Integration of Operator Panels in SIMATIC PCS 7 via the Industry Library

SIMATIC PCS 7 V9.0/ Industry Library V9.0 / TIA Portal V14

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1 Introduction

1.1 The task

Introduction

In modern production plants, engineering processes are generally monitored and controlled from the control room. There is also a requirement for in-process operation and monitoring of system sections. Different alarm systems, operating philosophies, and different configuration software must be taken into account when integrating operator panels into the higher level process control system.

Description of the automation task

The system engineer will be shown how to integrate operator panels into a PCS 7 project in order to operate and visualize PCS 7 system sections. Configuration should match the PCS 7 standard as closely as possible.

Figure 1-1
1.2 Solution

Using the SIMATIC PCS 7 Industry Library

The components of the SIMATIC PCS 7 Industry Library provide the basis for using Comfort Panels. The "IL for PCS 7" library includes interface blocks for this purpose, which interact with the blocks of the PCS 7 APL (Advanced Process Library) and provide the necessary data for representation on the Comfort Panel.

A WinCC Comfort V14 library ("IL for WinCC Comfort") is supplied in addition to the interface blocks; this contains preconfigured block icons and faceplates for display on the Comfort Panel.

Advantages of the solution using SIMATIC PCS 7 Industry Library

- Harmonic overall solutions for control system tasks, and as a result, optimum operation of the overall process by avoiding operation faults
- Number of functions created by the user is reduced. This leads to a cost saving over the entire life cycle
- Synergy effects related to training and knowledge transfer

Delimitation

The following topics are not covered in this document:

- Connection of S7-200, S7-1200, S7-1500
- Integration of third-party controls
  The following article already includes one way of achieving this automation task:

- PROFIBUS interface
  In this documentation, reference is only made to the use of Ethernet connections, but it is also possible to use PROFIBUS DP. The only difference lies in configuring the connection. In the case of a redundant PROFIBUS system, the following article may be of assistance.

- Programming S7 function blocks

- Creating faceplates on the OS and on the Comfort Panel
  (You can find related information in the SIMATIC PCS 7 and TIA Portal V14 documentation.)

Required knowledge

Basic knowledge of configuration using SIMATIC PCS 7 and knowledge of configuration using WinCC Comfort V14 (TIA Portal) are required.
Alternatives

Instead of Industry Library, you could also use custom-made programmed interface blocks. However, this solution entails additional effort in creating the control program and configuring the Comfort Panel.

The PCS 7 OS Web option represents a further means of operating the PCS 7 system from the operator panel. Here, the panel operates as a PCS 7 Web client, launched in Internet Explorer. This solution requires additional licenses for the PCS 7 OS Web option. You also have the option of using complete Panel PCs instead of operator panels. Once the OS client software is installed, these panel PCs can be used as complete PCS 7 OS clients. It is then unnecessary to adapt the control program, but in addition to the expensive hardware you will need additional licenses for the OS client software.

1.2.1 Overview

The "IL for PCS 7" interface blocks are integrated into the PCS 7 project and connected with the technological blocks of the PCS 7 APL. The Comfort Panels are configured in WinCC Comfort V14 (TIA) by means of "IL for WinCC Comfort".

Core functionality

The block library "IL for PCS 7" includes a suitable interface block for some of the technological blocks of the APL (e.g., motor, valve, analog value monitoring, etc.). The role of the interface blocks is to evaluate the status signals of the APL blocks and provide these to the Comfort Panel. Furthermore, the IL blocks should be connected to the APL blocks in such a way that they issue the switching commands for the APL block. This switches the technological block to "Local" operating mode.
1.2.2 Hardware and software components

The following hardware and software components were used to create this application example:

### Hardware components

<table>
<thead>
<tr>
<th>Components</th>
<th>Quantity</th>
<th>Article number</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU 417-4H</td>
<td>2</td>
<td>6ES7 417-4HT14-0AB0</td>
<td>Redundant for Section &quot;3. Panel connection to an H-CPU&quot;</td>
</tr>
<tr>
<td>CP 443-1</td>
<td>2</td>
<td>6GK7 443-1EX30-0XE0</td>
<td>Redundant for Section &quot;3. Panel connection to an H-CPU&quot;</td>
</tr>
<tr>
<td>MP 377</td>
<td>1</td>
<td>6AV6 644-0AA01-2AX0</td>
<td>-</td>
</tr>
<tr>
<td>TP 1200</td>
<td>1</td>
<td>6AV2 124-0MC01-0AX0</td>
<td>-</td>
</tr>
</tbody>
</table>

### Software components

<table>
<thead>
<tr>
<th>Components</th>
<th>Article number</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS V9.0 SP1</td>
<td>6ES7 658-5AX58-0YA5</td>
<td>-</td>
</tr>
<tr>
<td>WinCC Comfort V14 SP1 Upd 6</td>
<td>6AV2 101-0AA04-0AA5</td>
<td>-</td>
</tr>
<tr>
<td>PCS 7 Industry Library V9.0 Upd1</td>
<td>6DL5 410-8AX58-0YA0</td>
<td>-</td>
</tr>
</tbody>
</table>
Note

Compatibility:

- To avoid problems with the "Device Proxy Import" in Section 2.5.1, WinCC Comfort (TIA portal) must be installed together with PCS 7 on a PC.
- SIMATIC PCS 7 V9.0 SP1 is only compatible with WinCC Comfort V14 SP1 if Update 4 or Update 6 for WinCC Comfort V14 SP1 is installed.
- The PCS 7 Industry Library V9.0 is only compatible with WinCC Comfort V14 SP1 in combination with Update 1.
- The older multipanels (MP series) can no longer be configured from TIA Portal V15.

1.3 Basics

1.3.1 SIMATIC PCS 7 Industry Library V9.0

The "IL for PCS 7" block library used in this application example includes interface blocks which interact with the blocks of the PCS 7 APL (Advanced Process Library) and provide the necessary data for operation, monitoring and reporting on the Comfort Panel.

WinCC V14 conforming block icons and faceplates ("IL for WinCC Comfort") are supplied in addition to the interface blocks; these are used for configuration on the operator panel.

In order to avoid inconsistencies resulting from operation at different stations, the Industry Library contains blocks to enable multiple control room operation.

The following libraries are used for integrating Comfort Panels into the PCS 7 environment:

<table>
<thead>
<tr>
<th>Library</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS 7 APL V9.0</td>
<td>The function blocks of the APL model the processing apparatus, such as valves or motors, in the controller. They form the software-based starting point for controlling your system.</td>
</tr>
<tr>
<td>IL for PCS 7</td>
<td>The Industry Library includes interface blocks for operation and monitoring of the process with the help of panels. The interface blocks interact with the technological functions of the APL.</td>
</tr>
<tr>
<td>IL for WinCC Comfort</td>
<td>The Industry Library for WinCC Comfort (TIA Portal) includes all the necessary components (tags, connections, picture elements) for displaying on the Comfort Panel.</td>
</tr>
</tbody>
</table>
The following figure shows an exemplary PCS 7 system configuration with integrated panels:

**Figure 1-4**

### Reasons for using Industry Library
- Risk minimization thanks to standardization
- Uniform look and feel with PCS 7 APL
- Easy integration of S7-300 controllers, multi panels and Comfort Panels
- Reduction in the time and costs for development
- The best setup for upgrading to newer PCS 7 versions

### System requirements for using PCS 7 Industry Library
The PCS 7 Industry Library V9.0 Upd1 can be used with the following configuration software:

<table>
<thead>
<tr>
<th>Library</th>
<th>Configuration software</th>
</tr>
</thead>
</table>
| IL for S7        | SIMATIC STEP 7 V5.6  
SIMATIC S7 CFC V9.0  
AS-OS Engineering V9.0  
SIMATIC WinCC V7.4 SP1 Upd1  
Installed Industry Library V9.0  
or  
SIMATIC PCS 7 V9.0 SP1 with installed Industry Library V9.0 |
| IL for PCS 7     | SIMATIC PCS 7 V9.0 SP1  
SIMATIC PCS 7 APL V9.0 |
| IL for WinCC Comfort | SIMATIC Step7 Professional V14 SP1 Upd4 |

The following hardware is considered to be the minimum requirement:
### Table 1-5

<table>
<thead>
<tr>
<th>Library</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL for S7</td>
<td>S7-315 PN/DP and from Firmware V3.1</td>
</tr>
<tr>
<td>IL for PCS 7</td>
<td>The system requirements for Advanced Process Library V9.0 apply</td>
</tr>
<tr>
<td>IL for WinCC Comfort</td>
<td>Comfort / Multi Panels (display size ≥ 12 inch)</td>
</tr>
</tbody>
</table>

**Note**

Update 1 for the Industry Library is mandatory for use with PCS 7 V9.0 SP1 and the TIA Portal V14 SP1.

The update is available for download at the following entry:

### Multi-Panels and Comfort-Panels

The Comfort Panels of the TP series are the successor panels for the Multi Panels of the MP series. The Multi-Panels can still be planned as shown in this application example, but it is recommended to switch to Comfort-Panels as they offer a considerably higher screen resolution, functionality and performance.

**Note**

From the TIA Portal V15 onwards, Multi-Panels can no longer be configured.

You can find the corresponding successor products in the following entry:

### 1.3.2 Time synchronization

In PCS 7 systems, it is necessary for the clock times of all components, including PC stations, automation systems and other peripherals, to be synchronized. This is important in ensuring the chronological sequence of processes or the correct chronological order for archiving messages.

You can find detailed information on time synchronization in the following manual:

### Integrating Comfort Panels

The Comfort Panels should also be synchronized in order to prevent time inconsistencies, e.g. when using the bit message procedure. However, these cannot be synchronized using the SIMATIC or NTP processes.

Area pointers are set up in the project of the panel; these synchronize the system time in the controller with the system time in the panel. The control program has to make the current system time available to the area pointer using the system function "SFC1 - READ_CLK".

You can find further information about time synchronization of operator panels in the article "Clock synchronization between a HMI operator panel and a SIMATIC PLC".

Configuring the time synchronization will be explained in the remainder of the documentation.
1.3.3 Hierarchical operating concept

In order to avoid inconsistencies caused by operation from different locations, the local operator authorization for the APL has been extended for multiple control room operation. The concept envisages, for instance, 2-stage hierarchical operation. Levels 1 and 2 are intended for operation at the OS in the central control room, while Levels 3 to 8 are for operation at the Comfort Panel locally in the plant. However you can also configure the 8 available input levels individually.

Figure 1-6

Operating Level 1

The "UsrM" block (= User Manager) is built into the control program in order to manage the input levels, and is connected to the interface blocks of the IL for PCS 7 library. The interface blocks pass the signal on to the associated APL block.

The input level is selected using the faceplate on the OS or via the connection to the input "KeySwLvl" (= Key Switch Level). When the user administration is activated, a logged-in user with "higher order process operation" access rights is required for operator input at the faceplate.

An alternative control of the operating direction via the Comfort Panel can be found in Section 5.
The input level is set at the OS using the internal tag "@APLOpStation". The input level for the Comfort Panels is predefined at the interface blocks with the input parameter "PanelPerm".
Configuration of the multiple control room operation will be explained in the remainder of the documentation.

1.3.4 **Operator authorization and user configuration**

PCS 7 uses three authorization levels as standard for process operation. These are:

- **Level 5**: Operator inputs
  Simple operations can be carried out (e.g. switchover from manual to automatic).

- **Level 6**: Higher order operator inputs
  It is possible to carry out operations that have long-term effects on the process (e.g. adapting the limit values for a closed-loop controller).

- **Level 1100**: Highest order operator inputs
  Process values can be simulated and equipment can be released for servicing.
Further information about user hierarchies in PCS 7 can be found in the manual "PCS 7 OS Process Control". https://support.industry.siemens.com/cs/ww/en/view/109754981

The faceplates on the operator panel are configured in such a way that only level 5 operations are available. Higher and highest order operator inputs can only be performed on the OS.

If you want to further restrict access to the operator panel, you have the following options for setting up a user administration system:

- in the project of the operator panel or
- using SIMATIC Logon.

The procedure for configuring user administration can be found in the documentation for PCS 7 WinCC Comfort and SIMATIC Logon.

1.3.5 Process fault diagnostics

The interface blocks of the "IL for PCS 7" library are configured with the alarm signaling function "ALARM_DQ".

For the bit message procedure, the non-message-type variants are set up to show messages on the operator panel. However, more configuration effort is required for the panel project.

The message-type variant has the advantage that the operator can display and acknowledge the messages from both the OS and the operator panel. The APL block messages are then suppressed. However, the message-type blocks each reserve a further process object in addition to the APL blocks, and require more system resources. All messages of the APL block should always also exist on the associated interface block.

The standard version does not provide for operation messages to be generated on the operator panel. However, this kind of operation messaging can be configured
by connecting the control signals of the interface block to the inputs for external messages.

In contrast to the PCS 7 standard signaling block "Alarm_8P", the signaling function "Alarm_DQ" is also available on HMI devices based on S7-300 and on WinCC Comfort V14. However, "Alarm_DQ" can only generate one message per call.

Quantity structure for alarms and messages:

Table 1-6

<table>
<thead>
<tr>
<th></th>
<th>PCS 7 with S7-400</th>
<th>PCS 7 with S7-300</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Message block</strong></td>
<td>ALARM_8P/ALARM_DQ</td>
<td>ALARM_DQ</td>
</tr>
<tr>
<td><strong>Number of messages</strong></td>
<td>Up to 1000</td>
<td>Up to 300</td>
</tr>
</tbody>
</table>

Further information on the alarm blocks can be found in the manual "System Software and Standard Functions for S7-300/400".  
2 Configuration and project planning

2.1 Configuring the control program

The hardware configuration of the S7 program and the project engineering of APL blocks are assumed. A PCS 7 project with already three configured motors is used as an example project below. The technological function is configured in the usual way using the APL blocks.

The configuration steps in the S7 program described below are necessary for the Comfort Panel to operate.

2.1.1 Creating/extending a panel data block

Panels need the instance DB number for the interface block of the technological function which is to be operated on the panel. For this, there is a static data block in the S7 program with a separate integer variable for each configured panel block. The integer variables are described using the value of the IDB number. Proceed as follows:

1. Create a new data block or open an existing one using the panel IDB numbers in the S7 program. For example, use the DB number "DB25". This number is already preconfigured in the case of the panel blocks in the TIA Portal. This means you then need to make fewer adjustments during the panel configuration.

2. For each new interface block, create a parameter of type "INT" in the data block.

Figure 2-1

2.1.2 Configuring the APL block

A few preparations are necessary before you can configure the IL interface blocks for panels with the APL blocks. Proceed as follows:

1. Insert the APL block "MotL" in the CFC.

2. Open the properties of the block. In the "I/Os" tab, switch the following connections to visible:
   - "MsgLock"
   - "OpSt_In"
2 Configuration and project planning

- "ErrorNum" or any other output of your choice (except "ENO"), in order to link the block to the "BlockConnector" connection of the panel block.

3. Enable the block functions "Local authorization" and "Suppress messages". Set the following feature bits to TRUE:

- Feature.Bit24 – local operator authorization
- Feature.Bit25 – suppress all messages if MsgLock = 1

Figure 2-2

Note Further information on feature bits is available in the APL documentation.

2.1.3 Configuring the panel block of the Industry Library

Insert the panel block "PMotL" of the IL in the CFC. Connect the following connections with each other:

- PMotL.MsgLock_Out ► MotL.MsgLock
- PMotL.IDBNo ► Integer parameter of the panel data block
- MotL.ErrorNum (or any connection apart from ENO) ► PMotL.BlockConnector
- MotL.ErrorNum (or any connection apart from ENO) ► PMotL.SelFp1

Note The "BlockConnector" input of the panel interface block must be connected to any output (except "ENO") of the associated APL block. The relevant data for the panel block (for example, status information or messages) are then automatically processed via the panel block and displayed accordingly.

If any connection of the associated APL block is connected to the "SelFp1" or "SelFp2" input, a button will be displayed on the faceplate of the panel interface at execution time; this button opens the associated faceplate of the APL function.
2.2 Configuring the multiple control room operation in the control program

In order to ensure that production goes smoothly despite there being several distributed control units (OS, panels), it is essential that operator input is only permitted from one location at any time. To this end, we introduced the multiple control room concept, which is designed around the existing local operator authorization in the APL. The concept provides for hierarchical control room and panel operation with 1 to 8 levels. Each of these 8 levels can be assigned operator authorization from the OS faceplate. These input levels are given user-specific names using an enumeration in PCS 7 or a text list on the Comfort Panel.

2.2.1 Configuring the names of the input levels

You can assign distinct names for the 8 possible input levels. To do this, you will need the enumerations "IL_OpLong" and "IL_OpShort". You can find the enumerations as copy templates in the "IL for PCS 7" library.

Copy both of these enumerations into the AS project and assign dedicated names to the values according to your preferences.
2.2.2 Configuring the "UsrM" block

The "UsrM" block manages the control command acceptance of up to 8 input levels. During runtime, the block can either be operated from the faceplate of the OS ("KeySwitch.Value = FALSE"), or controlled by the process using the input "KeySwLvl" ("KeySwitch.Value = TRUE"). The availability of the level can be defined flexibly using the inputs "Dev01Act" to "Dev08Act".

4. Insert the "UsrM" function block from the "IL for PCS 7" library into a CFC.
5. Assign parameters to the following inputs:
   - "Dev01Act" to "Dev08Act" – FALSE = level not available, TRUE = level available
   - "KeySwitch.Value" – FALSE = operation from the OS, TRUE = process mode (KeySwitchLvl = 1 to 8)
   - "MaxLevel" – 1 to 8 = maximum usable input levels
2.2.3 Connecting the "UsrM" block

The connection of the "UsrM" block is demonstrated using the motor block of the APL and the associated interface block of the IL, which was already configured in the section "Configuring the APL block".

6. Connect the "Out" output of the "UsrM" block to the "SwitchPerm" input of the panel interface block.

7. Connect the "Out" output of the "UsrM" block to the "OpSt_In" input of the APL block. The "OpSt_In" input for the APL block is not usually visible. This connection allows you to jump from motor faceplate to the faceplate of the "UsrM" block on the OS.
2.2.4 Setting the input level for the interface blocks for panels

In order for the faceplate on the Comfort Panel to be operational, the value at the "SwitchPerm" input must match the "PanelPerm" input on the panel interface block.

8. Open the CFC that contains the interface block for the comfort panel.

9. At the "PanelPerm" parameter, select the desired input level at which this block should have control command acceptance.

Figure 2-7

Note The values for the input levels are parameterized in the "IL_OpLong" enumeration.

2.3 Compiling and loading the S7 program

If all the configurations to the S7 program are complete, you can compile the control program in the usual way and load it into the automation system, e.g., with the function "Target system > Compile and load objects...".
2.4 Configuring the OS

2.4.1 Creation of the operating image

Configuring the Operator Station largely follows the standard PCS 7 procedure, and will therefore not be described in detail. The following steps provide a brief overview of how the block icons of the IL are generated in the process screen of the OS. To illustrate this, the “Demo” CFC has been configured with the blocks “UsrM”, “PMotL” and “MotL”.

10. Create a process screen in the same folder of the plant hierarchy, where the CFC is located.

Figure 2-8

11. Compile the Operator Station with the menu function "Edit > Compile...". Select the option "Entire OS".

12. Open the OS process screen. You can now add all the necessary graphic elements and position the block icons as desired.
2.4.2 Defining the input level for the OS

The input level for the OS is predefined using the internal tag "@APLOpStation". This tag is generated as standard for every OS project. The faceplate of the OS is then operational if the value at "OpSt_In" matches the value of the tag "@APLOpStation". In other words, the input level set at the "UsrM" block must match the predefined operating level in the OS.

13. Open the OS tag management.
14. Select the tag "@APLOpStation" from the folder "Internal tags > Split Screen Manager".
15. Enter the value of the input level to be used in the "Start value" property for the tag. Note that only these values: 1, 2, 4, 8, 16, 32, 64 and 128 are permitted.
Note
The start value must match the value of the respective input level in the enumeration "IL_OpLong", or match "IL_OpShort".

2.5 Hardware configuration in the TIA Portal

The Comfort Panels are configured using the engineering software "SIMATIC WinCC Comfort (TIA Portal)". In this section, you will be guided through the following steps for configuring in the TIA Portal:

- Import the AS data using a device proxy
- Configure the hardware for the Comfort Panel
- Configure the communication connection

2.5.1 Importing AS data

The AS program has been created with PCS 7. To access the data blocks in the AS with a panel, the AS data is imported using a proxy device in STEP 7 V14. Follow these steps to configure the controller in the TIA Portal as a device proxy:

16. Create a new project in the TIA Portal.
17. Insert a new controller in the project. Select "Device Proxy" (1) as the device and assign an appropriate name.
18. In the project view of the TIA Portal, select the command "Initialize device proxy..." from the controller shortcut menu (2).

19. Navigate to the project folder for the PCS 7 project and select the S7 project (3) in which the automation system is configured.

20. If more than one controller is configured in the S7 project, you can select which controller (4) you want to use to import the data.
21. Following successful import, you will be able to find all the data blocks of the PLC, such as the panel DB (5) required for configuring the panel, in the TIA project.

22. Mark the Ethernet interface (6) for the PLC and select an available subnet in the properties window or create a new subnet (7).
2.5.2 Configuring the panel

Follow these steps to add a panel to the project:

23. Select “Add new device” from the project navigation.

24. Select the multi panel or comfort panel to be configured (1) and assign a device name (2). In this example a Comfort Panel TP1200 was used. If you have enabled the option “Start device wizard” (3), you can create the panel with a few default settings.
25. Run the device wizard with the default settings. The following settings are possible using the wizard:

- PLC connections: Configure connections
- Screen layout: Color, header, logo, etc.
- Messages: Alarm window, alarm line, system alarms, etc.
- Pictures: Root screen, create your own screens, etc.
- System screens: PLC status, project information, system settings, etc.
- Buttons: System buttons, button areas
26. After the wizard completes, you will find the Comfort Panel in the project navigator.
27. In the device view, select the Ethernet interface (1) and set the subnet (2) and the IP address (3) for your device.

Figure 2-17

2.5.3 Configuring HMI connection

If not yet available, configure an HMI connection to the panel with the following steps:

28. Switch to the Network view (1) in the device configuration.
29. Select the option "Connections" (2) and select "HMI connection" as connection type (3).
30. Using the mouse, draw a line between the two Ethernet interfaces (4).
31. You can check all the relevant connection parameters (5) in Properties.
2.6 Configuring the panel project

This section will explain how to create the panel project:

- Setting up the project library
- Configuring the variables
- Configuring the icons and faceplates
- Adjusting the text lists
- Configuring the operating level on the panel

Note: The time synchronization of the panel project is described in Section 4.2

2.6.1 Retrieving the library

After the "SIMATIC Industry Library WinCC Comfort" package has been installed using the general setup of IL V9.0, you will still have to retrieve the installed WinCC Comfort V14 library. The default location for the "IL_PCS7_V14.ZAL14" library file is in the "C:\Program Files (x86)\SIEMENS\Industry Library" folder. In the TIA portal, select the menu command "Extras > Global libraries > Retrieve library..." to retrieve the library.
2.6.2 Setting up the project library

Before you make a start on configuration, copy all the necessary functions from the "IL_PCS7_V14" library into the project library. As a prerequisite for this, you must have completed the installation of the IL for the TIA Portal and have retrieved the "IL_PCS7_V14" library. Proceed as follows:

32. Using drag-and-drop, move the "_General" folder into the "Master copies" folder in the project library (1). The objects in the "_General" folder are always necessary.

33. Drag-and-drop all the necessary functions (2) from the IL library into the "Master copies" folder in the project library.
2.6.3 Configuring block icons and faceplates

Each block container of the IL library contains all the necessary objects for the respective technological function (e.g. motor, valve, etc.). These are:

- Block icon for the technological function
- Faceplate for the technological function
- Variable table for the icon
- Variable table for the faceplate

In order to connect the icons and faceplates to the process, you need the variables contained in the variable table. Each configured icon and each faceplate needs its own associated variable table. However, several block icons of the same type can use the same faceplate with just one variable table to display the process data.

If several icons use the same faceplate during configuration, it is necessary to observe the sequence, as shown in Figure 2.21.

This is important in order to keep the configuration effort to a minimum. If the sequence is not followed, it can result in the picture objects being connected with the wrong variables, and these assignments then need to be corrected manually.

Figure 2.21
Each panel project that is to be configured using the IL blocks, needs one copy of the internal tags "VisibleST" and "VisibleTag" in order to display the faceplates.

34. Copy the tags "VisibleST" and "VisibleTag" (1) from the project library (Master copies > General > Global Variables) into the panel project. You can use the default tag table for the project, which has already been created, as the target.

Follow these steps to configure the motor from the previous section on the panel:

35. Copy the variable tables "Mot_Faceplate" and "Mot_Icon" (2) from the project library to the project folder "HMI tags".
36. Open the newly created variable tables.
37. Select the HMI connection (3) to the AS required for the process tags. As in Excel, you can use the handle to drag the selected connection and copy it to the remaining tags.
38. Set the address of the tag "*\Pointer" in the variable table "Mot_Icon" to the parameter (4) in the panel DB intended for this block.

Figure 2-25

39. Open a new or existing process screen, e.g. the root screen created using the wizard and defined as the start screen.

40. Drag the blocks "Mot" (5) and "PCS7_MotL_Icon" (6) into the process screen. The previously created tags will be automatically linked to these picture objects.

Figure 2-26
41. In order to add further block icons of the same type, you must first change the prefix of the tag name for the icons. You can do this using the “Find and replace” function. Change the name of the associated variable table (7) too.

**Figure 2-27**

**NOTICE**

It is possible to make unintended changes to variables

The “Find and replace” function makes it easy to alter the tag names throughout the project. Make sure that you always include a static component in the Find box, which you must also enter in the Replace box.
42. In the Properties box for the block icon, you can check that the relationship between the interface and tag has been retained, in spite of the change to the tag name.

Figure 2-28
You can now add additional block icons and faceplates with the associated variable table, but make sure to always follow the editing sequence shown in Figure 2-20.

The image below shows, by way of example, the configuration of three motors; the data for these motors will be represented in a faceplate at execution time.

Figure 2-29

2.6.4 Adjusting the texts for the block icons

In order to identify the configured blocks at execution time, it is necessary to make adjustments to some properties of the block icon. The texts for the icon are static. The dynamic texts on the faceplate are written into the corresponding tags at the icon by means of an event.

Taking the analog block as an example, this section will demonstrate how to adjust the names of process tags and the entity. Proceed as follows:

1. Select the block icon and switch to the "Interface" tab in the Properties window.
2. Change the value (1) at "Label > Blockname" to the name of the process tag to which the icon is connected.
3. Change the value (2) at "Unit > Unit" to the measurement unit for the process value displayed on the icon.
In order to also display the texts on the faceplate, click on the icon to write the values in the faceplate tags.

4. Switch to the "Events" tab.
5. For the tag "Blockname" (3), change the text to the name of the process tag to which the icon is connected.
6. Change the text for the tag "UnitPV" (4) to the measurement unit for the process value displayed on the icon.
7. If additional external process values are configured on the panel block in the S7 program, you can adjust the units of these process values for the tags "Unit_Aux1" to "Unit_Aux4" (5).
2.6.5 Adjusting the texts for the input levels

The faceplates of the "IL for WinCC Comfort" are linked with text lists which are generated by insertion into a panel display. The text lists are used to display the currently selected input levels on the faceplate.
The text lists are already configured with standard texts. If you have chosen different names for the input levels in the enumerations of the PCS 7 project, you will need to adjust the text lists in the panel project likewise.

The text fields inserted in the faceplates for the selected input level are connected to the "Permission_PCS7" text list. If you insert additional faceplates into a process screen after the change to the text list, a further text list which is assigned to the new block will be created.

Proceed as follows:
1. Open the editor for text and graphics lists from the project navigation.
2. Select the text list "Permission_PCS7".
3. Adjust the texts for bits 0-7 to match the configuration of the enumeration "IL_OpLong" in the SIMATIC Manager.

Figure 2-32

Note
Further information on the subject of the "Multiple control room concept" can be found in the section "Multiple control room concept".

You have now finished configuring the technological functions for the Comfort Panel.

2.6.6 Creating graphics

You can complete the process pictures with the remaining graphic objects. Using the layer function in the configuration software makes it easier to create the process pictures.

In the "Layout" tab, you can easily assign all the graphic objects to the different layers. Move all the block icons and faceplates to a higher layer (1). To draw the process screen, you can then hide this layer using the eye icon (2).
Once you have finished the process screen, move the icons and faceplates back to their intended position.

Figure 2-34
### 2.6.7 Assigning alarm window parameters

When creating the Comfort Panel, the HMI device wizard starts by default. If you leave the proposed options selected in the step "messages", the corresponding message controls are created in the global screen of the panel project.

**Figure 2-35**

If a message is triggered by an AS block at execution time, the corresponding message control appears above the current process screen and is displayed until the operator closes the Control.

To assign parameters to the message controls, open the global screen of the panel project.

**Figure 2-36**
The properties of the message controls are shown if you select one of the controls.

**Figure 2-37**

![Panel Configuration](image)

**Note**

Panels always display the UTC timestamp generated by S7-300/400 controllers for messages. They therefore do not contain any possibility of distinguishing between UTC (system time) and local time. WinCC Comfort or Advanced also use the UTC timestamp generated by the PLC and do not distinguish between system time and local time.

### 2.6.8 Critical messages caused by multiplex tags

The faceplates on the Comfort Panel work with a dynamic pointer tag. When the faceplates are opened by clicking on an icon, this tag is provided with the correct IDB number. The value of the pointer tag is reset to "0" by closing the faceplate. All multiplex tags of the faceplate now show an invalid address range in the AS (DB0.<tags>). This status is displayed on the Comfort Panel by means of a system alarm.
Every time you switch to a display with a faceplate, or when opening/closing a
faceplate, an alarm window with the system alarm "Address error received/sent" is
shown for a short duration in front of the process screen.

If you do not want this alarm window to appear over and over again, you can delete
the alarm message control for system system alarms from the global screen ("...
Display management > Global screen") and re-insert it into another screen that can
be called up manually.

<table>
<thead>
<tr>
<th>NOTICE</th>
<th>System alarms will no longer be displayed automatically</th>
</tr>
</thead>
</table>
|        | If you remove the system diagnostics window from the global screen, you will
|        | need to configure a separate display to show the system alarms. At execution
time you will then need to invoke this display manually to view the system
alarms. |

### 2.6.9 User-configurable message classes

Since the launch of PCS 7 V8.0 SP1, it has been possible to customize the colors,
names and texts of message classes in PCS 7.

**Note** You can find further information about "User-configurable message classes"
(APMK) in PCS 7 at:


If you use this function in your PCS7 project, you can configure the messages on
the panel in such way that alarms and messages are displayed with the same texts
and colors as in the OS. To this end, other icons and faceplates are used on the
panel.
These panel interface blocks of IL for PCS 7 can be configured with user-defined displays for the message classes:

- MonAnL
- MonAn08
- MonAnDi
- MonDiL
- MonDi08
- MotSpdCL
- PIDL

The IL V14 includes additional block icons and faceplates for each of these technological components. Alongside their actual label, these have the suffix "APMK" (1). With these blocks, the following properties can be configured for each message type (e.g.: HHH, HH, H, L, LL, LLL):

- `<Message type>_Backcolor`
- `<Message type>_Fontcolor`
- `<Message type>_Sign`
- `<Message type>_Text` (faceplate only)
Follow these steps to change the representation of the messages:

4. When configuring the technological functions, use the block icons and faceplates with the suffix "_APMK".
5. Select the block to be changed.
6. In Properties, in the "Interface" tab, you will find the "Messages" record. Here, you can change the background color, text color, sign and text for every available message type (2).

Figure 2-12
2.6.10 Loading the panel

To load the Comfort Panel, select the command "Load to device > Software (load completely)" in the shortcut menu for the HMI station. For the initial loading of the Comfort Panel, the "Extended download" dialog is displayed.

Note

The communication or transmission of project data from the ES to the Comfort Panel only operates via the standard network adapter, not via the CP1613 or the CP1623.

Figure 2-13

Make the following settings:

1. Select the settings according to your configuration.
2. Start the search for the Panel on the network and wait until the scan is complete.
3. Click the "Load" button.
(4) Check the "Overwrite all" option.
(5) Start the transfer by clicking the "Load" button.

**Note**  
If problems occur when loading multi-panels, make sure to activate the transfer mode on the panel and change the transfer mode to "Ethernet" if necessary.
3 Panel connection to an H-CPU

In general the configuration of the actual control program with an H-system is identical to configuration with a single CPU. However to configure the Operator Panel on an H-system, a dedicated connection is needed to each CPU. A connection is additionally configured on the Operator Panel to receive the connection to the active CPU (Master) at execution time.

The "H_STATUS" function block is built into the S7 program and provides the panel with the information as to which CPU is Master or Standby.

You can obtain the function block "H_STATUS" at the following article:

The following sections show you how the connection is switched by means of the "ChangeConnection" function on the Comfort Panel.

3.1 How do you read out the operating state and status of an H system?

To read out the status of the H-CPU, configure the "H_STATUS" block in a CFC and connect the output signals to a user-defined data block.

1. Create a data block (e.g., DB24) in the user area with the following parameters:
   - R0_CPU_STATE – BOOL
   - Reserve0 – BYTE
   - R1_CPU_STATE – BOOL
   - Reserve1 – BYTE

   The reserve bytes are created so that the second status bit receives the next address to the word limit. In WinCC Comfort, at least one byte per status is required for configuration.

   Figure 3-1

7. Insert the "H_STATUS" block in a CFC and connect the following outputs to the parameters of the DB:
   - R0_MSTR ► R0_CPU_STATE
   - R1_MSTR ► R1_CPU_STATE

   The block can be built into a watchdog alarm OB with a long cycle time (e.g. OB33 with 500ms).
3.2 Configuring hardware in the TIA portal

Configure the hardware as described in Section "2.5 Hardware configuration in the TIA Portal". Consider the H-CPU as a single CPU.

In the Network view, configure an HMI connection with the name "RedConn" (1).

3.3 Configuring connections in WinCC Comfort

In order to use an H-system with a Panel, you require 3 connections. These are:

- Connection 1: "RedConn" change connection
- Connection 2: Connection to H-CPU Rack 0
- Connection 3: Connection to H-CPU Rack 1

A tag is configured for each of connections 2 and 3 to monitor the status of the H-CPU. These monitoring tags are configured so that if the value changes, the change connection is switched over to the active Master of the H-system.

All other tags in the panel project are configured with the change connection.

In this case, the "ReConn" connection, which has been configured from the HMI device to the proxy PLC, is used as a change connection.
3.4 Configuring monitoring tags

8. Create two tags with the following properties:

Tag 1:
- Name: ChangeConn_H0
- Data type: BYTE
- Connection: Conn_H0
- Address: DB24.DBB0
- Acquisition mode: Cyclic continuous
- Area: Bottom 2 = 0 / Top 2 = 0

Tag 2:
- Name: ChangeConn_H1
- Data type: BYTE
- Connection: Conn_H1
- Address: DB24.DBB2
- Acquisition mode: Cyclic continuous
- Area: Bottom 2 = 0 / Top 2 = 0
Figure 3-5

Panel connection to an H-CPU
9. Configure the event on the tags:

Tag 1:
- Trigger: If exceeded
- Event: ChangeConnection
- Target connection: RedConn
- Address, Slot and Rack: (like "Conn_H0" connection)

Tag 2:
- Trigger: If exceeded
- Event: ChangeConnection
- Target connection: RedConn
- Address, Slot and Rack: (like "Conn_H1" connection)

Figure 3-6

3.5 Configuring the technological blocks

Proceed as described in section "2.6 Configuring the panel project". However for all process tags, use the change connection instead of the direct connection to the CPU.
The HMI tags for the technological blocks will then always maintain a connection to the Master CPU of the H-system.

Figure 3-8
4 Time synchronization

4.1 Time synchronization of AS and OS

4.1.1 Synchronization using the SIMATIC process

The OS server is the time-of-day master. OS clients and automation systems are slave clocks. The time should be set to Coordinated Universal Time (UTC) throughout the entire system.

Note Depending on the CPU used, only the NTP method may be used for clock synchronization. You can find information about available methods of clock synchronization of your CPU in the relevant manuals.

Configuring the OS server as time-of-day master

10. Open the OS project for the server that is to be configured as time-of-day master.
11. Open the "Time Synchronization" editor.
12. Select the option "Synchronization via System Bus".
13. Set an Access point (1) and define this as "Master". Here, select the CP for your system bus.
14. If necessary, you can configure a further access point as "Master".
15. Save the changes and load the OS.

Figure 4-4-1

Configuring the OS client as slave clock
16. Open the OS client projects in succession.
17. Open the “Time Synchronization” editor.
18. Select the option “Synchronization via Terminal Bus” (2).
19. Select the option “Use the time from a connected WinCC server”.
20. Save the changes and load the OS.

Figure 4-4-2

Configuring the automation system as slave clock

21. Open the hardware configuration for the AS.
22. Open the properties for the CP and switch to the “Time-of-Day synchronization” tab.
23. Select the option “Forward time of day” in the “SIMATIC Mode” group box (3).
24. Open the properties for the CPU and switch to the “Diagnostics/Clock” tab.
25. Select the synchronization type “As slave” in the AS (4).
26. Save and compile the changes and load the hardware configuration.
Note

You can find further information about time synchronization in the PCS 7 environment in the following manual:


4.1.2 Synchronization in the NTP process

In the NTP process, the clock time is provided by a Windows PC which is connected both to the system bus and to the terminal bus. The NTP server is configured from the management console of the operating system.

You can find a detailed description of how to configure the time synchronization using the NTP procedure in the following article:


Alternatively, a central system clock can be configured as NTP server.

Note

You can find further information about time synchronization in the PCS 7 environment in the following manual:

4.2 Time synchronization panel

The Comfort Panels are synchronized with the AS. In order to configure the control program and the panel, you need the following components:

- 12-byte data block (AS)
- System function block "READ_CLK" (AS)
- Global area pointer "Date/Time PLC" (panel)

Creating a data block

The area pointer in the panel requires a 12-byte data storage area in the AS. Since the data type "DATE_AND_TIME" only occupies 8 bytes, you need to add 4 more unused bytes to the DB.

Create a data block with one DB no. in the area reserved for other applications, by using the following parameters:

- Name: "SPS_TIME", type: "DATE_AND_TIME"
- Name: "RESERVE", type: "ARRAY [0..3] OF BYTE"

![Figure 4-4-4](image)

Reading out PLC time

You can read out the system time of the AS from the IL using the system function SFC1 - READ_CLK or with the function block FB60 - LOC_TIME (FB60).

Proceed as follows:

27. Create a new CFC.

28. Add the system function READ_CLK (1) for the UTC time or the function block LOC_TIME (2) of the Industry Library for the local time in the chart.

29. Connect the output CDT or LT to the SPS_TIME parameter you created previously in the DB.

30. Compile and load the control program.
Configuring the panel area pointer

The area pointer is configured in the TIA Portal with an existing connection to the controller, which should be the time-of-day master for the panel.

Carry out the following steps:

31. In the TIA portal, open the panel connections.
32. Switch to the “Area pointer” tab.
33. Configure the global area pointer as "Date/Time PLC". For the address, enter the DB with the parameter "SPS_TIME".
34. Compile and load the panel project.
4.3 Time synchronization with an H-system

The time synchronization of a Comfort Panel with an H-system is no different to that of a single system. However, the parameters of the global area pointer "Date/Time PLC" are assigned with the AC Connection "RedConn" (1). Configure the time synchronization, as described in section "4.2 Time synchronization".
5 Alternative configurations

5.1 Assigning operator authorization on the panel

As an alternative to the principle shown in the Section "Hierarchical operating concept" for the assignment of operating authorizations, since the Industry Library V8.2 there is also the possibility to control the operating authorizations via a panel.

Note
However, it is recommended that operating authorizations only be allowed from one location at a time in order to avoid inconsistencies during operation. This means that the user authorizations should be controlled either by a single panel or by the OS.

The configuration of the operator control via the panel is similar to that of a motor, as described in the section "Configuration and project planning". To control the operating authorization via the panel, the "UsrM" block is connected with the equivalent "PUsrM" block for the panel. The WinCC Comfort V14 library ("IL for WinCC Comfort") provides corresponding image blocks and symbols for operation on the panel.

5.1.1 Configuration of "PUsrM" in the S7 program

35. Create a new data block or open an existing one using the panel IDB numbers in the S7 program. For example, use the DB number "DB25". This number is already preconfigured in the case of the panel blocks in the TIA Portal. This means you then need to make fewer adjustments during the panel configuration.

36. For each new interface block, create a parameter of type "INT" in the data block.

37. Open the properties of the already configured "UsrM" block. In the "I/Os" tab, switch the following connections to visible:
   - "MsgLock"
   - "ErrorCode" or any other output of your choice (except "ENO"), in order to link the block to the "BlockConnector" connection of the panel block.

38. Enable the block functions "Local authorization" and "Suppress messages". Set the following feature bits to TRUE:
   - Feature.Bit24 – local operator authorization
   - Feature.Bit25 – suppress all messages if MsgLock = 1

39. Set the input KeySwitch.Value = TRUE to avoid operator authorizations being granted from the OS.
40. Insert the panel block "PUsrM" of the IL in the CFC. Connect the following connections with each other:

- PUsrM.MsgLock_Out ► UsrM.MsgLock
- PUsrM.IDBNo ► Integer parameter of the panel data block
- UsrM.ErrorCode (or any connection apart from ENO) ► PUsrM.BlockConnector

41. The output UsrM.Out can be connected as before with the corresponding inputs SwitchPerm or OpSt_In of the APL and IL blocks.

42. Compile and download the S7 program as usual.
5.1.2 Configuration of the panel operator authorization in the TIA Portal

The configuration of the panel authorization in the TIA portal is similar to the configuration of a motor, as described in the section "Configuring the panel project".

However, the panel project requires the internal tag "@ILPanelStation" in addition to the two internal tags "VisibleST" and "VisibleTag" to operate the user authorization.

1. Copy the tag "@ILPanelStation" (1) from the project library (Master copies > General > Global Variables) into the panel project. You can use the default tag table for the project, which has already been created, as the target.

2. Copy the tag tables "MUrsM_Faceplate" and "UsrM_Icon" (2) from the project library to the project folder "HMI tags".
3. Open the newly created variable tables.

4. Select the HMI connection (3) to the AS required for the process tags. As in Excel, you can use the handle to drag the selected connection and copy it to the remaining tags.

5. Set the address of the tag "\Pointer" in the variable table "UsrM_Icon" to the parameter (4) in the panel DB intended for this block.

6. Open a new or existing process image.

7. Drag the blocks "UsrM" (5) and "PCS7_UsrM_Icon" (5) into the process screen. The previously created tags will be automatically linked to these picture objects.
8. Adjust the input levels as described in the section “Adjusting the texts for the input levels”.

9. Compile and load the panel.

10. The operator authorizations can now be controlled via the panel.
6 Operation at execution time

6.1 Setting the authorized input level during runtime

During runtime, you can select the input level at the OS, or control it via the process at the "KeySwLvl" input of the "UsrM" block.

Specifying the authorized level via the process

The level which is to receive control command acceptance is defined using the "KeySwLvl" input. The input is of type "INT" and processes the values 1 to 8. The default input level using the process becomes active when the "Keyswitch" input is set.

Figure 6-1

(1) Selectable input level
(2) Non-selectable input level
(3) Operation mode: KeySwitch = FALSE (OS), KeySwitch = TRUE (process)
(4) Specification of the input level using the process
(5) Maximum usable input levels
(6) Selected input level
(7) Display of KeySwitch = TRUE on the OS – the block is not operational

The block has the following behavior:
- Only selectable levels can be set.
- If a non-selectable level is set at the "KeySwLvl" input, the next highest level is used.
- If the value at "KeySwLvl" is greater than "MaxLevel" or smaller than 1, the highest selectable level is used.
Specifying the authorized level on the OS by the operator

In the case of operator input at the OS with user administration activated, the logged-in user must have "Higher process controlling" rights.

The faceplate of "UsrM" is only operational if the value '0' is present at the "KeySwitch" input of the AS block.

Figure 6-2

1. Display of the active level on the "UsrM" block icon
2. Display of the active level on the block icon for the panel interface block on the OS
3. Selectable level
4. Selection button for changing the input level

The levels that can be displayed and selected are only the ones set as active on the block (inputs "Dev01Act" to "Dev08Act").

The texts on the block icon and on the faceplate are defined using the "IL_OpLong" enumeration.
6.2 Operation on the OS and on the Operator Panel

Depending on the configuration effort, the process screen will have a similar appearance for both operating stations (Operator Station and Comfort Panel).

Figure 6-3

The following special features will result from operating the system using the Industry Library blocks:

- The station authorized for operation can be set at the OS (1), depending on the configuration, on a panel or via the process.
- Pending alarms and messages and the input level (2) set are displayed on the OS block icon of the interface block.
- The symbol "OP" on the panel block icon indicates whether this block is currently operational (3).
Appendix

7.1 Service and support

Industry Online Support
Do you have any questions or need assistance?
Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.
The Industry Online Support is the central address for information about our products, solutions and services.
Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:
https://support.industry.siemens.com/

Technical Support
The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:
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For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:
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• Repair services
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You can find detailed information on our range of services in the service catalog web page:
https://support.industry.siemens.com/cs/sc

Industry Online Support app
You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for Apple iOS, Android and Windows Phone:
https://support.industry.siemens.com/cs/ww/en/sc/2067
7.2 Links and literature

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7.3 Change documentation

Table 7-2

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