

SIMATIC PCS 7 Process Control System

Getting Started - First Step Documentation • January 2004



simatic
PCS 7

SIEMENS

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

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Preface

Information About the Getting Started PCS 7 - First Steps Documentation

Getting Started with PCS 7; The First Steps documentation uses a simple sample project to show you the fundamental procedures and the interaction of the software components of SIMATIC PCS 7 during engineering and in process operation.

This Getting Started documentation serves as an introduction and therefore does without detailed and background information. If this Getting Started documentation has aroused your interest in SIMATIC PCS 7, we recommend the Getting Started PCS 7 - Part 1 for Beginners documentation.

Aim of this Getting Started Documentation

The aim of this documentation is to provide you with a rapid and successful guided introduction to SIMATIC PCS 7. You get to know many elementary configuration steps and develop an understanding for how SIMATIC PCS 7 functions in the process.

Prerequisites for the Getting Started PCS 7 - First Steps Documentation

The sample project "fast_MP" can be carried out on any PC or programming device on which the following software is installed:

- Windows 2000 Professional operating system with Service Pack 3, Internet Explorer 6.0, Message Queuing service and SQL-Server
- Software package SIMATIC PCS 7 as of V6.0 and the authorization diskette
- PLCSIM to simulate a SIMATIC S7-400 automation system

Elements of the Getting Started PCS 7 - First Steps Documentation

This documentation is available as an on-line help and as a printable manual (PDF format). It is advisable to use the printed PDF during configuration on the PC. In order to reduce the time required for configuration, an archived zip file, which contains the completed CFC charts, is included as a library.

The online help and the printed manual are located under **Start > Simatic > Documentation > English** following the installation of SIMATIC PCS 7. The archived Zip file "Sim_lib.zip" is saved under the following path following the installation of SIMATIC PCS 7: installation path \SIEMENS\STEP7\Examples_MP.

We wish you every success!

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1 Creatig a PCS 7 Project

1.1 Creating the PCS 7 Project "fast_MP"

The PCS 7 wizard "New Project" allows you to create a new PCS 7 multiproject with a few mouse clicks.

Prerequisites

- Installation of PCS 7 as of V6.0
- Installation of S7-PLCSIM V5.2 and the corresponding Hotfix1

Procedure

Step	Procedure
1	Start the SIMATIC Manager. Either by double-clicking on the corresponding icon on the desktop or by using the command Start SIMATIC SIMATIC Manager .
2	Close any projects which may be opened by using the menu command File > Close .
3	Start the PCS 7 Wizard by using the menu command File > "New Project" Wizard .
4	Leave the presettings in the initial dialog box (1/4) and click on the "Next" command button.
5	Select the CPU417-4 in the wizard dialog box (2/4) and click on the "Next" command button.
6	• In the wizard dialog box (3/4) select "3" layers for the Plant Hierarchy. • Under PLC Objects activate the "CFC Chart" and "SFC Chart" check boxes. • Under OS Objects activate the "PCS 7 OS" check box and select the "Single workstation system" radio button. Then click on the "Next" command button.
7	In the wizard dialog box (4/4) enter "fast" under the directory name, specify the storage site or leave the default setting and click on the "Complete" command button.

Step	Procedure
8	The "Message Number Assignment Selection" dialog box is only displayed if you have not changed the default setting "Always Prompt Settings" for new projects in the "Select" dialog box. Select the "Unique message number assignment for the CPU" radio button and terminate the dialog box by clicking on the "OK" dialog box. You can furthermore specify default settings for future projects/libraries in this dialog box. If you specify a default differently from the standard default setting, the prompt for the message number assignment selection in the PCS 7 Wizard is no longer displayed.
9	Close the Plant View and open the Process Object View by using the View > Process Object View menu command.
10	In the SIMATIC Manager use the Window > Arrange > Horizontally menu command to position the two windows "Process Object View" and "Component View" underneath each other.

Note

In the SIMATIC Manager the **Options > Settings** menu command can be used to specify in the "Settings" dialog box of the "View" tab under "Default Project View" which view is to be displayed when a project is opened.

Result

The "fast_MP" multiproject with a SIMATIC 400 station, a SIMATIC PC station and a master data library "fast_Lib" was created. After the above-mentioned steps have been completed, the created multiproject is displayed in the Project Object View and in the Component View in the SIMATIC Manager.

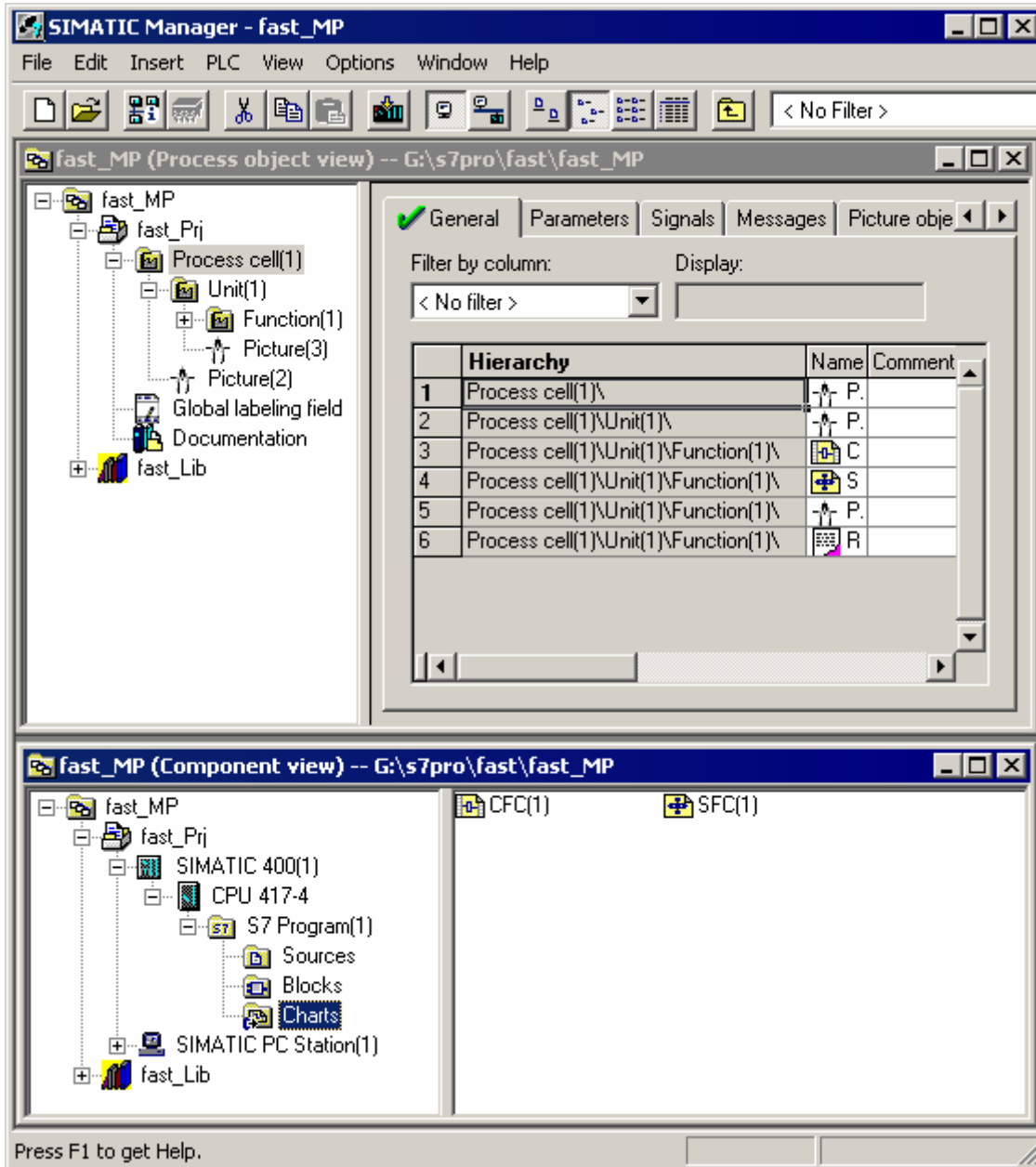


Figure 1-1: Creating the PCS 7 Project "fast_MP"

2 Configuring the Hardware and Network

2.1 Configuring the Hardware

In addition to the objects which the PCS 7 Wizards has created, you require further hardware modules from the hardware catalog.
These configuration steps are carried out in HW Config.

Prerequisites

- The PCS 7 multiproject "fast_MP" has been created.

Procedure

Step	Procedure
1	In the Component view select the SIMATIC 400 station using the right-hand mouse button and click on "Open Object" in the pop-up menu.
2	• In HW Config open the "PROFIBUS-DP" folder on the right-hand side in the hardware catalog. • Then open the "ET 200M" folder and select "IM 153-2" in order to drag and drop this module onto the line of the PROFIBUS DP Master system while keeping the left-hand mouse button pressed. • Acknowledge the "Properties - PROFIBUS Interface IM 153-2" dialog box by clicking on the "OK" command button.
3	• Open the "IM 153-2" folder in the hardware catalog by clicking on the plus icon before this folder. • Open the "AI-300" folder contained in it and drag the module "SM 331 AI8x12Bit" (6ES7 331-7KF01-0AB0) to Slot 4 at the bottom of the configuration table of the IM 153-2 while keeping the left-hand mouse button pressed. Close the "AI-300" folder". Tip: When the module is selected in the hardware catalog, the Order Number (MLFB) is displayed below in the information box. • Open the "AO-300" folder contained in it and drag the module "SM 332 AO2x12Bit" (6ES7 332-5HB01-0AB0) to Slot 5 at the bottom of the configuration table of the IM 153-2 while keeping the left-hand mouse button pressed. Close the "AO-300" folder". • Open the "DI-300" folder contained in it and drag the module "SM 321 DI16xDC24V" (6ES7 321-1BH01-0AA0) to Slot 6 at the bottom of the configuration table of the IM 153-2 while keeping the left-hand mouse button pressed. Close the "DI-300" folder". • Open the "DO-300" folder contained in it and drag the module "SM 322 DO8xDC24V/2A" (6ES7 322-1BF01-0AA0) to Slot 7 at the bottom of the configuration table of the IM 153-2 while keeping the left-hand mouse button pressed. Close the "DO-300" folder".

Result

In HW Config the redundant interface IM 153-2 was inserted for the ET 200M peripheral device as a distributed peripheral device. The ET 200M was extended with analog/digital input/output modules.

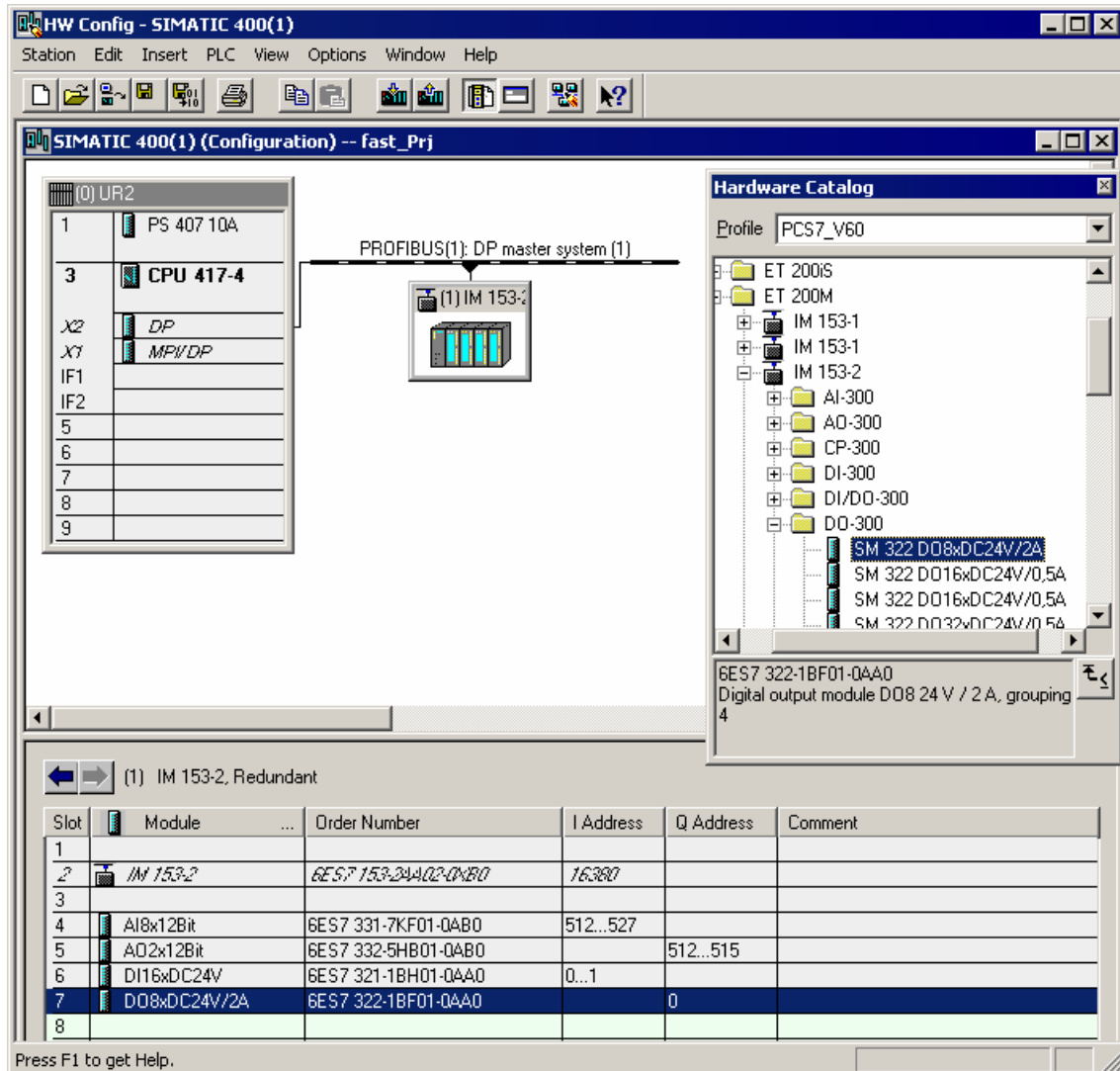


Figure 2-1: Configuring the Hardware

2.2 Editing Symbols in the in HW Config

2.2.1 Editing Symbols for Analog Input Modules

In order to assign names to the addresses of the analog input module "AI8x12Bit", assign symbolic names and comments for each address in the "Edit Symbols" dialog box.

Prerequisites

- The analog input modules have been configured in HW Config.
- HW Config is open.

Procedure

Step	Procedure
1	• In the configuration table select the analog input module inserted at Slot 4 with the right-hand mouse button and select "Edit Symbols" in the pop-up menu. • Confirm the query whether the previous modifications are to be saved by clicking on the "OK" command button.
2	Enter PIDCTRL1-PV_IN in the "Symbol" column for the first address (EW 512) and use the TAB key to move the cursor to the "Data Type" column and further to the "Comment" column. Enter the symbolic name from the "Symbol" column again in the "Comment" column. Tip: Copy the name assigned in the "Symbol" column and paste it into the "Comment" column.
3	Enter PIDCTRL2-PV_IN in the "Symbol" column for the second address (EW 514) and use the TAB key to move the cursor to the "Data Type" column and further to the "Comment" column. Enter the symbolic name from the "Symbol" column again in the "Comment" column.
4	Enter PIDCTRL1-LMNR_IN in the "Symbol" column for the third address (EW 516) and use the TAB key to move the cursor to the "Data Type" column and further to the "Comment" column. Enter the symbolic name from the "Symbol" column again in the "Comment" column.
5	Enter PIDCTRL2-LMNR_IN in the "Symbol" column for the fourth address (EW 520) and use the TAB key to move the cursor to the "Data Type" column and further to the "Comment" column. Enter the symbolic name from the "Symbol" column again in the "Comment" column.
6	Close the "Edit Symbols - AI8x12Bit" dialog box by using the "OK" command button.

Result

Address	Symbol	Data Type	Comment
WV 512	PIDCTRL1-PV_IN	WORD	PIDCTRL1-PV_IN
WV 514	PIDCTRL2-PV_IN	WORD	PIDCTRL2-PV_IN
WV 516	PIDCTRL1-LMNR_IN	WORD	PIDCTRL1-LMNR_IN
WV 518			
WV 520	PIDCTRL2-LMNR_IN	WORD	PIDCTRL2-LMNR_IN
WV 522			
WV 524			
WV 526			

Add Symbols Delete Symbol Sort:

The symbol table is updated with 'OK' or 'Apply'

OK Apply Cancel Help

Figure 2-2: Editing Symbols for Analog Input Modules

2.2.2 Editing Symbols for Analog Output Modules

In order to assign names to the addresses of the analog output module "AO2x12Bit", assign symbolic names and comments for each address in the "Edit Symbols" dialog box.

Since editing is carried out similarly to "Editing Symbols for Analog Modules", the procedure is not described here. Please enter the symbolic names and comments as shown in the figure below under "Result".

Prerequisites

- The analog output modules have been configured in HW Config.
- HW Config is open.

Result

Address	Symbol	Data Type	Comment
QWV 512	PIDCTRL1-OUT	WORD	PIDCTRL1-OUT
QWV 514	PIDCTRL2-OUT	WORD	PIDCTRL2-OUT

Add Symbols Delete Symbol Sort:

The symbol table is updated with 'OK' or 'Apply'

OK Apply Cancel Help

Figure 2-3: Editing Symbols for Analog Output Modules

2.2.3 Editing Symbols for Digital Input Modules

In order to assign names to the addresses of the digital input module "DI16x24V", assign symbolic names and comments for each address in the "Edit Symbols" dialog box.

Since editing is carried out similarly to "Editing Symbols for Analog Modules", the procedure is not described here. Please enter the symbolic names and comments as shown in the figure below under "Result".

Prerequisites

- The digital input modules have been configured in HW Config.
- HW Config is open.

Result

Address	Symbol	Data Type	Comment
I 0.0	MOTOR1-FB_RUN	BOOL	MOTOR1-FB_RUN
I 0.1	MOTOR2-FB_RUN	BOOL	MOTOR2-FB_RUN
I 0.2	VALVE1-FB_OPEN	BOOL	VALVE1-FB_OPEN
I 0.3	VALVE1-FB_CLSD	BOOL	VALVE1-FB_CLSD
I 0.4	VALVE2-FB_OPEN	BOOL	VALVE2-FB_OPEN
I 0.5	VALVE2-FB_CLSD	BOOL	VALVE2-FB_CLSD
I 0.6			
I 0.7			
I 1.0			
I 1.1			
I 1.2			
I 1.3			
I 1.4			
I 1.5			
I 1.6			

The symbol table is updated with 'OK' or 'Apply'

Figure 2-4: Editing Symbols for Digital Input Modules

2.2.4 Editing Symbols for Digital Output Modules

In order to assign names to the addresses of the digital output module "DO8xDC24V/2A", assign symbolic names and comments for each address in the "Edit Symbols" dialog box.

Since editing is carried out similarly to "Editing Symbols for Analog Modules", the procedure is not described here. Please enter the symbolic names and comments as shown in the figure below under "Result".

Prerequisites

- The digital output modules have been configured in HW Config.
- HW Config is open.

Result

Address	Symbol	Data Type	Comment
Q 0.0	MOTOR1-OUT	BOOL	MOTOR1-OUT
Q 0.1	MOTOR2-OUT	BOOL	MOTOR2-OUT
Q 0.2	VALVE1-OUT	BOOL	VALVE1-OUT
Q 0.3	VALVE2-OUT	BOOL	VALVE2-OUT
Q 0.4			
Q 0.5			
Q 0.6			
Q 0.7			

Add Symbols Delete Symbol Sort:

The symbol table is updated with 'OK' or 'Apply'

OK Apply Cancel Help

Figure 2-5: Editing Symbols for Digital Input Modules

2.3 Setting Up the MPI Interface for SIMATIC PC Station

In order for S7-PLCSIM to be used the OS must have an MPI interface, since the OS variables can otherwise not be compiled.

Prerequisites

- The PCS 7 project "fast_MP" has been created using the PCS 7 Wizard.

Procedure

Step	Procedure
1	In the SIMATIC Manager select the SIMATIC PC station contained in the "fast_Prj" folder with the left-hand mouse button in the Component view.
2	Double-click on the "Configuration" object in the right-hand window of the SIMATIC Manager.
3	• In HW Config open the "SIMATIC PC Station" folder in the hardware catalog. • Then open the "CP-PROFIBUS" folder contained in it and subsequently the "CP 5611" folder. • Select the "SW V6.0 SP5..." object contained in it and drag the object while keeping the left-hand mouse button pressed onto Index 2 in the configuration table and release the left-hand mouse button.
4	Close the displayed dialog box "Properties - PROFIBUS Interface CP 5611 (RO/S2)" by using the "OK" command button.
5	Select the inserted CP 5611 in the configuration table using the right-hand mouse button and select "Object Properties" in the pop-up menu.
6	• In the "Properties - CP 5611" dialog box use the fold-down list to change the "Type:" from "PROFIBUS" to "MPI" in the "Interface" field of the "General" tab. Confirm the warning dialog box by clicking on the "Yes" command button. • Click on the "Properties" command button in the "Interface" field and select under "Subnet:" "MPI(1)". Note The address for MPI is reset automatically to 3, since the CPU already uses the Address 2. • Terminate the dialog box "Properties - PROFIBUS Interface CP 5611 (RO/S2)" by using the "OK" command button • Exit the "Properties - CP 5611" dialog box by using the "OK" command button.
7	Save and compile the configuration by using the menu command Station > Save and Compile and exit HW Config by using the menu command Station > Exit .

Result

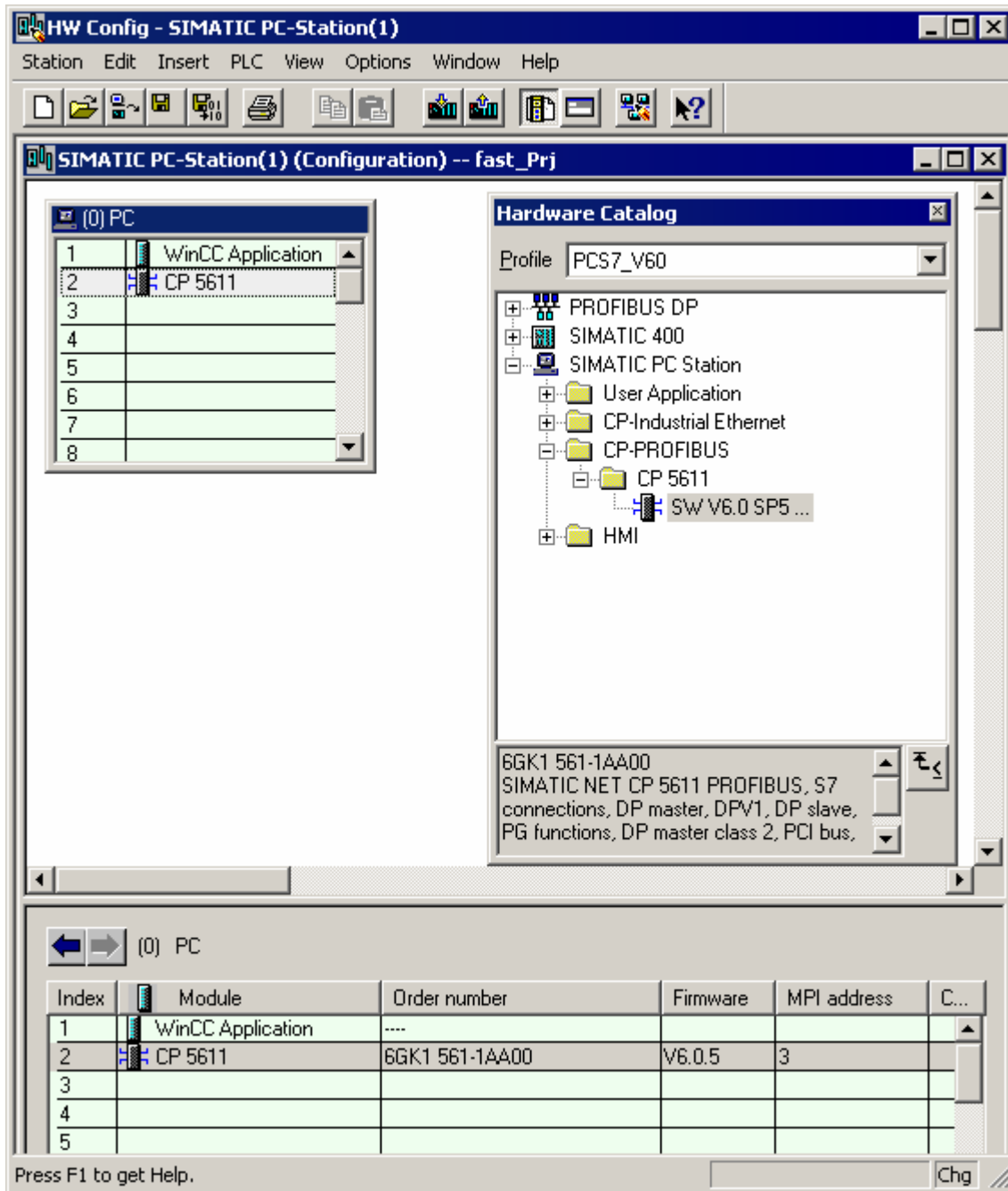


Figure 2-6: Setting Up the MPI Interface for SIMATIC PC Station

2.4 Saving and Compiling NetPro

The settings for the MPI interface of the OS which you have configured in HW Config are imported into NetPro. The network configuration now has to be saved, compiled and tested.

Prerequisites

- Completed configuration in HW Config

Procedure

Step	Procedure
1	In the component view select the "fast_Prj" project in the left-hand window of the SIMATIC Manager.
2	Double-click on the "MPI(1)" object in the right-hand window of the SIMATIC Manager.
3	In NetPro click on the menu command Network > Save and Compile .
4	In the "Save and Compile" dialog box select "Compile and check everything" and confirm the dialog box by using the "OK" command button.
5	Use the menu command Window > 1 fast_Prj (Network) --... to activate the original window again in NetPro.

Result

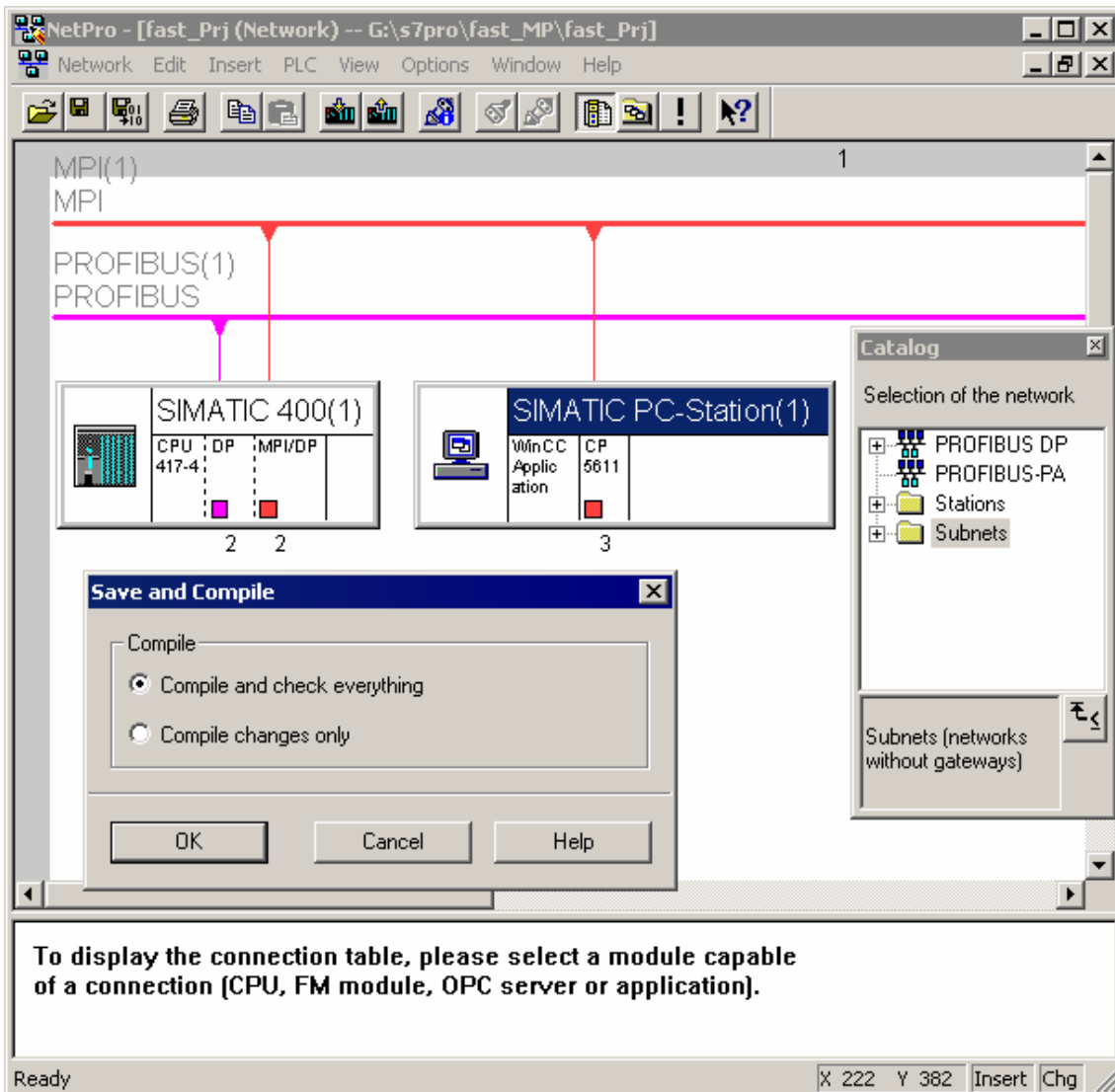


Figure 2-7: Compiling NetPro

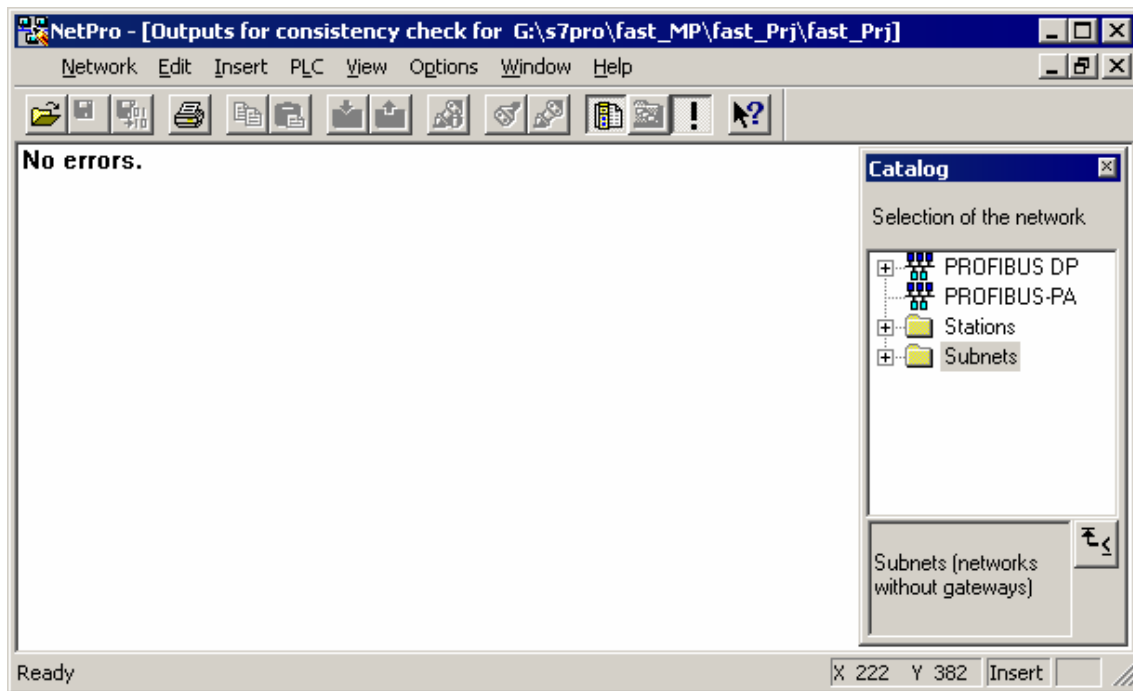


Figure 2-8: Results - Compiling NetPro

2.5 Starting S7-PLCSIM

You cannot download the MPI interface configured in HW Config from NetPro to the PLC until S7-PLCSIM has been started.

Prerequisites

- Completed configuration in HW Config.
- The network configuration from NetPro has been saved, compiled and tested.

Procedure

Step	Procedure
1	Change to the window of the SIMATIC Manager by using the task bar
2	S7-PLCSIM is started by using the menu command Options > Simulate Module .
3	Leave the CPU in the "STOP" state.
4	Use the task bar to change back to the window of the SIMATIC Manager.

Result

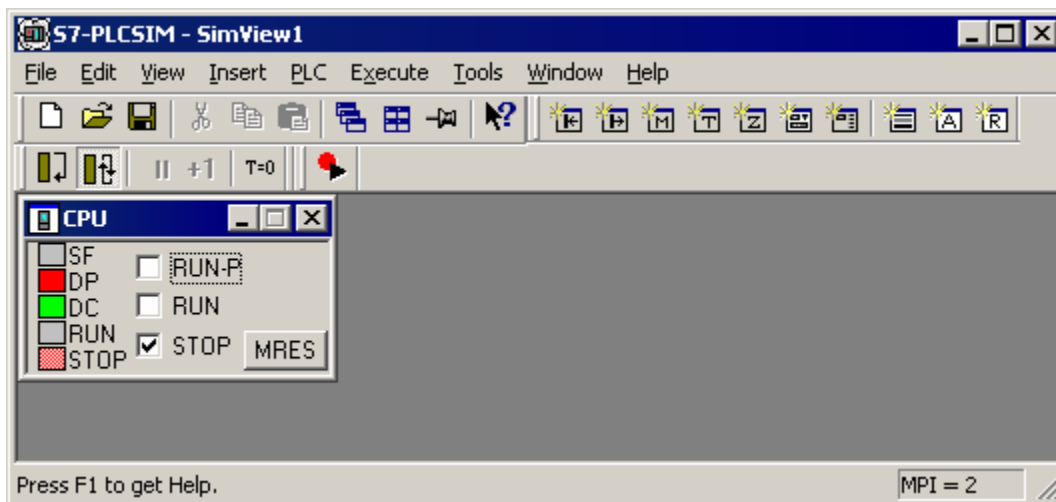


Figure 2-9: Starting S7-PLCSIM

2.6 Downloading from NetPro to PLC

The MPI interface configured in HW Config now has to be downloaded from NetPro to the PLC.

Prerequisites

- Completed configuration in HW Config.
- Opened NetPro in the original window.
- S7-PLCSIM has been started and the CPU is in the "STOP" state.

Procedure

Step	Procedure
1	In the Network view window select the "MPI/DP" interface in the SIMATIC 400(1) with the right-hand mouse button and in the pop-up menu click on Download in Current Project > Selected Stations .
2	Confirm the warning dialog box by clicking on the "Yes" command button.
3	Exit NetPro by using the menu command Network > Exit .

Result

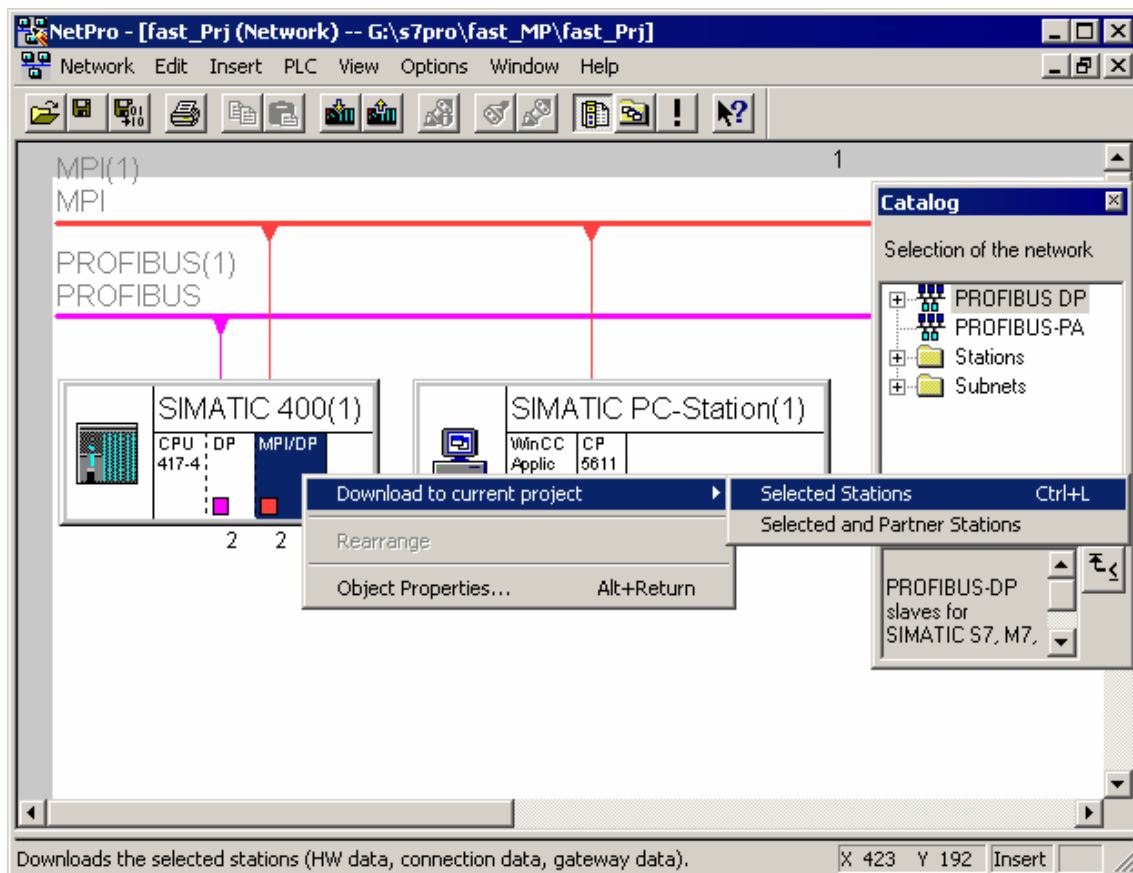


Figure 2-10: Downloading from NetPro to PLC

3 Configuring Measuring Points and Sequential Control

3.1 Copying Prepared CFC Charts from the Zip File to the Master Data Library

The standard templates for MOTOR, VALVE and PIDCTRL from the PCS 7 Library as of V60 have to be adapted for the simulation.

In order to reduce the time required, the prepared CFC charts, which were archived as a zip file, are de-archived in the SIMATIC Manager and copied into the "Charts" folder in the master data library within the S7 program.

Prerequisites

- The PCS 7 project "fast_MP" has been created using the PCS 7 Wizard.
- The SIMATIC Manager is open and the project "fast_MP" is displayed in the Component view with all the opened hierarchy folders.
- The Zip file "Sim_lib.zip" has been copied from the "..\SIEMENS\STEP7\Examples_MP" folder into the folder "..\SIEMENS\STEP7\S7tmp".

Procedure

Step	Procedure
1	• Open the library archived as a zip file by using the menu command File > Dearchive. • In the "Dearchive - Select Archive" dialog box open the "Sim_lib.zip" archive file and click on the "Open" command button. • In the "Select Target Directory" dialog box select the "fast" project folder at the position where you have stored your project. • Acknowledge the message displayed by clicking on the "OK" command button. • Acknowledge the warning message displayed by clicking on the "Yes" command button.
2	In the SIMATIC Manager click on the menu command Window > Arrange > Horizontally .

Step	Procedure
3	- In the left-hand window of the "fast_Lib" library select the "Charts" folder within the "S7 Program" folder. - Select the CFC charts MOTOR1, PIDCTRL1 and VALVE1 in the right-hand window while keeping the "CTRL" key pressed. - Move the selected CFC charts with the left-hand mouse button pressed into the "fast_Lib" master data library within the S7 program in the "Charts" folder and release the left-hand mouse button. Tip: The "Charts" folder is displayed in the Component view below the "fast_Lib" master data library of the multiproject. The CFC charts are now stored in the master data library within your multiproject.
4	Close the "fast_Lib" window.

Result

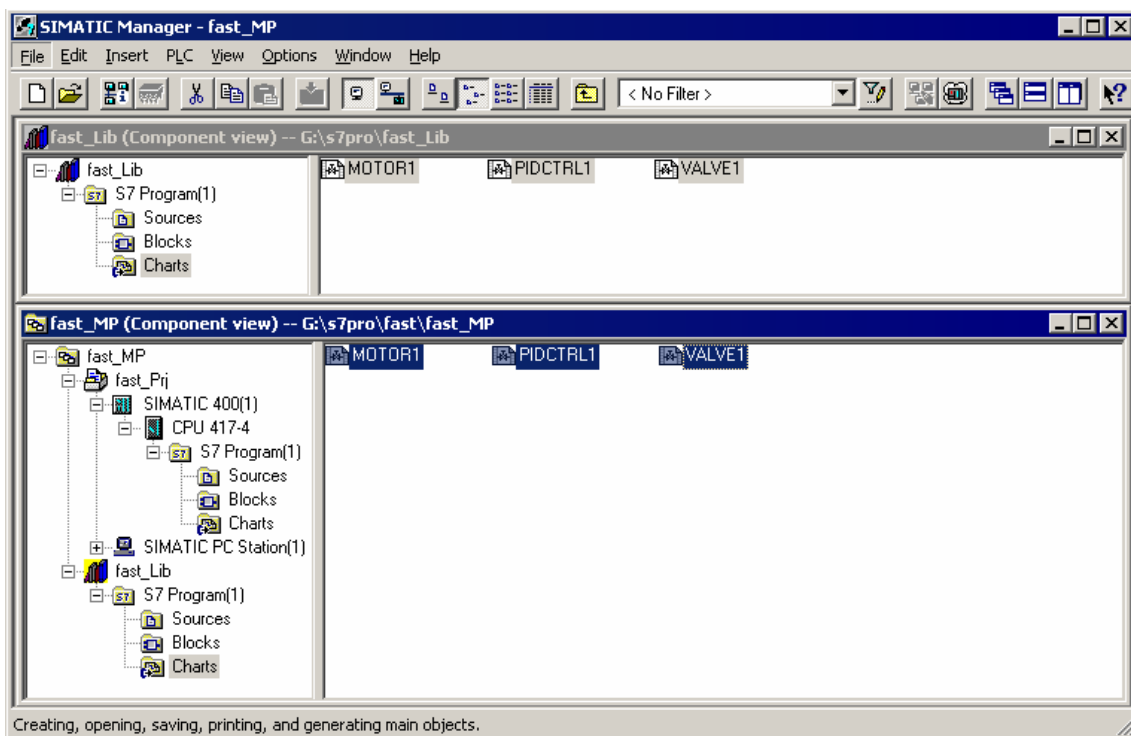


Figure 3-1: Copying Prepared CFC Charts

3.2 Copying CFC Charts into the Project

The adapted and renamed CFC charts now have to be copied from the "fast_Lib" master data library into the "fast_Prj" project in the "Function(1)" folder of the plant. Further configuration cannot be carried out until the CFC are located there. This process is carried out in the SIMATIC Manager in the Process Object view.

Prerequisites

- The templates MOTOR1, VALVE1 and PIDCTRL1 are contained in the master data library in the "Templates" folder in the Process Object view.
- The SIMATIC Manager is open and the "fast_MP" project is displayed in the Process Object view with all the opened hierarchy folders.

Procedure

Step	Procedure
1	Open the Project Object view by using the menu command View > Process Object View and open all the hierarchy folders.
2	Click on the "Templates" folder in the "fast_Lib" folder in the left-hand window.
3	The three adapted and renamed CFC charts MOTOR1, VALVE1 and PIDCTRL1 are displayed in the right-hand window.
4	Select all three charts while keeping the "CTRL" key pressed by consecutively clicking in all the lines in the first column.
5	Press the left-hand mouse button over the selected area in the first column in the right-hand window of the Process Object view, keep the mouse button pressed and drag the selected CFC charts into the "Function(1)" folder within the "fast_Prj" folder.

Result

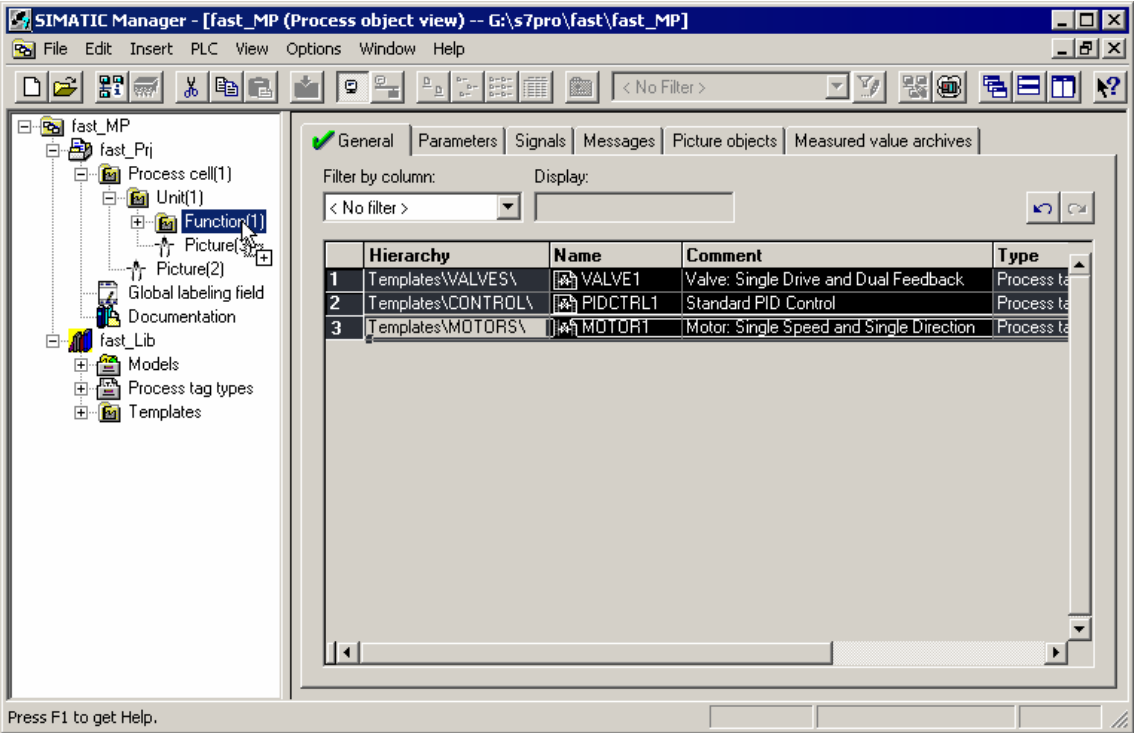


Figure 3-2: Copying CFC Charts into the Project

3.3 Configuring the CFC Chart

The "SFC(1)" SFC chart created by the PCS 7 Wizard in the "Function(1)" folder within the "fast_Prj" project has to be renamed and adapted for the simulation.

Prerequisites

- The PCS 7 Wizard "New Project" has been carried out.
- The SIMATIC Manager is open and the "fast_MP" project is displayed in the Process Object view with all the opened hierarchy folders.

Procedure

Step	Procedure
1	Use the right-hand mouse button to select the "SFC(1)" object in the "Function(1)" folder and click on "Rename" in the pop-up menu.
2	Enter the new name, "Control", and press the "ENTER" key.
3	Double-click on the "Control" object.
4	• Click in SFC on the menu command Insert > Step +Transition. • After you have activated the menu command, move the cursor in the SFC chart below the "START" step until a green line is displayed and press the left-hand mouse button. • Then click on the menu command Insert > Select.
5	• Use the right-hand mouse button to select the first transition (2) below the "START" step and click on the "Object Properties" in the pop-up menu. • Change to the "Condition" tab. • Click on the "Browse" command button. • Select the "PIDCTRL1" CFC chart under "Charts" in the "Name" column. • Then select the "PID" block under "Blocks" in the "Name" column. • Now select the "PV_IN" connection under "Connections" in the "Name" column and then click on the "Apply" and "Close" command buttons. • In the "Properties - 2 --..." dialog box enter the number 50 next to "=" under "Number 1" and change the sign "=" to ">". • Click on the "Accept" and "Close" commands buttons.
6	• Use the right-hand mouse button to select Step (3) below Transition (2) in the SFC chart and click on the "Object Properties" in the pop-up menu. • Under "Minimum" in the "Run time" area, enter: 10s, without a space between the 10 and s. • Change to the "Editing" tab and click on the "Browse" command button. • Select the "MOTOR1" CFC chart under "Charts" in the "Name" column. • Then select the "MOTOR" block under "Blocks" in the "Name" column. • Now select the "AUTO_ON" connection under "Connections" in the "Name" column and then click on the "Apply" and "Close" command button. • In the "Properties - 3 --..." dialog box enter the "number 1" next to "=" under Number 1 and click on the "Apply" and "Close" command buttons. The motor is now switched on when the process value of the control reaches the value of 50 or exceeds it.

Step	Procedure
7	• Use the right-hand mouse button to select Step (3) and click on "Copy" in the pop-up menu. • Click with the right-hand mouse button in the chart and on "Paste" in the pop-up menu. • Move the cursor in the SFC chart above the "End" step until the green line is displayed and press the left-hand mouse button.
8	• Select the copied and inserted Step (4) using the right-hand mouse button and select "Object Properties" in the pop-up menu. • Change to the "Editing" tab. • In the "Properties - 4 --..." dialog box enter the number 0 next to "=" under "Number 1" and click on the "Apply" and "Close" command buttons . Switch the motor off again. • Close the SFC by means of the menu command SFC > Exit.

Result

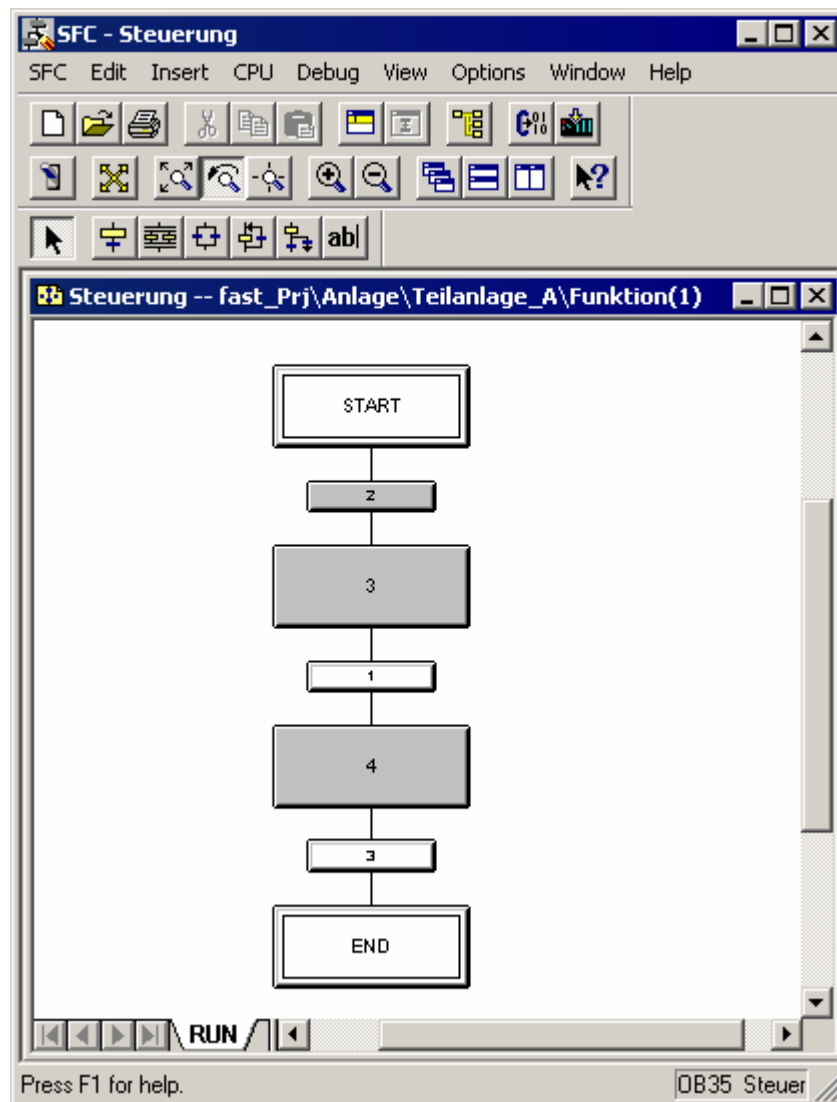


Figure 3-3: Configuring the CFC Chart

3.4 Renaming project folder and deleting project objects

The Unit(1) contained in the fast_Prj" project has been created through the PCS 7 Wizard and renamed. The name Unit(1) is renamed to Unit_A, since the renamed Unit_A is later copied and inserted into the Unit(1) folder. The plant structure gains in clarity through the renaming. In addition, objects which were created by the PCS 7 Wizard and which are not needed are to be deleted.

Prerequisites

- The PCS 7 Wizard "New Project" has been carried out.
- The SIMATIC Manager is open and the "fast_MP" project is displayed with all the opened hierarchy folders in the Plant view.

Note

The various views in the SIMATIC Manager are set by using the menu command **View > e. g. Plant View**.

Procedure

Step	Procedure
1	Use the right-hand mouse button to select the "Plant(1)" folder in the Plant view in the left-hand window and click on "Rename" in the pop-up menu.
2	Enter the name "Plant".
3	Use the right-hand mouse button to select the "Unit(1)" folder in the left-hand window and click on "Rename" in the pop-up menu .
4	Enter the name "Unit_A".
5	Click on the "Function(1)" folder below the "Unit_A" folder.
6	Use the right-hand mouse button to select the "CFC(1)" object in the right-hand window and click on "Delete" in the pop-up menu .

Result

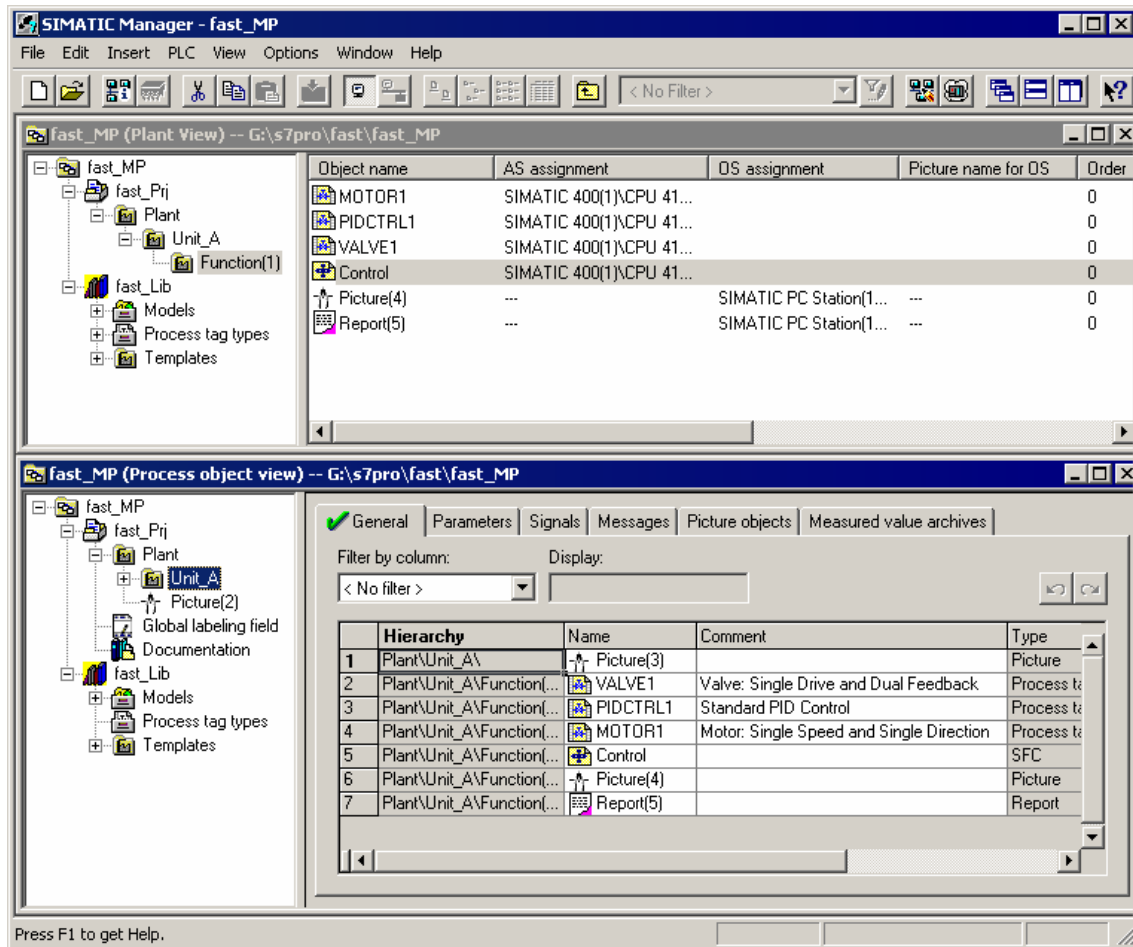


Figure 3-4: Renaming project folder

4 Preparing the Plant Display for Automatic Generation

4.1 Preparing a Plant Display for Automatic Generation

A few preparations have to be carried out for automatic plant display generation.

Prerequisites

- The PCS 7 Wizard "New Project" has been carried out.
- The SIMATIC Manager is open and the "fast_MP" project is displayed with all the opened hierarchy folders in the Plant view.

Procedure

Step	Procedure
1	Click on the "Unit_A" folder in the Plant view in the left-hand window.
2	Use the right-hand mouse button to select the "Display (3)" object in the right-hand window and click on "Object Properties" in the pop-up menu .
3	Change to the "Block Icon" tab.
4	Activate the "Derive block symbols from the Plant hierarchy" check box and exit the dialog box by clicking on the "OK" command button.
5	Use the right-hand mouse button to select the "Unit_A" folder in the right-hand window and click on Plant Hierarchy > Settings in the pop-up menu.
6	Activate the check box in the "OS area" column for the second level in the Plant hierarchy - Settings" dialog box in the area "Settings per level".
7	Activate the "Derive display hierarchy from the Plant hierarchy" check box and exit the dialog box by clicking on the "OK" command button.

Result

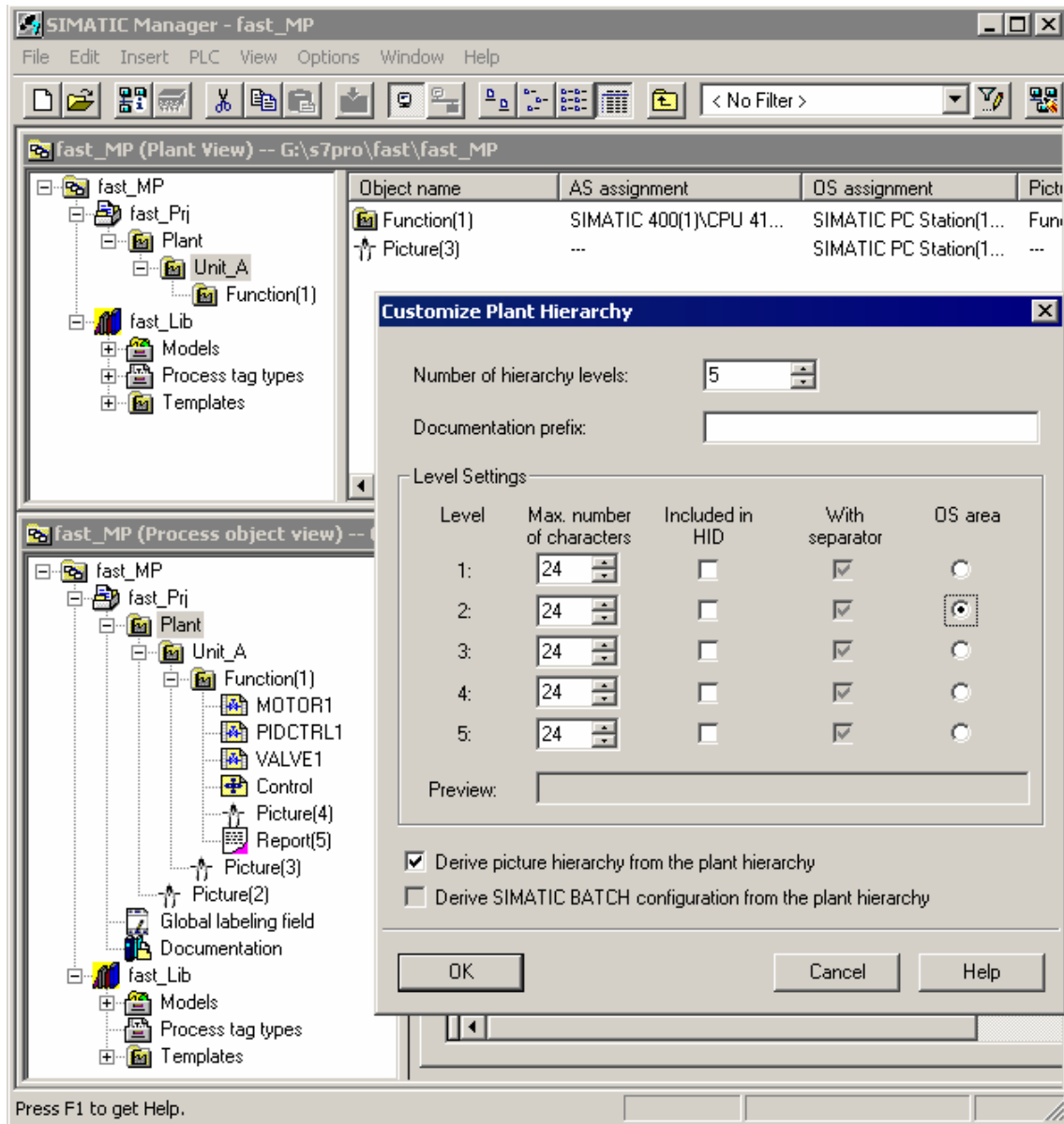


Figure 4-1: Preparing a Plant Display for Automatic Generation

5 Creating Unit_B Using a Copy of Unit_A

5.1 Creating Unit_B by Copying Unit_A

Unit_A is copied and inserted into the "Plant" folder in Plant view. A duplicate of Unit_A is created with all the contained and configured objects. In order to differentiate the new unit is renamed to "Unit_B".

Prerequisites

- The SIMATIC Manager is open and the "fast_MP" project is displayed with all the opened hierarchy folders in the Plant view.

Procedure

Step	Procedure
1	Use the right-hand mouse button to select the "Plant_A" folder in the left-hand window of the Plant view and click on "Copy" in the pop-up menu.
2	Use the right-hand mouse button to select the "Plant" folder and click on "Insert" in the pop-up menu.
3	Use the right-hand mouse button to select the created "Unit_A(1)" folder and click on "Rename" in the pop-up menu .
4	Enter the name "Unit_B".
5	Select the "Function(1)" folder in the left-hand window below the "Unit_B" folder.
6	• Use the right-hand mouse button to select the "MOTOR(1)" object in the right-hand window and click on "Rename" in the pop-up menu. • Enter the name, "MOTOR2", and press the "ENTER" key. • Use the right-hand mouse button to select the "PIDCTRL(1)" object in the right-hand window and click on "Rename" in the pop-up menu. • Enter the name, "PIDCTRL2", and press the "ENTER" key. • Use the right-hand mouse button to select the "VALVE1(1)" object in the right-hand window and click on "Rename" in the pop-up menu. • Enter the name, "VALVE2", and press the "ENTER" key.

Result

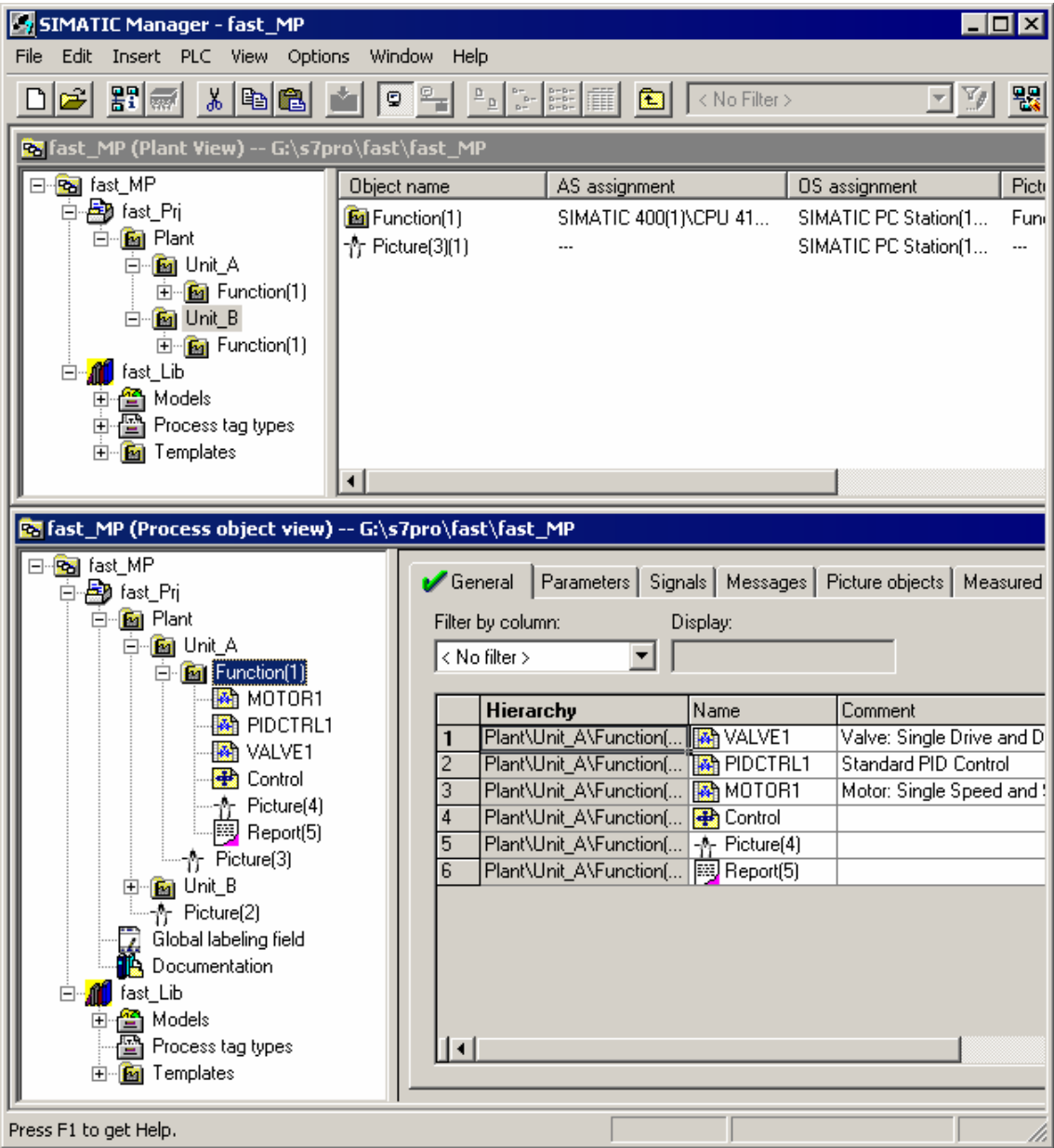


Figure 5-1: Creating Unit_B by Copying Unit_A

6 Configuring and Interconnecting Measuring Points

6.1 Configuring and Interconnecting Measuring Points

In the Process Object view the signals are first inserted and then the parameter values modified.

Prerequisites

- The SIMATIC Manager is open and the "fast_MP" project is displayed in the Process Object view with all the opened hierarchy folders.

Procedure

Step	Procedure
1	Click on the "Plant" folder in the Process Object view in the left-hand window.
2	Click on the "Signals" tab in the right-hand window.
3	• In the right-hand window divide the display window into two sections by positioning the cursor over the bar on the left next to the lower horizontal scroll bar until the divide symbol is displayed and then move the bar to the middle of the display window. • Then slide the bar of the left-hand horizontal scroll bar until the columns "Chart", "Block" and "I/O comment" are displayed in the left-hand window. Use the Split symbol on the column margins in the column heading in order to hide or reduce the columns. • Next slide the bar of the right-hand horizontal scroll bar until the "Signal" column is displayed. • Sort the "Chart" column in ascending order by clicking on the "Chart" column heading.
4	• Use the right-hand mouse button to click on in the "Signal" column for "MOTOR1" chart and "FB_ON" block and click on "Insert signal" in the pop-up menu. • In the "Insert Signal" dialog box right-click in the right-hand window on the "Inputs" folder and then on "Open" in the pop-up menu. In the hardware configuration the signal names were selected so that they are combined from the names of the measuring point, "Chart" column, and the name of the channel drivers, "Block" column. • Select the "MOTOR1-FB_RUN" signal correspondingly in the "Insert Signal" dialog box in the right-hand window and then click on the "Apply" command button. In the Process Object view the inserted signal is applied automatically in the "Signal" column and the next cell is selected.

Step	Procedure
5	- Click on the "Outputs" folder in the "Insert Signal" dialog box in the left-hand window. - Select the "MOTOR1-OUT" signal in the right-hand window and click on the "Apply" command button.
6	Insert all the further signals as described in Step 5. Note that you have to change between the "Inputs" and "Outputs" folders in the "Insert Signal" dialog box in the left-hand window, depending on the signal.
7	Close the "Insert Signals" dialog box.
8	- Click on the "Parameters" tab in the Process Object view in the right-hand window. - Split the right-hand window into two sections as already described in Step 3. The left-hand window should contain the "Chart" column, the right window the "Measuring point interface", "Category" and "Value" columns. - Sort the "Chart" column in descending order by clicking on the "Chart" column heading. - Enter the value 6 in the "Value" column in the right-hand window for the "VALVE1" chart name and "Monitoring time" measuring point interface. - Enter the value 6 in the "Value" column in the right-hand window for the "VALVE2" chart name and "Monitoring time" measuring point interface.

Result

The result shown in the following figure is displayed after Step 7.

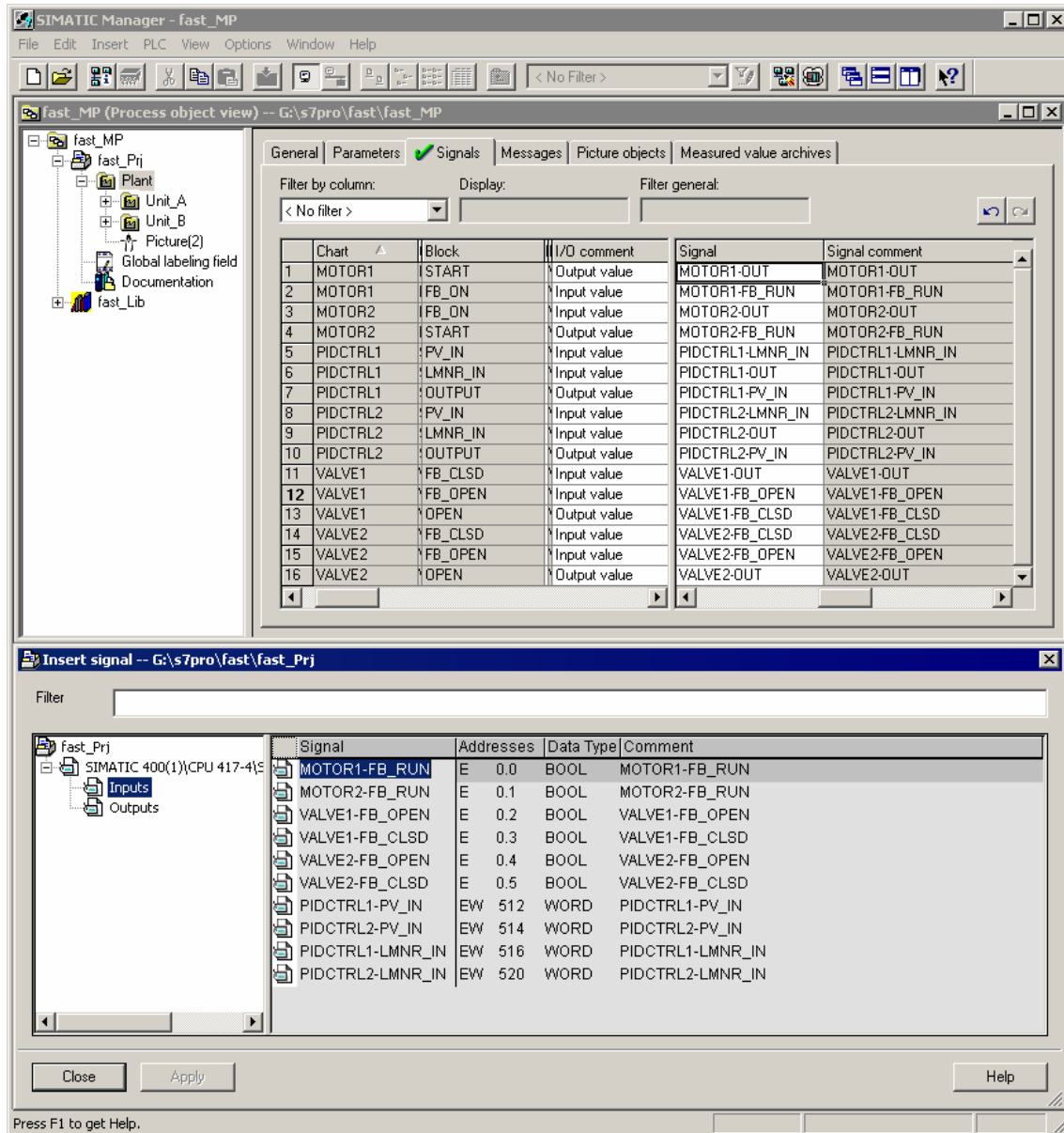


Figure 6-1: Configuring and Interconnecting Measuring Points - Signals

The result shown in the following figure is displayed after Step 8.

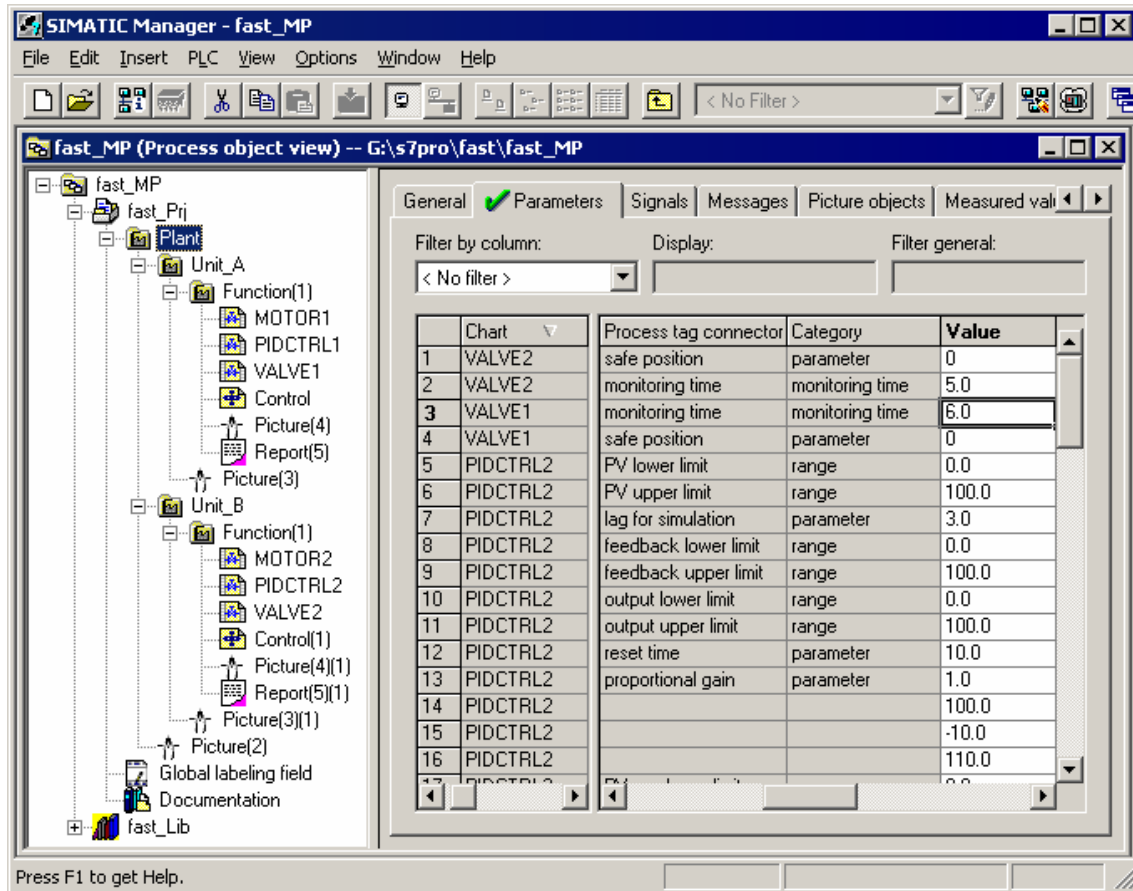


Figure 6-2: Configuring and Interconnecting Measuring Points - Parameters

7 Compiling and Downloading Objects

7.1 Compiling and Downloading Objects

You have now carried out all the preparations for compiling and downloading the objects. All the settings required to compile and download the charts and the OS can be carried out in the "Compile and Download Objects" dialog box.

Prerequisites

- The SIMATIC Manager is open and the "fast_MP" project is displayed in the Component view.
- S7-PLCSIM has been started.

Procedure

Step	Procedure
1	• Use the right-hand mouse button to select the uppermost hierarchy folder "fast_MP" in the left-hand window and click on PLC > Compile and Download Objects in the pop-up menu. • In the dialog box open all the folders by using the plus symbol. • Activate the check boxes in the "Compile" and "Download" columns for the "Charts" folder. • Click on the "Charts" folder and then on the "Edit" command button in the "Settings for Compilation/Download" area.
2	• In the "Compile Program/Download PLC" dialog box set "Entire program" in the "Scope" area. • Activate the "Generate Module Drivers" check box and exit the dialog box by using the "OK" command button. • Acknowledge the displayed warning dialog box by using the "OK" command button.

Step	Procedure
3	• In the "Compile and Download Objects" dialog box activate the check box in the "Compile" column for the "OS(1)" folder. • Click on the "OS(1)" folder and then on the "Edit" command button in the "Settings for Compilation/Download" area. • In the dialog "Settings: Compile OS", click on the "Next" button. • Click again on the "Next" command button. • Activate the check boxes "Tags and Messages", "SFC-Visualization" and "Picture Tree" in the subsequent dialog boxes under "Data". Below "Additional Options" activate the check box "Create/update block symbols". Below "Scope" activate the radio button "Entire OS" and the check box "With memory reset". • Then click on the "Apply" command button. • Close the subsequently displayed warning "Settings: Download OS" without any input by pressing the "OK" button.
4	• Click on the "Start" command button in the "Compile and Download Objects" dialog box. • Confirm the dialog displayed "Compile and Download Objects" with "OK" command button. • Click on the "Yes" button in the subsequent dialog displayed. • Close the log file. • Close the "Compile and download objects" dialog box by clicking the "Close" command button.

Result

The resulting "Compile and download objects" dialog box is displayed in the figure below.

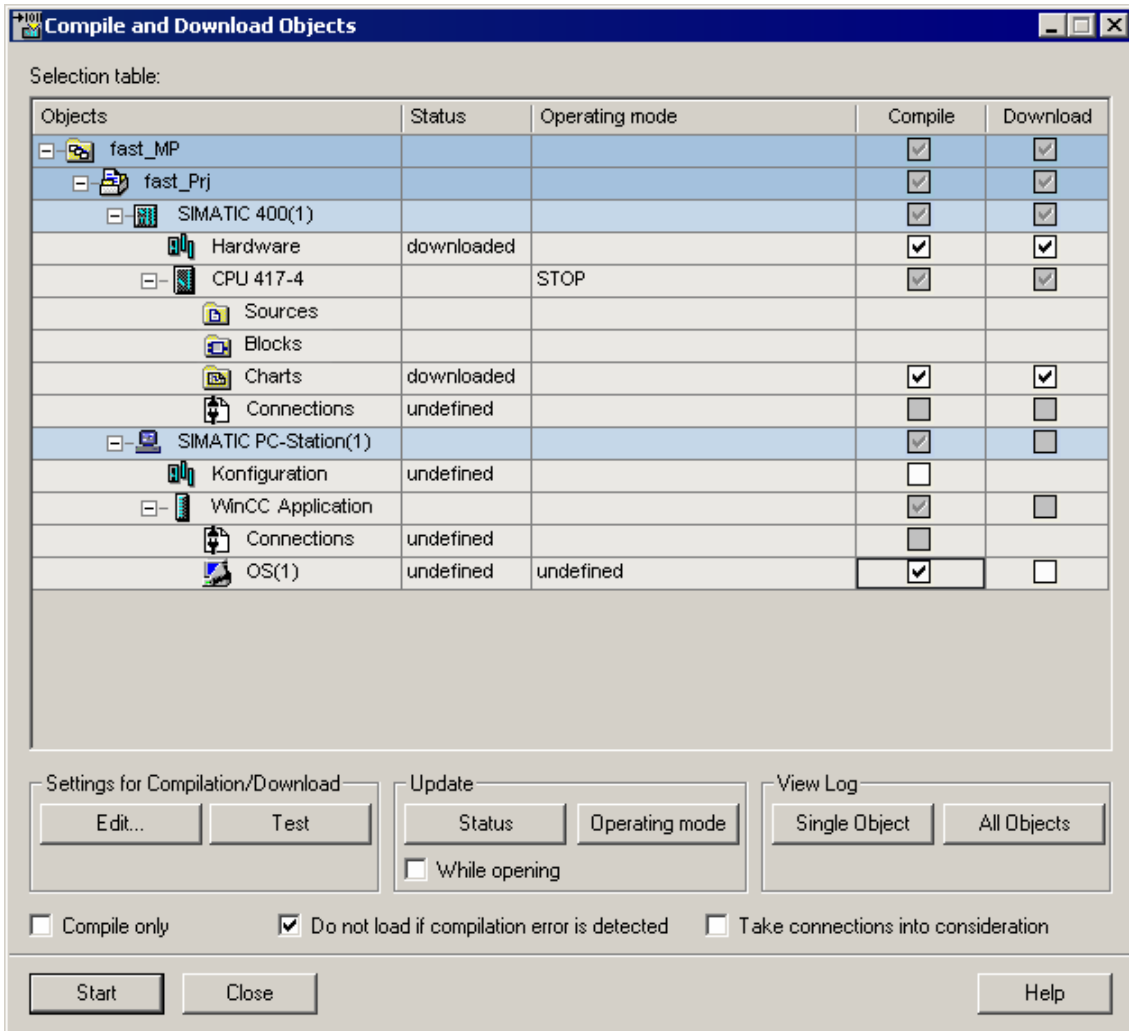
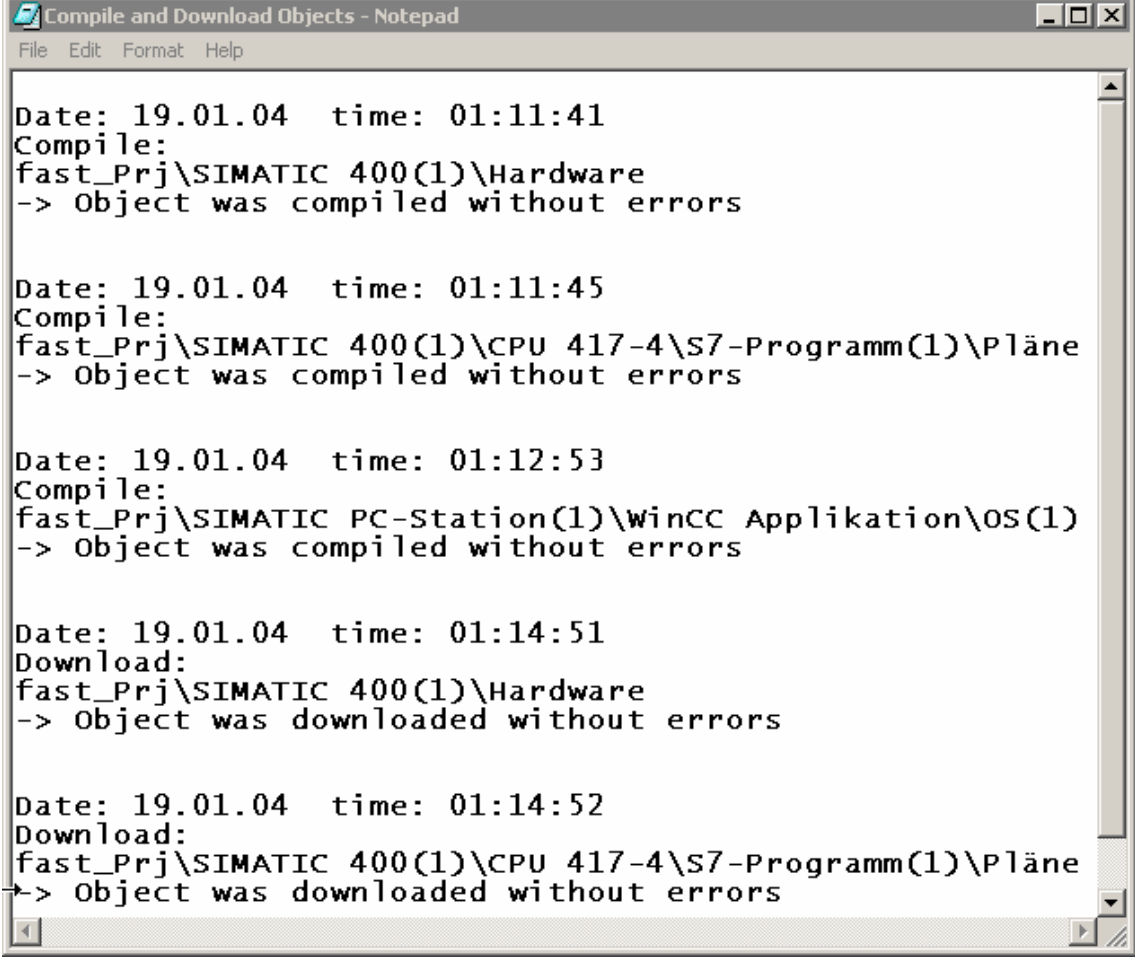


Figure 7-1: Compile and download objects

The following file is displayed after the compiling and downloading process has been completed.



```
Compile and Download Objects - Notepad
File Edit Format Help

Date: 19.01.04   time: 01:11:41
Compile:
fast_Prj\SIMATIC 400(1)\Hardware
-> Object was compiled without errors

Date: 19.01.04   time: 01:11:45
Compile:
fast_Prj\SIMATIC 400(1)\CPU 417-4\S7-Programm(1)\Pläne
-> Object was compiled without errors

Date: 19.01.04   time: 01:12:53
Compile:
fast_Prj\SIMATIC PC-Station(1)\WinCC Applikation\OS(1)
-> Object was compiled without errors

Date: 19.01.04   time: 01:14:51
Download:
fast_Prj\SIMATIC 400(1)\Hardware
-> Object was downloaded without errors

Date: 19.01.04   time: 01:14:52
Download:
fast_Prj\SIMATIC 400(1)\CPU 417-4\S7-Programm(1)\Pläne
-> Object was downloaded without errors
```

Figure 7-2: Compiling and downloading process completed

7.2 S7-PLCSIM: Setting CPU to RUN-P

After the objects have been compiled and downloaded, the simulation of the CPU has to be changed over from the "STOP" state to the "RUN-P" state.

Prerequisites

- Compiling and downloading of the objects has been carried out.
- The program S7-PLCSIM has already been started.

Procedure

Step	Procedure
1	Open the "S7-PLCSIM - SimView1" window by clicking on the corresponding icon in the task bar.
2	Activate the "RUN-P" check box in the "CPU" window.
3	Click on the "Minimize button in the "S7-PLCSIM - SimView1" window.

Result

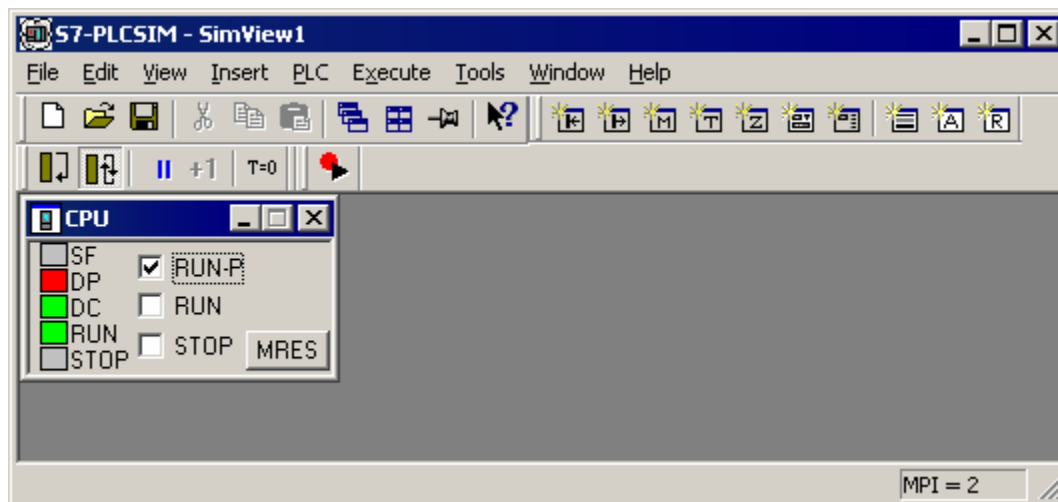


Figure 7-3: S7-PLCSIM: Setting CPU to RUN-P

8 Operating and Monitoring the Process

8.1 Operating and Monitoring the Process

The process can be operated and monitored if the OS is opened from the SIMATIC Manager and the OS project is activated.

Note

The automatically generated pictures, Picture(3) from Unit_A and Picture(3)(1) from Unit_B can be modified or removed in the Graphics Designer of the WinCC Explorer.

Prerequisites

- The simulation of the CPU has been set to the "RUN-P" state in S7-PLCSIM.
- The SIMATIC Manager is open and the "fast_MP" project is displayed in the Component view.

Procedure

Step	Procedure
1	Open the folder structure of the SIMATIC PC station in the left-hand window of the SIMATIC Manager.
2	Use the right-hand mouse button to select the "OS(1)" folder and click on "Open Object" in the pop-up menu.
3	In WinCC Explorer click on the menu command File > Activate or use the corresponding command from the toolbar.
4	• In the "SIMATIC PCS 7 Control System" user interface click on the area selection button "Unit_A" at the top left in the overview area. The automatically generated picture with the objects or symbols "Control", "Controller", "Motor" and "Valve" is displayed.

Step	Procedure
5	- Click on the "MOTOR1/MOTOR" symbol in the working area of the user interface. The display block of the motor is displayed in the working area of the user interface. - Click on the "Reset" command button in the display block and then the "Execute" command button in the displayed dialog box. Tip: You can also press the "ENTER" key on the keyboard instead of clicking on the "Execute" command button. - Click on the "Start" command button. The motor is started and this is indicated on the left-hand side in the display block under "Status" "On".
6	Also have the display blocks of the controller and of the valve displayed in the working area and try out their operation.
7	- Click on the "STOP" command button in the display block "MOTOR1" in order to stop the motor. - Then click on the "Auto" command button to set MOTOR1 to the operating mode "Automatic".
8	- Click on the "PIDCTRL1/PID" symbol in order to display this display block in the working area. - Set "Auto" in the operating mode. - Click in the input field next to "SP" in order to enter the setpoint value 40.
9	- Change to Button Set 2 by using the "Button Set Change" command button at the bottom left in the user interface. - Click on the "SFC Visualization" command button in the Button Set 2. - Select "Control" in the "SFC Name" column in the "Open SFC" dialog box in the right-hand window and click on the "OK" command button. The window of the SFC overview is displayed in the working area. - Click in the window of the SFC overview. The Details view is opened. - Click in the Details view on the "Start" command button and the dialog box then displayed by clicking on the "OK" command button. If the process value of the controller does not exceed 50, the sequential control system stops at the first transition and is no longer executed. - Click on the window already displayed of the controller block "PIDCTRL1/PID". - Click in the input field next to "SP" in order to enter the setpoint value 90. Monitor the Details view of the SFC. The sequential control system is now executed completely. MOTOR1 is started in the flow chart in Step 3 and stopped again in Step 4.
10	- Change to Button Set 1 by using the "Button Set Change" command button. - Click on the "Message system" command button. New messages are displayed in the working area. - Click on the "Operating message list" command button. The operating message list is displayed in the working area. All the operator inputs which you carried out in the display blocks are listed here.

Result

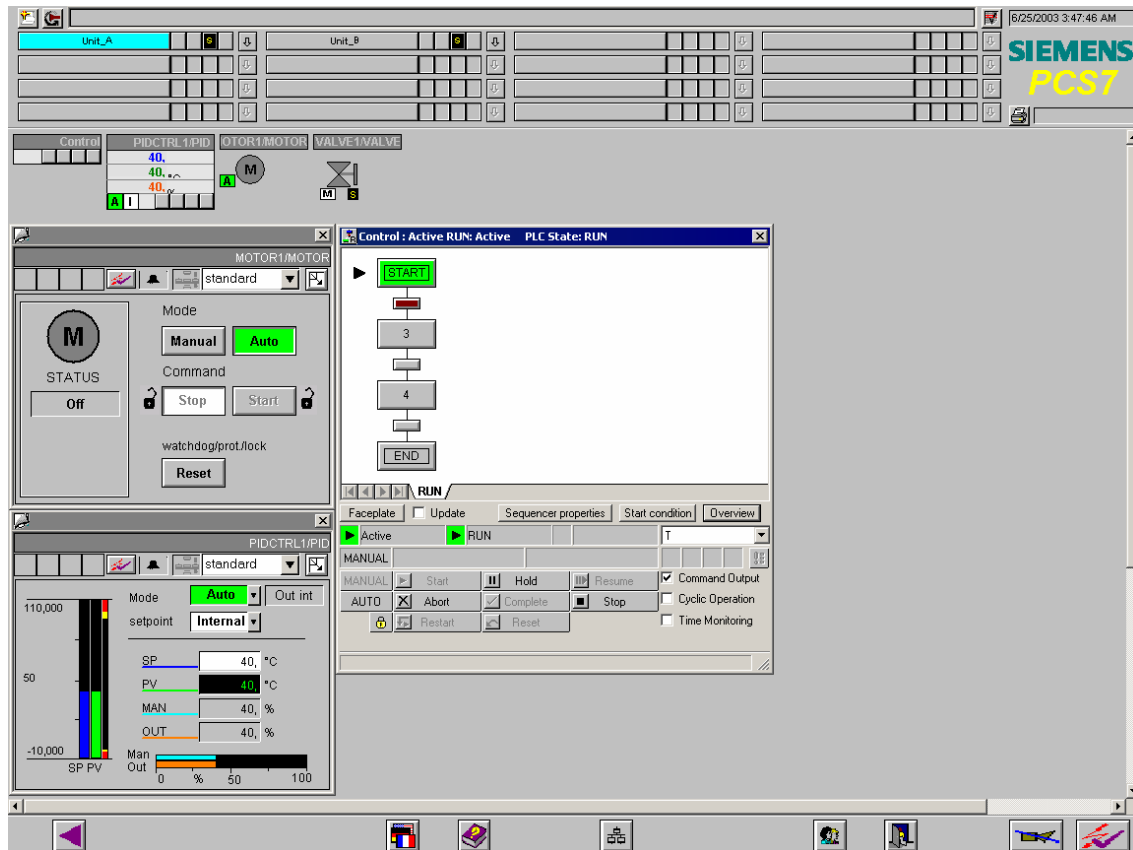


Figure 8-1: Operating and Monitoring the Process (1)

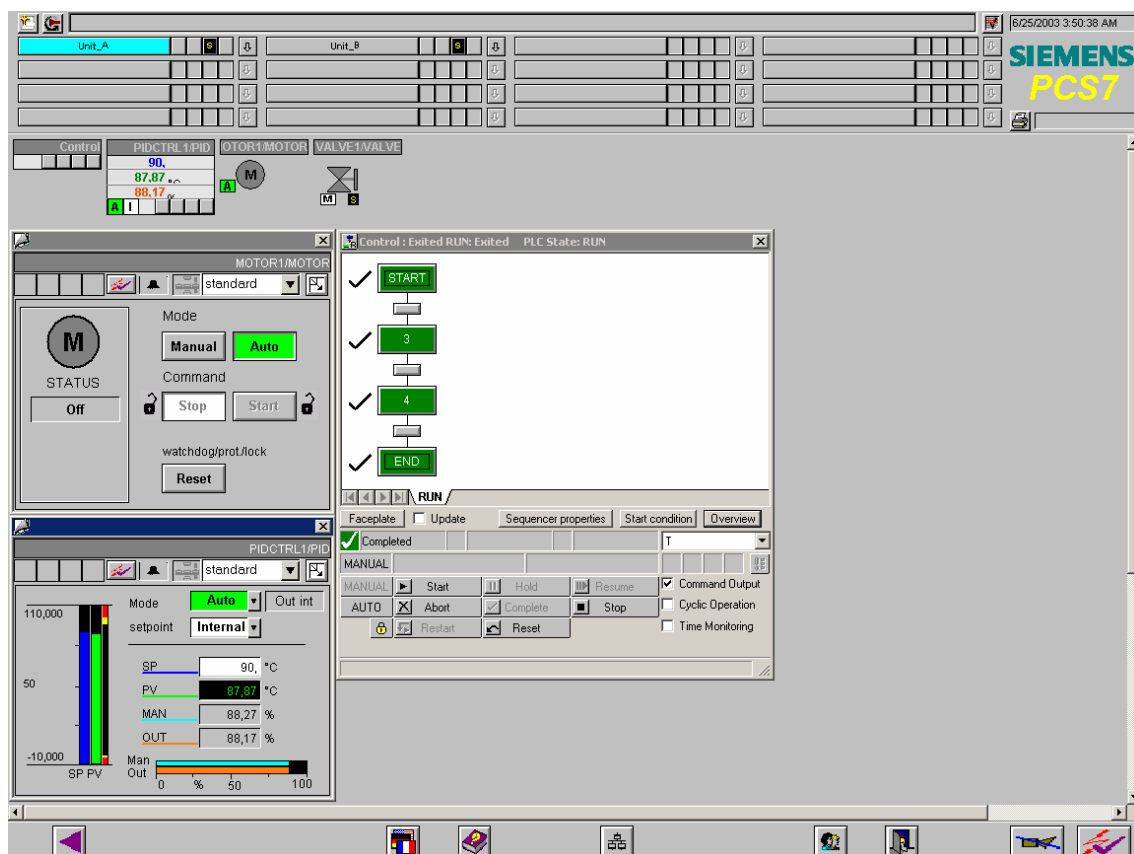
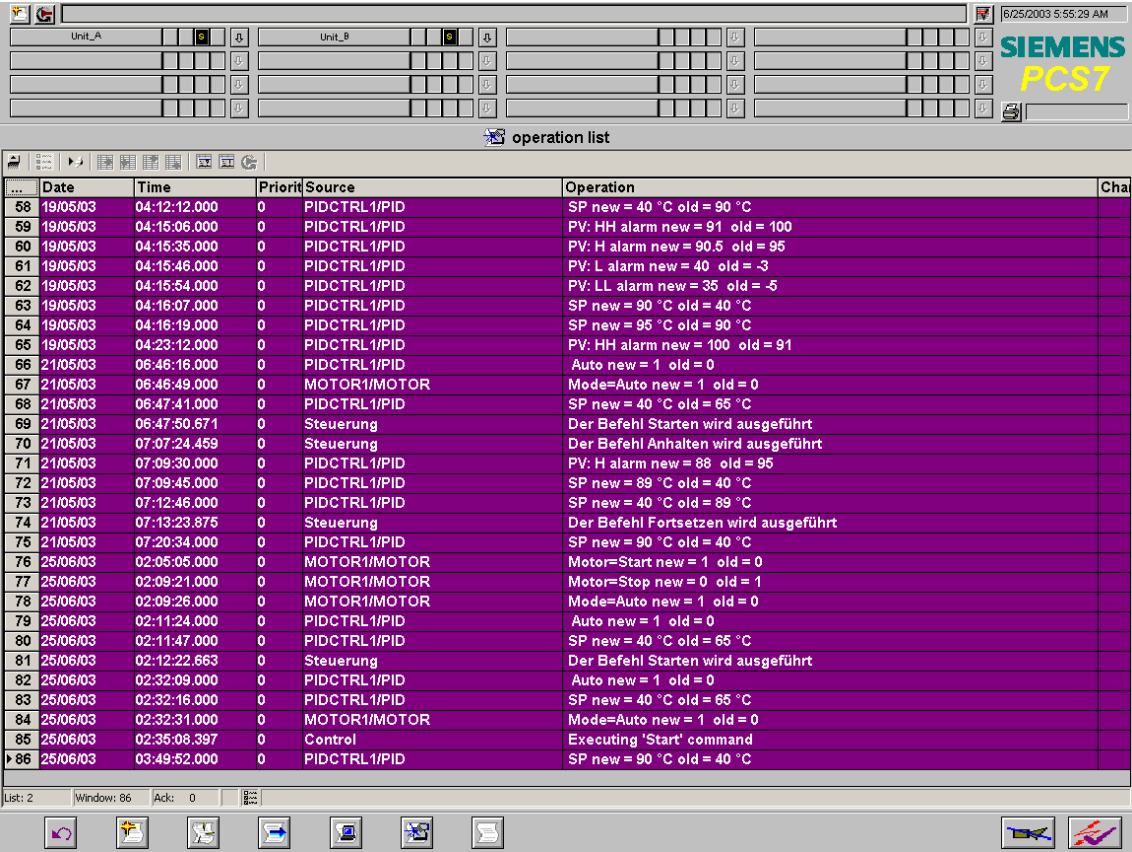


Figure 8-2: Operating and Monitoring the Process (2)



...	Date	Time	Priority	Source	Operation	Cha
58	19/05/03	04:12:12.000	0	PIDCTRL1/PID	SP new = 40 °C old = 90 °C	
59	19/05/03	04:15:06.000	0	PIDCTRL1/PID	PV: HH alarm new = 91 old = 100	
60	19/05/03	04:15:35.000	0	PIDCTRL1/PID	PV: H alarm new = 90.5 old = 95	
61	19/05/03	04:15:46.000	0	PIDCTRL1/PID	PV: L alarm new = 40 old = -3	
62	19/05/03	04:15:54.000	0	PIDCTRL1/PID	PV: LL alarm new = 35 old = -5	
63	19/05/03	04:16:07.000	0	PIDCTRL1/PID	SP new = 90 °C old = 40 °C	
64	19/05/03	04:16:19.000	0	PIDCTRL1/PID	SP new = 95 °C old = 90 °C	
65	19/05/03	04:23:12.000	0	PIDCTRL1/PID	PV: HH alarm new = 100 old = 91	
66	21/05/03	06:46:16.000	0	PIDCTRL1/PID	Auto new = 1 old = 0	
67	21/05/03	06:46:49.000	0	MOTOR1/MOTOR	Mode=Auto new = 1 old = 0	
68	21/05/03	06:47:41.000	0	PIDCTRL1/PID	SP new = 40 °C old = 65 °C	
69	21/05/03	06:47:50.671	0	Steuerung	Der Befehl Starten wird ausgeführt	
70	21/05/03	07:07:24.459	0	Steuerung	Der Befehl Anhalten wird ausgeführt	
71	21/05/03	07:09:30.000	0	PIDCTRL1/PID	PV: H alarm new = 88 old = 95	
72	21/05/03	07:09:45.000	0	PIDCTRL1/PID	SP new = 89 °C old = 40 °C	
73	21/05/03	07:12:46.000	0	PIDCTRL1/PID	SP new = 40 °C old = 89 °C	
74	21/05/03	07:13:23.875	0	Steuerung	Der Befehl Fortsetzen wird ausgeführt	
75	21/05/03	07:20:34.000	0	PIDCTRL1/PID	SP new = 90 °C old = 40 °C	
76	25/06/03	02:05:05.000	0	MOTOR1/MOTOR	Motor=Start new = 1 old = 0	
77	25/06/03	02:09:21.000	0	MOTOR1/MOTOR	Motor=Stop new = 0 old = 1	
78	25/06/03	02:09:26.000	0	MOTOR1/MOTOR	Mode=Auto new = 1 old = 0	
79	25/06/03	02:11:24.000	0	PIDCTRL1/PID	Auto new = 1 old = 0	
80	25/06/03	02:11:47.000	0	PIDCTRL1/PID	SP new = 40 °C old = 65 °C	
81	25/06/03	02:12:22.663	0	Steuerung	Der Befehl Starten wird ausgeführt	
82	25/06/03	02:32:09.000	0	PIDCTRL1/PID	Auto new = 1 old = 0	
83	25/06/03	02:32:16.000	0	PIDCTRL1/PID	SP new = 40 °C old = 65 °C	
84	25/06/03	02:32:31.000	0	MOTOR1/MOTOR	Mode=Auto new = 1 old = 0	
85	25/06/03	02:35:08.397	0	Control	Executing 'Start' command	
86	25/06/03	03:49:52.000	0	PIDCTRL1/PID	SP new = 90 °C old = 40 °C	

Figure 8-3: Operating message list

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