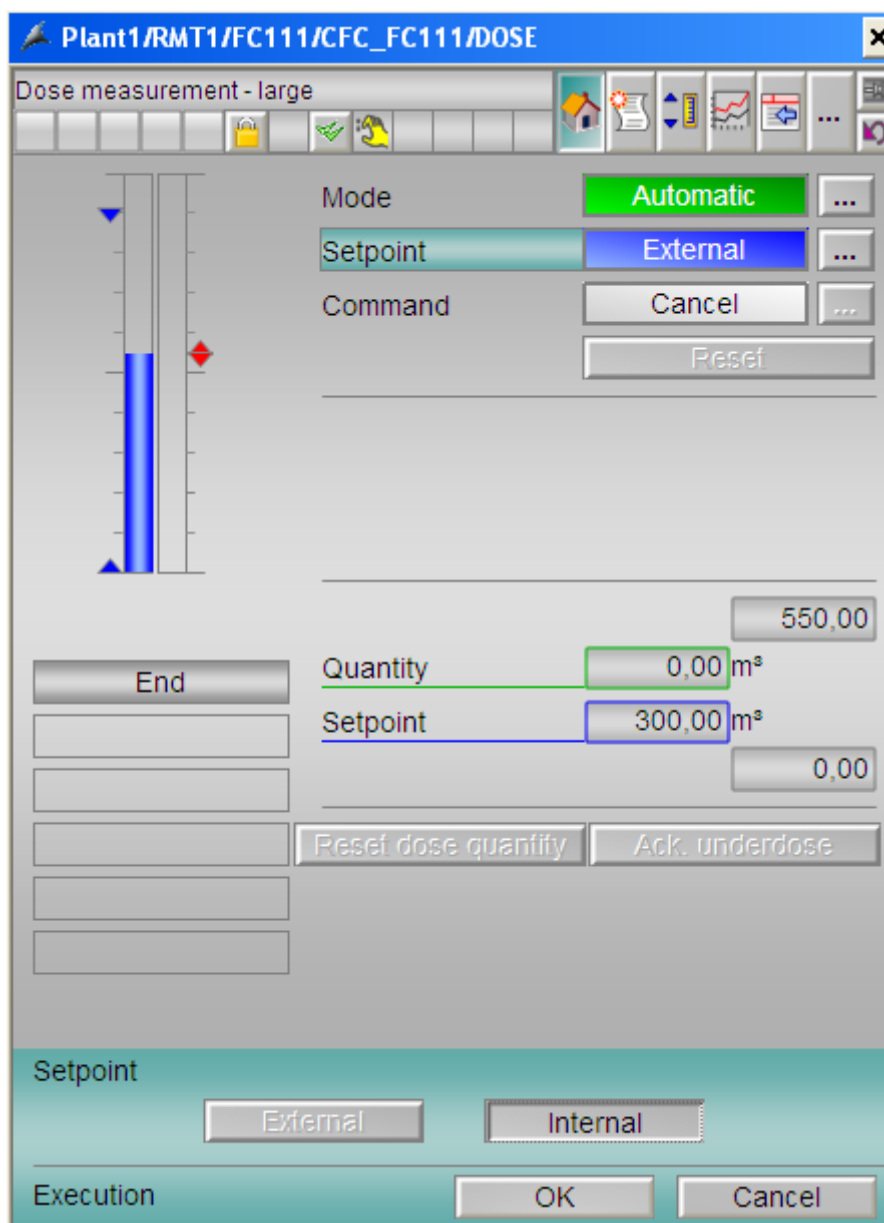
Step 2: Enter the setpoint

1. Click on the ".../CFC_FC111/DOSE" block icon.
The faceplate opens.



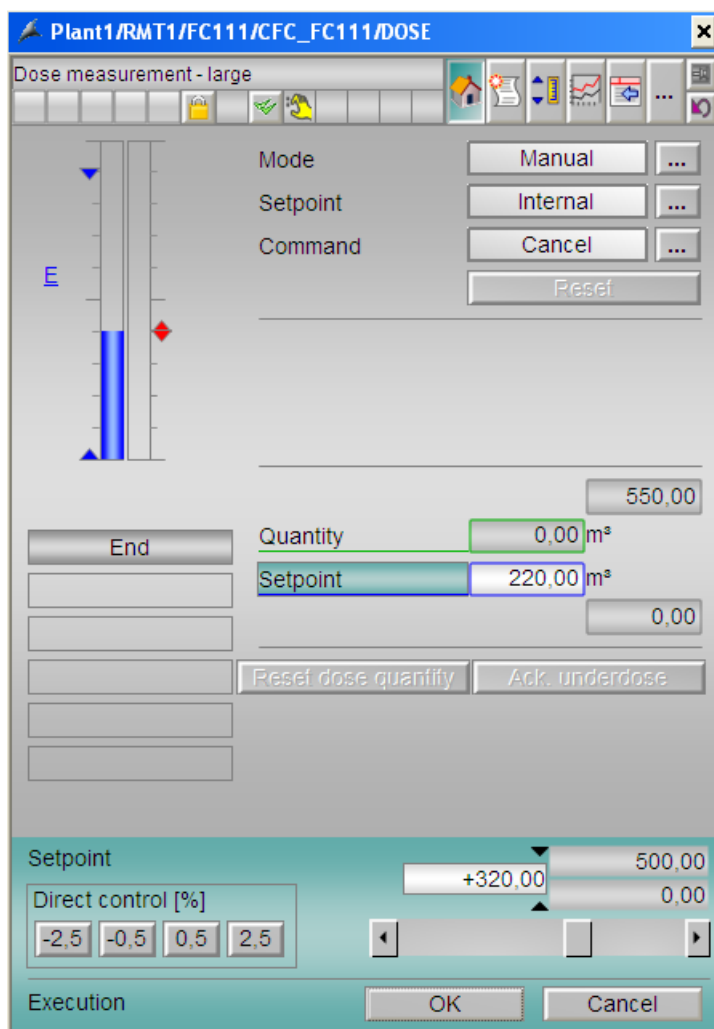
2. Check which setpoint default is enabled:
If you want to select the other setpoint default, proceed as follows:
 - Click "..." next to the display for the setpoint default.
The faceplate is expanded.
 - Click "External" if the external setpoint should be selected or the "Internal" if the internal setpoint should be selected.

- Click on the "internal" box and then click "OK".



- If you have selected the "Internal" setpoint default, you can change the setpoint. To do this, click on the numerical display of setpoint. The faceplate is expanded.

5. Change the position of the controller or enter the desired setpoint.



6. Click "OK".
The value is entered in the input box.
7. Close the faceplate.
The modified value is displayed in the block icon.
8. Restart the process and review the results.

9.2.9 How to Work with Messages

Introduction

Messages are displayed to you as follows:

- In the message line
- In a separate message list

Message line

While the process is running, warnings and alarms with messages are displayed in the message line of your screen. The message line contains the latest message with the highest priority.

Click the button to the right of the message line to acknowledge the messages.

Message list

You can also view all the messages and alarms in a list.

1. Click "Change Button Set":



2. Click on "Message System":



The message list is displayed.

3. Acknowledge the messages as shown in the table below.

If you ...	... then	
want to acknowledge a single message	click "Acknowledge single messages".	
	This acknowledges the message that is highlighted in color at the start of the line.	
want to acknowledge all messages	click "Acknowledge all visible messages".	

4. Click the buttons in the key area to navigate to the various message and alarm lists.
5. Click the "Previous Graphic" button in the button area:



This returns you to the "RMT1" process picture.

9.2.10 How to Exit Process Mode

Procedure

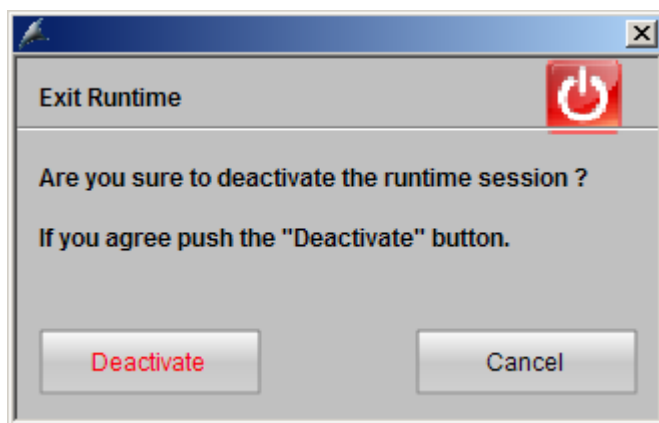
1. Click "Change keyset" in the keyset area:



2. Click "Leave Runtime".



The "End Runtime" dialog box opens.



3. Click "Deactivate".
This is used to exit process mode.
4. Exit WinCC Explorer.

Performing additional tasks

10.1 Introduction to the Additional Task

Additional Task

In the "color_gs" project, two identically configured raw material tanks are required. The additional task is to configure the second raw material tank "RMT2". But do not worry: You do not need to work through all steps again but will use the automatic functions of PCS 7. You will find that the copying function of PCS 7 will save you many steps by performing these steps for you automatically in the background.

When you create the second raw material tank, you will work largely on your own. You have already become familiar with many of the required dialog boxes during configuration of the first raw material tank. Therefore, in this section, we will not prescribe detailed step-by-step instructions but will simply specify the order in which you must make the configuration, giving you a general guideline on how to proceed.

10.2 How to Copy the Existing 'RMT1' Part of the Plant

Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.
- Configuration of the RMT1 plant component is complete and free of errors.

Procedure

1. Use the "Copy/Paste" function in Windows to copy the complete "RMT1" hierarchy folder to the "Plant1" hierarchy folder.
SIMATIC Manager generates a copy of the "RMT1" hierarchy folder, names it "RMT1(1)" and saves it to the "Plant1" hierarchy folder. The names of the objects, for example, CFCs and SFCs, are also appended with a sequential number.
When you copy/move hierarchy folders which contain CFCs and process pictures, the references of dynamic objects from OS pictures to CFC blocks in the target hierarchy folder.

Note

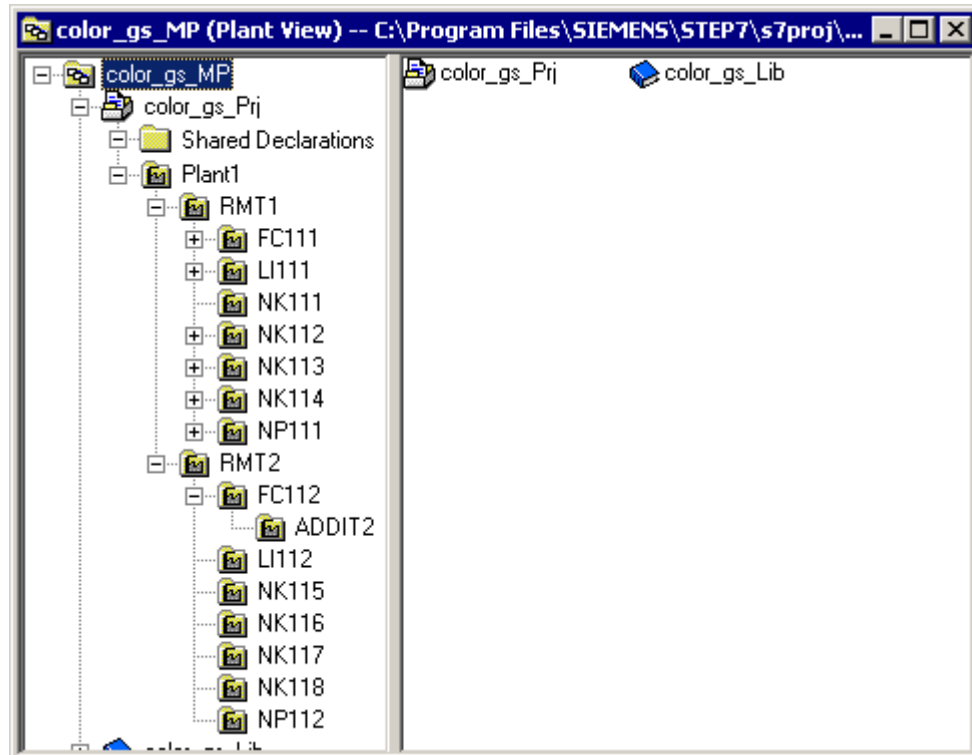
If you copy or move charts and pictures individually, in other words, you copy or move them not within the hierarchy folder, the references of the dynamic objects are lost and they must be linked to the blocks again in the pictures.

2. Change the names of the hierarchy folder and the objects in the individual hierarchy folders according to the table below:

Hierarchy folder	New name	Object contained – old name	New name
RMT1(1)	RMT2	RMT1(1)" process picture	RMT2
		SFC_RMT1(1)	SFC_RMT2
FC111	FC112	CFC_FC111(1)	CFC_FC112
ADDIT	ADDIT2	CFC_SETP(1)	CFC_SETP2
LI111	LI112	CFC_LI111(1)	CFC_LI112
NK 111	NK115	CFC_NK111(1)	CFC_NK115
NK112	NK116	CFC_NK112(1)	CFC_NK116
NK113	NK117	CFC_NK113(1)	CFC_NK117
NK114	NK118	CFC_NK114(1)	CFC_NK118
NP111	NP112	CFC_NP111(1)	CFC_NP112

Result

Your plant hierarchy should now appear as follows:



10.3 Preparation for Process Mode

Preparation

New charts and a new process picture were created when plant component RMT1 was copied to create RMT2. This new information must now be downloaded to the automation system and "made known" to the OS.

You use the central "Compile and Download Objects" function for this purpose. In this situation, PCS 7 provides you with the option of compiling and downloading only the changed information. This reduces the time required for the compile and download operation. In your "color_gs" project, this is not yet a problem since the project is small. When configuring large plants, this option gains in significance.

Once the compile and download operation is complete, you need to adapt the RMT2 process picture.

Then you can activate process mode and test the functions.

10.4 How to Compile and Download the Changes

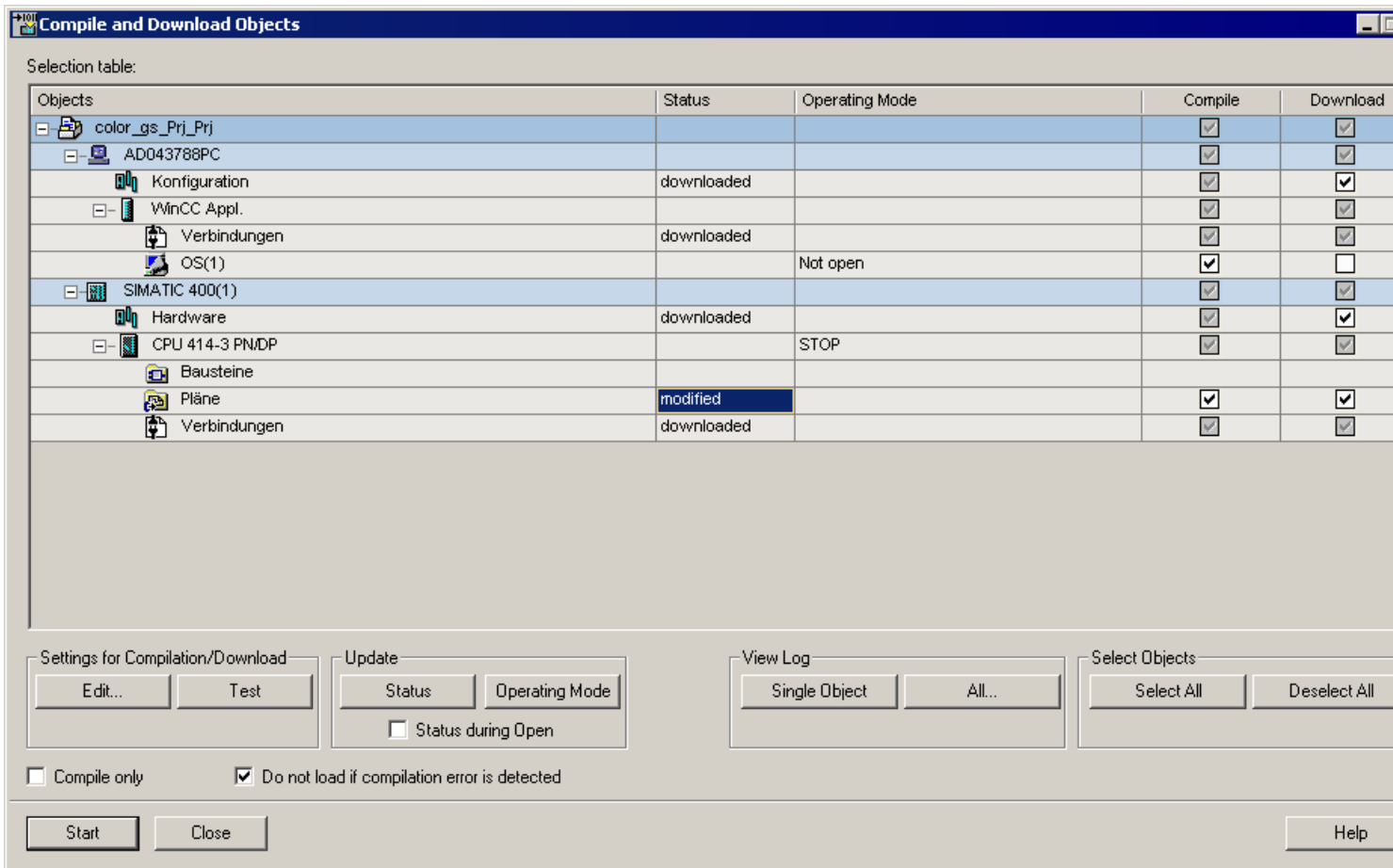
Requirements

- The example project is open in SIMATIC Manager.
- The plant view is activated.
- The CPU is in "RUN-P" mode.

Procedure

1. Select the "color_gs_Prj" object in the tree view.
2. Select the menu command **PLC > Compile and Download Objects..**
The "Charts" object status is "changed".

3. Activate the check boxes as follows:



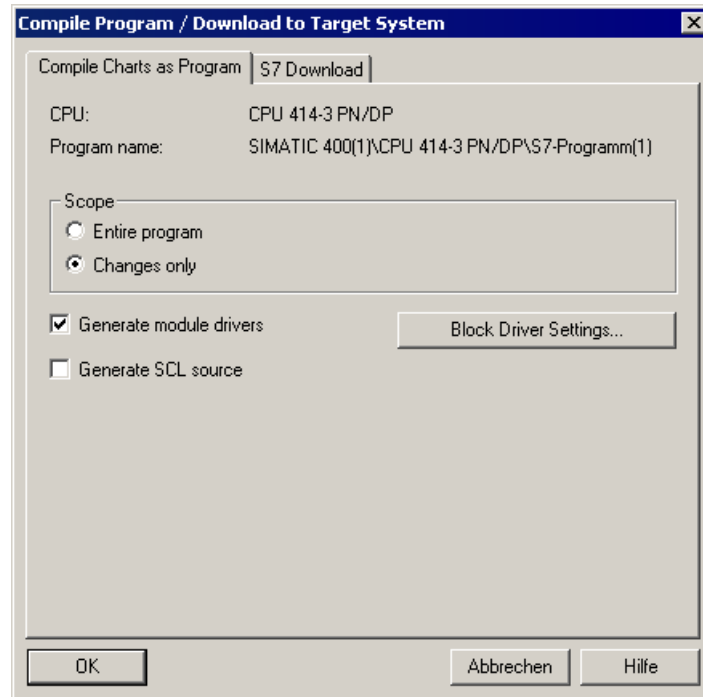
Note

If you see the status "undefined" for all objects in the "Compile and Download Objects" dialog box, click "Status" in the "Update" area.
This updates the status.

4. Select the "Charts" object and click "Edit".
The "Compile Program/Download to Target System" dialog box opens.

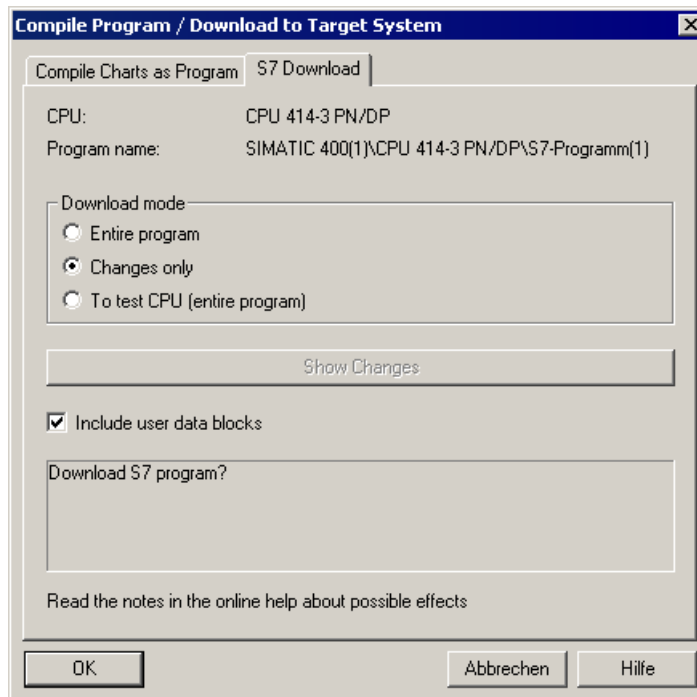
5. Make the following settings:

- Activate the "Changes only" option button in the "Scope" group.
The CPU only remains in process mode if you activate this option.
- Activate the "Generate module drivers" check box.



6. Switch to the tab "S7 load".

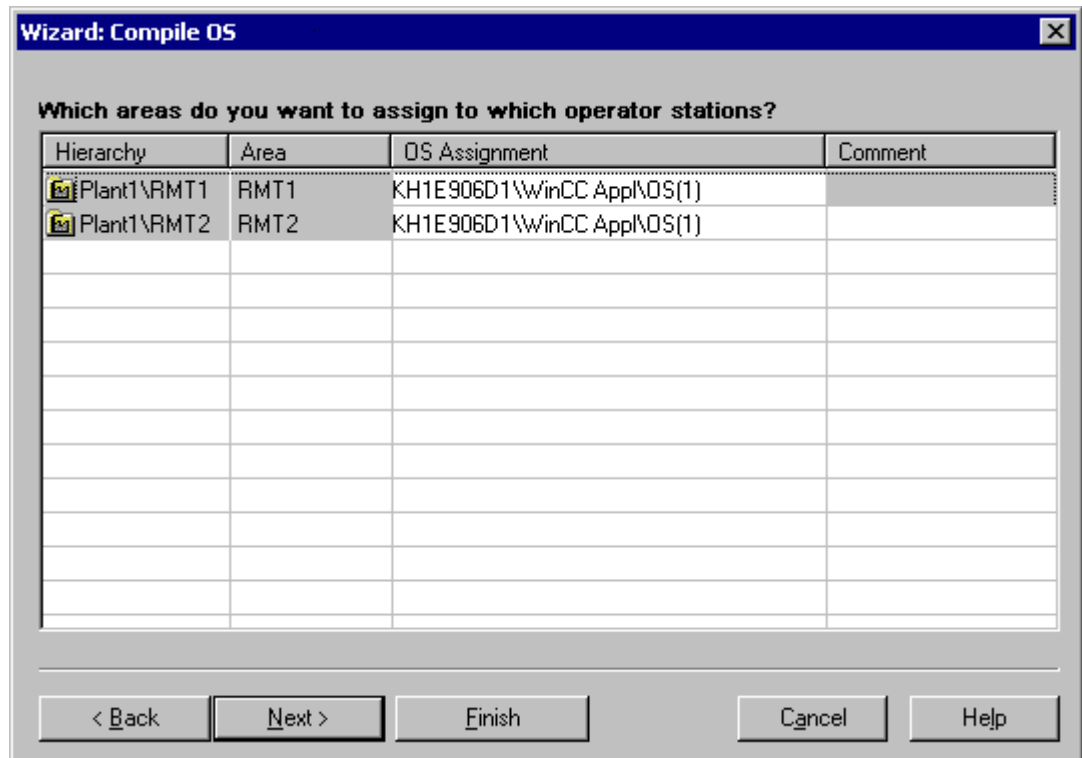
7. Make the following settings:
 - Select the "Changes only" option button in the "Download mode" group.
 - Select the check box "Include user data blocks".



8. Click "OK".
The settings are applied.

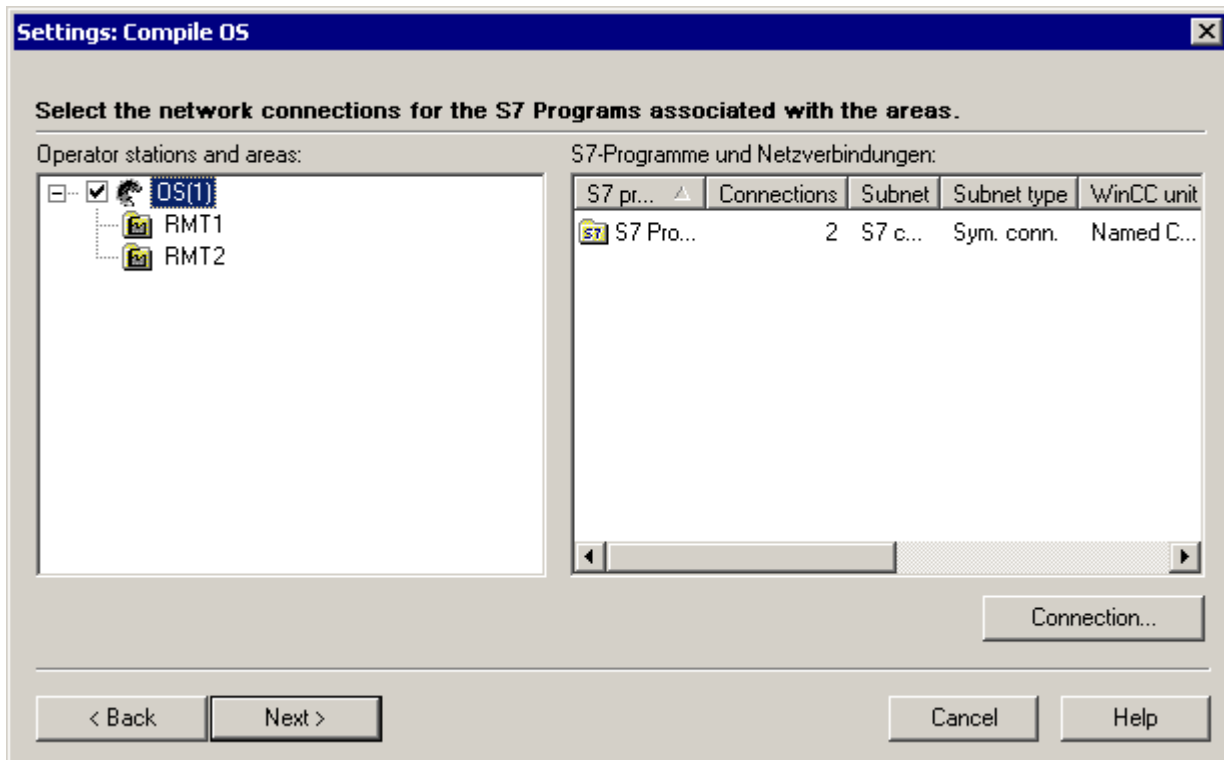
9. Select the "OS(1)" object and click "Edit".

The "Which areas do you want to assign to the operator station OS(1)?" dialog box opens, with the existing "RMT1" plant unit and the new "RMT2" plant unit displayed in the list. Both are automatically assigned to the OS (1).



10. Click "Next >".

The "Select the network connections for the S7 Programs associated with the areas" dialog box opens. Both OS areas are shown in the left pane and the network connection that you have created in NetPro is shown in the right pane.



11. Click "Next >".

12. The dialog "Select the compilation data and scope of compilation" is displayed.

13. Activate the following check boxes and option buttons:

- "Data" group: "Tags and messages"
- "Data" group: "SFC visualization"
- "Data" group: "Picture tree"
- "Scope" group: "Changes"

14. Click "Apply".

The dialog box closes.

15. Click "Start".

The compile and download operation starts and the message dialog "Downloading program changes during operation" opens.

16. Click "OK".

The message dialog "If you want to download changes online, please make sure that ... Do you want to continue?" opens.

17. Click "Yes".

The compile and download operation starts and the log file is opened in the text editor.

18. Close the text editor.

19. Click "Close" in the "Compile and Download Objects" dialog box.

10.5 How to Adapt the OS Configuration

Requirement

The example project is open in WinCC Explorer.

Procedure

1. Open process picture "RMT2" in the Graphics Designer.
2. Change the header text to "Plant unit RMT2".
3. Save the process picture.
4. Close the Graphics Designer.

Additional changes are not necessary because all the block icons in the process picture along with their associated interconnections were updated by the copy operation and the subsequent compilation operation.

10.6 How to Start Process Mode

Requirements

- The OS is compiled.
- The example project is open in WinCC Explorer.
- The follow-up work has been performed in the "RMT2" process picture.

Procedure

1. Select **File > Activate** in WinCC Explorer.
This function changes to operation in process mode. the overview area displays a button named "RMT2". You monitor the units separately by toggling the views using the "RMT1" and "RMT2" buttons. The button of the unit which is currently visualized is marked with a color.
2. Click "RMT2" in the overview area.
3. Change the button set, followed by "SFC Visualization".
The "Open SFC" dialog box opens. The detail view shows two SFC charts: the SFC chart from "RMT1" and the SFC chart from "RMT2".
4. Select SFC chart "../RMT2" and start the sequential control system.
For additional information on this, refer to the chapter titled Working in runtime (Page 173).
5. Perform the following steps in process mode:
 - Switch between the plant units.
 - Change the setpoint presetting.
 - Specify the reactor selection.
 - Etc.For additional information on this, refer to the chapter titled Working in runtime (Page 173).

Starting and adapting the example

11.1 Example project "color_gs"

Example project "color_gs"

You can download the completely configured PCS 7 project "color_gs" from the Internet (www.siemens.com/pcs7-documentation). The project is available as download via the link to the PCS 7 manual "Getting Started - Part 1".

Hotspot-Text (www.siemens.com/pcs7-documentation) Use this project to gain insight into working with SIMATIC PCS7 or to compare a project you have created to this example project.

You can open and start this project on your computer. Since we assumed a specific hardware configuration when creating the project, you will need to adapt the hardware configuration if you use different hardware components.

The overview shows you how to open and adapt the example project:

- Open the example project (Page 202)
- Adapt the hardware of the example project (Page 202)
- Adapt the blocks for the example project (Page 203)
- Adapt the project data for the example project (Page 204)
- Compile and download the example project (Page 205)

11.2 Procedure

11.2.1 How to Open the Example Project

Introduction

This step is only necessary if you want to work with the example project of the "color_gs.zip" file. You can extract the zip file using a SIMATIC Manager function.

Note

The example project comes in the form of a ZIP file that you extract using a PCS 7 function.

Requirement

SIMATIC Manager is open.

Procedure

1. Select the menu command **File > Retrieve....**
2. Open the folder in which you have stored the "color_gs.zip" file.
3. Select file "color_gs.zip" and click "Open".
4. If you ...
 - want to accept the default folder, click "OK".
 - have created a separate folder for the example project, navigate to this folder and then click "OK".Retrieval from the archive is then started. After retrieval from the archive, the "Retrieve from Archive" message window opens.
5. Click "OK".

The message box "The multiproject 'color_gs_MP' has been retrieved from the archive. Do you want to start it now?" dialog box opens.
6. Click "Yes".

11.2.2 How to Adapt the Hardware for the Example Project

Requirements

- The example project is open in SIMATIC Manager.
- The component view is activated.

Procedure

1. Activate the required network adapter in the configuration console.
For detailed information about this, refer to the section titled "How to make the settings in the configuration console" (Page 28).
2. Configure the AS:
 - Select your existing component from the hardware catalog and drag it to the correct slot.
A number of components we used are placed intentionally on correct slots.
 - Make the settings for the network connections (Ethernet).
For detailed information about this, refer to the section titled "How to configure the AS" (Page 39).
3. Rename the PC station in the SIMATIC Manager:
 - Select the object with the symbol  in the tree structure.
 - Enter the name of your computer in the object properties.
For detailed information about this, refer to the section titled "How to rename the PC Station" (Page 42).
4. Configure the OS:
 - Check the Station Configuration Editor to see if it matches the preset configuration. Set the network adapter and network connections.
For detailed information about this, refer to the section titled "How to configure the PC station of the OS" (Page 42).
5. Configure the network connection in NetPro and download the PC station.
For detailed information about this, refer to the section titled "How to make the settings in NetPro" (Page 44).

11.2.3 How to Adapt the Blocks for the Example Project

Requirements

- The example project is open in SIMATIC Manager.
- The "PCS 7 AP Library V80" is open and selected.

Procedure

1. Select the "PCS 7 AP Library V80\Blocks+Templates\Blocks" item in the tree view. The detail view displays all the blocks.
2. Select all blocks that are also contained in your library.
3. Insert the blocks in the "color_gs_MP\color_gs_Lib\S7 Program(1)\Blocks" master data library using drag-and-drop.
The "Insert function block" dialog box opens.
4. Click "All".
This replaces all blocks in the master data library with the blocks from the current version of the PCS 7 library.

5. Select "color_gs_MP\color_gs_Lib\S7 program(1)\Charts" in the tree view.
6. Select the process tag type "VALVE".
7. Select the menu command **Edit > Open Object**.
The process tag type opens in the CFC Editor.
8. Select the menu command **Options > Block Types....**
The "Block Types" dialog box opens.
9. Select all blocks in the "Chart Folder" group and click "New Version".
The "Set Format" dialog box opens.
10. Click "Yes" to implement the formats.
The "Import New Version" dialog box opens if the process tag types still contain blocks from an older version.
11. Click "Yes" to update the blocks.
The "Import New Version" dialog box opens and displays all the identical block types.
12. Click "Yes".
The dialog box closes.
13. Click "Close".
14. Close the CFC Editor.
15. Select the item "color_gs_MP>\color_gs_Lib\S7 program(1)\Blocks" in the tree view.
16. Select the menu command **Options > Charts > Update Block Types....**
The "Update Block Types" wizard opens.
 - In the "Select the S7 programs to be checked" step, select all the files of the "color_gs" project. The check boxes for all folders of all S7 programs are activated by default.
 - Click "Next".
 - All block types are activated by default in the step "Select the block type to be updated".
 - Click "Finish". The "Set Format" dialog box opens.
 - Click "Yes" to implement the formats. The log file opens when the update of the blocks and block instances is completed.
17. Click "Close" in the log.
18. Compile the AS after the block import.

11.2.4 How to adapt the project data for the example project

Requirements

- The example project is open in SIMATIC Manager.
- OS(1) is selected in the Component view.

Procedure

1. Select the menu command **Edit > Open Object**.
The "s7omwinx" dialog box opens.
2. Click "Yes" to open the project on a local computer which operates in server mode.
WinCC Explorer opens.

Note

Configured server

- Confirmation with "Yes" is necessary only if the computer name configured in the sample project does not match the name of the computer on which you have created the sample project.
 - The computer name will be adapted automatically. You will be informed by a message box.
 - Exit WinCC Explorer and start these steps once again.
-

3. Select the OS(1)\Computer item in the navigation window.
4. Double-click the computer symbol in the detail view.
5. Enter the name of the computer on which you have opened the project in the "Computer name" input box.
You can find this name in the Station Configuration Editor.
6. Click "OK".
7. Acknowledge the "Change computer name" message with "OK".
The computer symbol will now be crossed out red in the dialog box.
8. Exit WinCC Explorer and open it again.
The computer name has now been applied.
9. Select the entry "OS Project Editor".
10. In the shortcut menu, select the menu command "Open".
The OS project editor opens.
11. Check whether the monitor configuration matches your system and modify if necessary.
Apply the other default settings and click "OK".
The OS project editor configures the project.
12. Exit WinCC Explorer.

11.2.5 How to Compile and Download the Example Project

Requirements

- The sample project is open in the component view of the SIMATIC Manager.
- The CPU is in "STOP" mode.
- The hardware is adapted.
- The blocks and project data are adapted.

Procedure

1. Select the "color_gs_Prj" object in the tree view.
2. Select the menu command **PLC > Compile and Download Objects..**
The "Compile and Download Objects" dialog box opens.
3. Activate the following check boxes:
 - color_gs_Prj\[name of the PC station]\Configuration: "Compile"
 - color_gs_Prj\[name of the PC station]\WinCC application\OS(1): "Compile"
 - color_gs_Prj\SIMATIC 400(1)\Hardware: "Compile" and "Download"
 - color_gs_Prj\SIMATIC 400(1)\[Name of the CPU]\Charts: "Compile" and "Download"
4. Select the "Charts" object and click "Edit".
The "Compile Program\Download to Target System" dialog box opens.
5. Activate the following option buttons and check boxes:
 - "Scope" group: "Entire program"
 - Additional settings: "Generate module drivers"
6. Click "OK".
7. Select the "OS(1)" object and click "Edit".
8. In the "Which areas do you want to assign to the operator station OS(1)?" dialog box, assign the preset plant units to OS (1).
9. Select the S7 connection in the "Select the network connections for the S7 Programs associated with the areas" dialog box.
10. In the "Select the data you want to compile and the scope of the compilation" dialog box, select the following check boxes:
 - "Data" group: "Tags and messages"
 - "Data" group: "SFC Visualization"
 - "Data" group: "Picture Tree"
 - "Scope" group: "Entire OS with memory reset"
11. Click "Apply".
12. Click "Start".
The compile and download operation starts. The message "Downloading program changes during operation can, in the case of malfunctions or program errors, cause serious damage to personnel and equipment! Make sure..." opens.
13. Click "OK".
The message dialog "If you want to download changes online, please make sure that ... Do you want to continue?" opens.
14. Click "Yes".
The log file opens in the text editor to show you whether or not the compilation and download operation was successfully completed.
15. Close the text editor.
16. Start the CPU of the AS.

Working in the OS

1. Switch to the component view of SIMATIC Manager.
2. Open the OS.
You can find detailed information about this in the section:
"How to start the PCS 7 OS (Page 150)".
3. Activate process mode.

Additional information

You can find detailed information about this in the section:
"The operator station in process mode (Page 173)".

Index

"

"New Project" Wizard, 30

A

- Acknowledge, 184
 - Message, 184
- Adapting, 51, 99, 198, 202
 - Default names, 51
 - Example project, 202
 - OS Configuration, 198
 - Parameter, 99
- Add, 167
 - Text field, 167
- Additional Task, 187
- Addresses, 102
 - Delete interconnection, 102
- Applications, 18
 - of the ES, 18
- AS, 39
 - Configuring, 39
- AS-OS assignment, 55
- AS-OS communication, 55
- Assigning parameters, 79, 83, 87, 90, 99, 118, 123
 - Blocks in CFC_FC111, 83
 - Blocks in CFC_LI111, 87
 - Blocks in CFC_NP111, 90
 - CFC_NK111x, 99
 - CFC_SETP, 79
 - SFC, 118
 - Transitions, 123

B

- Basic knowledge, 9
- Block, 61
 - Saving, 61
- Block catalog, 75
- Block comment, 99
- Block icons, 143, 145
 - Activate generation, 143
 - Generating, 145
- Blocks, 78, 91
 - I/Os, 78
 - Interconnecting, 91
- Brief overview, 17

PCS 7, 17

Button set, 173

C

- Calling, 180
 - Faceplate, 180
- Catalog, 76
- CFC, 57, 70, 71, 130, 188
 - Compiling, 130
 - Downloading, 130
 - Inserting, 71
 - Object properties, 70
 - Renaming, 70, 188
- CFC chart, 67, 133
 - Creating, 67
 - Plant hierarchy, 67
 - Test mode, 133
- CFC charts, 78
 - Configure Blocks, 78
- CFC Editor, 57, 75, 76, 135
 - Catalog, 76
 - Monitoring, 135
 - Overview, 75
 - Single view, 75
 - Structure, 75
 - Test mode, 135
 - Testing the chart, 135
- CFC_FC111, 68, 81, 83, 94
 - Assigning parameters, 83
 - Insert blocks, 81
 - Interconnecting, 94
- CFC_LI111, 69, 86, 87, 95
 - Assigning parameters, 87
 - Insert blocks, 86
 - Interconnecting, 95
- CFC_NK111x, 99
 - Assigning parameters, 99
- CFC_NK11x, 70
- CFC_NP111, 69, 90
 - Assigning parameters, 90
- CFC_SETP, 68, 78, 79
 - Assigning parameters, 79
 - Insert blocks, 78
- CFCs, 67, 68, 69, 70, 77, 91
 - Interconnecting, 91
 - Meaning of CFC_FC111, 68
 - meaning of CFC_LI111, 69
 - Meaning of CFC_NK11x, 70

- Meaning of CFC_NP111, 69
- Meaning of CFC_SETP, 68
- Opening, 77
- Project "color_gs", 67
- Change, 75
 - from the overview to single sheet, 75
- Changes, 191
 - Downloading, 191
- Close, 37
 - Project, 37
- Compile, 129, 147
- Compiling, 130, 205
 - CFC/SFC, 130
 - Example project, 205
 - Object, 130
 - Operator station, 147
- Component view, 21, 141
 - Operator station, 141
- Components, 17
 - PCS 7 project, 17
- Configuration, 26, 39, 76, 141
 - Catalog in the CFC Editor, 76
 - Hardware, 39
 - PCS 7 OS, 141
 - Project plant, 26
- Configuration console, 28
 - Setup, 28
- Configuration steps for the color_gs project, 27
- Configuration tasks, 77
 - Overview of CFC charts, 77
- Configure, 78
 - Blocks in CFC charts, 78
- Configured mode, 28
- Configuring, 39, 42
 - AS, 39
 - OS, 42
 - Station, 39
- Connection partner, 44
- Coping, 188
 - Plant components, 188
- Create, 111
 - Sequential control system, 111
- Creating, 30, 32, 67
 - CFC chart, 67
 - New project, 30
 - Project, 32

D

- Default names, 51
 - Adapting, 51
- Defining, 97

- Connections for the process object view, 97
- Delete, 102, 144
 - Interconnection to addresses, 102
 - Picture, 144
- Description, 19, 23
 - Project "color_gs", 23
 - SIMATIC Manager, 19
- Detail view, 20
 - SIMATIC Manager, 20
- Device, 51
- Display, 75
 - CFC Editor, 75
- Download, 47, 129
 - Hardware configuration, 47
- Downloading, 130, 191, 205
 - CFC, 130
 - Change, 191
 - Example project, 205
 - Object, 130
 - SFC, 130
- Drawing area, 154
- Duplicate, 162
 - Text field, 162

E

- Edit, 143
 - Picture properties, 143
- End, 179, 186
 - Process mode, 186
- ES, 18
 - Applications, 18
- Example project, 201, 202, 205
 - Adapting, 202
 - Compiling, 205
 - Downloading, 205
- Example project color_gs, 202
 - Retrieving from archive, 202

F

- Faceplates, 180
- Filter, 97
- Format, 161
 - Text field, 161
- Function, 51
- Functions, 106
 - SFC Editor, 106

G

Generating, 145
 Block icons, 145
 Graphics Designer, 154, 155, 157
 Libraries, 154
 Object palettes, 155
 Objects, 154, 157
 Toolbars, 155

H

Hardware, 13, 39
 AS configuration, 39
 Catalog, 39
 Requirements, 13
 Hardware configuration, 39, 47
 AS, 39
 Download, 47
 Hardware settings, 28
 Hide, 64
 Library, 64
 Hierarchy folder, 54, 188
 Insert, 54
 Renaming, 188
 Higher Level Designations, 49
 How to adapt the blocks for the example project, 203
 How to adapt the project data for the example project, 204

I

I/Os, 78
 Hidden, 78
 Identification, 57
 CFC, 57
 Initialization, 118
 Insert, 169
 Setpoint default, 169
 Inserting, 54, 71, 72, 73, 78, 81, 86, 158, 161
 Block in CFC_FC111, 81
 Block in CFC_SETP, 78
 Blocks in CFC_LI111, 86
 CFC Charts in the PH, 71
 Hierarchy folder, 54
 Piping / tanks in the process picture, 158
 Process tag type, 72, 73
 Text field, 161
 Interconnect, 164
 Raw materials tank with process value, 164

Interconnecting, 91, 94, 95
 Blocks in CFC_FC111, 94
 Blocks in CFC_LI111, 95
 CFCs, 91
 Interconnection to addresses, 102
 Delete, 102
 Interfaces, 28
 Setup before configuration, 28
 IP Protocol, 42

L

Labeling, 161
 Labeling plant units in the process picture, 161
 Libraries, 75, 154
 Graphics Designer, 154
 Library, 60, 64
 Hide, 64
 Open, 60
 Show, 64

M

MAC address, 28, 42
 Manual, 9
 Purpose, 9
 Master data library, 30, 58, 61, 63
 Advantages, 58
 Process tag types, 58
 Saving blocks, 61
 Saving objects, 58
 Saving process tag types, 63
 Memory reset, 147
 Message, 184
 Acknowledge, 184
 Message line, 184
 Message Line, 173
 Message list, 184
 Message system, 184
 MODE, 83
 Modify, 143, 180
 Picture name, 143
 Setpoint default, 180
 Monitoring on/off, 135
 Move, 108
 SFC, 108
 Multiproject, 30

N

Naming, 51, 161

- Plant components, 51
- Plant hierarchy, 51
- Text field, 161
- Navigation window, 152
- NetPro, 44
- Network, 28
 - Setup before configuration, 28
- Network adapters, 28
- New project, 30
 - Creating, 30

O

- Object, 17, 130, 157
 - Compiling, 130
 - Downloading, 130
 - Project, 17
 - Static, 157
 - Text fields, 157
- Object palettes, 155
- Objects, 154
 - Dynamic, 154
 - Static, 154
- Open, 37, 110, 154
 - Library, 60
 - Process picture, 154
 - Project, 37
 - SFC, 110
 - Toolbars, 155
- Opening, 22, 60, 77, 155
 - CFC, 77
 - SIMATIC Manager, 22
- Operating, 179
 - Process, 179
- Operating mode, 28
- Operator station, 140, 147, 150
 - Compiling, 147
 - in process mode, 140
 - Network connections, 147
 - Start, 150
- Optimizing, 126
 - Run sequence, 126
- OS, 42
 - Configuring, 42
- OS area, 147
- OS configuration, 142
 - Block icons, 142
 - Compilation, 142
 - Picture properties, 142
- OS Configuration, 198
 - Adapting, 198
- OS project editor, 205

- Overview, 75
- Overview area, 173

P

- Parameter
 - Adapting, 99
- Parameters, 99, 121, 124
 - Steps, 121
 - Transitions, 124
- PC station, 42
 - Renaming, 42
- PCS 7, 17
 - Brief overview, 17
- PCS 7 OS, 141, 152
 - Configuration, 141
 - Structure, 152
- PCS 7 Library V70, 61, 63
- PG mode, 28
- Picture, 144
 - Delete, 144
- Picture hierarchy, 49
- Picture properties, 143
 - Change the name of the picture, 143
 - Edit, 143
- Picture tree, 147
- Piping and instrumentation flow diagram, 24
- Plant, 51
- Plant components, 51, 188
 - Coping, 188
 - Naming, 51
- Plant configuration, 26
- Plant hierarchy, 49, 51, 54, 67, 71, 145
 - Adapting names, 51
 - CFC chart, 67
 - Create block icons, 145
 - Hierarchy folder, 54
 - Hierarchy levels, 49
 - Higher Level Designations, 49
 - Inserting a CFC, 71
 - Naming, 51
 - Picture hierarchy, 49
 - Setup, 49
- Plant view, 51
 - Device, 51
 - Function, 51
 - Plant, 51
 - Structuring, 51
 - Unit, 51
- Plant View, 21
- Process, 176, 179, 180, 184
 - Call faceplate, 180

- Change setpoint, 180
- Message, 184
- Operating, 179
- Reactor selection, 179
- Starting, 176
- Stopping, 179
- Process mode, 140, 173, 175, 186, 199
 - End, 186
 - Start, 175
 - Starting, 199
 - User Interface, 173
- Process object view, 21, 97, 99
 - Adapting the view, 99
 - Block comment, 99
 - Defining connections, 97
 - Filter, 97
- Process picture, 152, 154, 158, 161
 - Inserting pipes, 158
 - Inserting tanks, 158
 - Labeling plant units, 161
 - Open, 154
- Process pictures, 141
- Process tag type, 73
 - Inserting, 73
- Process tag types, 58, 63, 72
 - Inserting, 72
 - Master data library, 58
 - Saving, 63
 - Templates, 72
- Project, 17, 23, 30, 32, 37, 187
 - "color_gs", 23
 - Additional Task, 187
 - Assistant, 30
 - Close, 37
 - Components, 17
 - Creating, 32
 - Open, 37
- Project editor, 205
- Project plant, 26
 - Configuration, 26
- Properties, 107
 - Step, 107
 - Transition, 107
- Purpose, 9
 - Manual, 9

R

- Rename, 109, 113
 - SFC, 109
 - Steps, 113
- Renaming, 42, 70, 115, 188

- CFC, 70
- CFC/SFC, 188
- PC station, 42
- Transitions, 115
- Requirements, 13, 14
 - Hardware, 13
 - Software, 14
- Retrieving from archive, 202
 - Example project color_gs, 202
- Run sequence, 126
 - Optimizing, 126
- Runtime group, 130

S

- S7 connection, 44, 147
- Sampling time, 130
- Saving, 58, 61, 63
 - Block, 61
 - Objects in the master data library, 58
 - Process tag types, 63
- Select, 179
 - Reactor, 179
- Sequence control, 105, 111
 - Create, 111
- Sequential control system, 110
- Setpoint default, 169
 - Insert, 169
- Setup, 28, 44, 49, 162
 - Configuration console, 28
 - Hardware, 28
 - In NetPro, 44
 - Interface, 28
 - Network, 28
 - Plant hierarchy, 49
 - Text field, 162
- SFC, 105, 108, 118, 130, 188
 - Assigning parameters, 118
 - Compiling, 130
 - Downloading, 130
 - Initialization, 118
 - Move, 108
 - Renaming, 188
- SFC chart, 133
 - Test mode, 133
- SFC Editor, 106, 134
 - Functions, 106
 - Step, 106
 - Test mode, 134
 - Testing the chart, 134
 - Transition, 106
- SFC Visualization, 147

- SFCs, 109, 110
 - Open, 110
 - Rename, 109
- Show, 64
 - Library, 64
- SIMATIC Manager, 19, 20, 22, 142
 - Description, 19
 - OS compilation, 142
 - OS configuration, 142
 - Start, 22
 - Structure, 20
 - User Interface, 20
- Single view, 75
- Software, 14
 - Requirements, 14
- Stand-alone project, 30
- Starting, 22, 150, 175, 176, 199
 - Button set, 176
 - Operator station, 150
 - Process mode, 175, 199
 - SFC block icon, 176
 - SIMATIC Manager, 22
- Static object, 157
- Station, 39
 - Configuring, 39
- Step, 106, 107
 - Properties, 107
- Steps, 113, 121
 - Parameters, 121
 - Rename, 113
- Stopping
 - Process, 179
- Structure, 20, 75, 106, 152
 - CFC Editor, 75
 - SFC Editor, 106
 - SIMATIC Manager, 20
 - WinCC Explorer, 152
- Structuring, 51
 - In the plant hierarchy, 51

T

- Tag interconnection, 157
- Tag Interconnection, 164
 - Raw materials tank, 164
- Target system, 130
- Task list, 24, 26
 - Piping and instrumentation flow diagram, 24
 - Plant configuration, 26
- Templates, 72
- Test, 129
- Test mode, 133, 134, 135

- CFC chart, 133
- CFC Editor, 135
- Operating mode, 134
- Properties, 134
- SFC chart, 133
- SFC Editor, 134
- Step control mode, 134
- Text field, 161, 162, 167
 - Add, 167
 - Attributes, 162
 - Configuring the object properties, 162
 - Duplicate, 162
 - Format, 161
 - Inserting, 161
 - Naming, 161
- Text fields, 157
- Toolbars, 155
 - Graphics Designer, 155
- Transition, 106, 107
 - Properties, 107
- Transitions, 115, 123, 124
 - Parameters, 123, 124
 - Renaming, 115
- Tree structure, 20
 - SIMATIC Manager, 20

U

- Unit, 51
- User Interface, 173
 - Process mode, 173

V

- Validity, 9
- Valve control, 97
- View, 38
- Views, 21
 - Component view, 21
 - Plant View, 21
 - Process object view, 21

W

- WinCC Explorer, 152
 - Structure, 152
- Wizard ", 30
- Work, 38
 - with views, 38