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Process automation with the SIMATIC PCS 7 CPU 410-5H controller



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Preface

Introduction

There are various automation systems available for the SIMATIC PCS 7 process control system which differ in performance, quantity structure, communications interfaces and scalability, and other things. These include:

- AS 410 automation systems
- Complementary S7-400 systems (AS 412 to AS 417)

Depending on the automation performance requirements, CPU 412 to CPU 417 may be used on the complementary S7-400 systems. If the performance limit of one of the CPUs being used is reached, e.g., as a result of necessary modifications to the user program, the hardware must be exchanged to increase the performance, or a higher performance S7-400 system used.

The AS 410 offers a CPU - the innovative CPU 410-5H Process Automation - which is versatile in use. The automation performance is scaled without having to change the CPU and is carried out by the number of SIMATIC PCS 7 process objects. In this case the best performance is always available, regardless of the operating range.

The reduction of types on the AS 410 to a single CPU brings numerous benefits. It simplifies considerably the selection, configuration and planning of the automation system, the keeping of a spare parts inventory and plant expansion.

Document contents

This document describes scenarios which explain relevant functions of the CPU 410-5H Process Automation in the AS 410 and illustrates advantages over the complementary S7-400 systems. It also gives you an overview of important configuring steps and notes.

In the document, you will find information on the following topics:

- General information on the CPU 410-5H Process Automation
- Advantages of the CPU 410-H
- Configuring the communications interface and establishing the connection between the ES and the AS
- Type Change in RUN (TCiR) function
- Configuration of the PN/Ethernet interfaces
- Online upgrade of process objects

Validity

This application applies to:

- CPU 410-5H Process Automation, Firmware Version 8.1
- SIMATIC PCS 7 V8.1

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1 CPU 410-5H at a glance

In this chapter you will find general information on the CPU 410-5H, its functions and areas of application.

1.1 Introduction

The CPU 410-5H is a controller specially designed for process automation which is versatile in use. With its robust, high performance hardware, the CPU 410-5H covers the entire performance spectrum of the AS 412 to AS 417 complementary systems.

Scalable performance

The performance range of the CPU 410-5H can be individually scaled according to the size and type of the PCS 7 applications. This is done by means of the PO volume, which is determined by the System Expansion Card (SEC). The volume extends from 100 PO to unlimited, at which point other performance data of the CPU act as the limiting factor.

The PO quantity structure of an SEC can be conveniently extended from the PCS 7 V8.1 by means of CPU 410 expansion packs. It is not necessary to dismantle the CPU or the SEC. There are CPU 410 expansion packs available for 100 POs and 500 Poss. The CPU 410 expansion packs can be ordered in various ways:

- Online via <http://www.siemens.com/industrymall>
- Through your Siemens contact person (www.siemens.com/automation/partner)

Communication

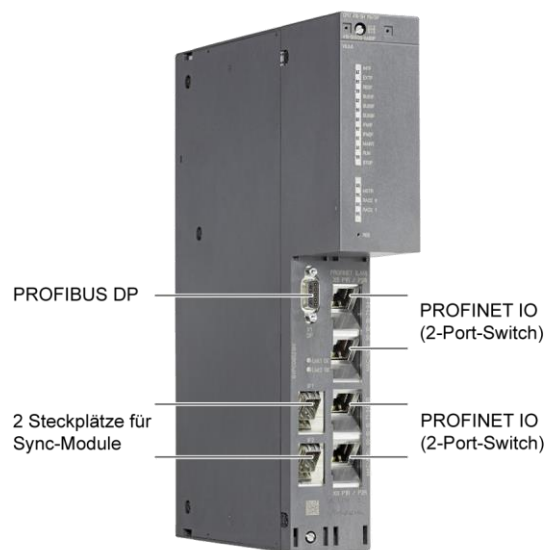
The CPU has two 10/100 Mbps PN/Ethernet interfaces, which can be configured as follows:

- 2x PROFINET, e.g., for redundant configurations without the use of external CPs
- 1x Industrial Ethernet and 1x PROFINET, e.g., for connecting to the plant bus and the process bus without the use of external CPs.
- 2x Industrial Ethernet, e.g., to design redundancy into the plant bus

The CPU has an additional 12 Mbps PROFIBUS interface and allows the connection of up to 96 nodes. The distributed process I/O can be linked either directly (PROFIBUS DP) or via a subordinate process bus (PROFIBUS PA).

1.1 Introduction

The PROFINET interfaces can be used for connecting or expanding the I/O devices. 250 devices can be connected for each PROFINET interface.



Process safety functions

The standard SIMATIC PCS 7 CPU 410 setup allows integrated process safety functions and offers all the functions required for safety-oriented applications. The controller is TÜV (German Technical Inspectorate) certified and meets all safety requirements up to SIL 3. The CPU is capable of multitasking, meaning that several programs can run simultaneously - both Basic Process Control Applications (BPCS) and safety-oriented applications. The programs are also reaction-free, with the result that potential errors in the BPCS applications have no effect on the safety-oriented applications and vice versa.

High-availability

Two redundant, galvanic ally isolated controllers are used to guarantee maximum availability. They can be mounted on a common rack or also operated synchronously at a distance of up to ten kilometers from one another. In this case, one of the two CPUs functions as the master and the other as the reserve. In each case, two synchronization submodules are used for redundant coupling, whereby the two CPUs are synchronized by means of fiber-optic cables. The modules can be exchanged during operation.

1.2 Advantages of the CPU 410-5H

General information

The CPU 410-5H offers many advantages, such as:

- A hardware platform for all application uses, application sizes and performance ranges
Consequently the selection, configuration and planning of the automation system are simplified.
- Lower costs for spare or replacement part inventories, as only one CPU type is used in the project.
- Flexible expansion of the automation performance without replacing hardware
- Lower investment costs and greater possibilities for use in regions with coating requirements, thanks to the protective coating of the CPU 410-5H
- Reduction of plant downtime due to the possibility of type updating of AS blocks in RUN mode (TCiR).

Plant planning

The advantages of the CPU 410-5H come into their own above all when planning a new plant:

- When planning the automation performance necessary for your plant, you will no longer have to consider different CPU variants, as the CPU 410-5H can be used for all purposes (e.g., as an H or an F-system, as well as for all application sizes).
- The required automation performance (PO volumes) can be ordered according to the application size after the engineering phase is complete.
- The automation performance can be conveniently expanded as required at any time by means of the CPU System Expansion Card (SEC), without any exchange of hardware or plant downtime.
- The planning of the CPU spares is simplified considerably by the use of standardized hardware. In this case you will only need one CPU 410-5H without SEC as a replacement part, since the SEC can be transferred if the CPU is exchanged.
- Thanks to networking with PROFINET (PN), switchgear and drives can be reached by every CPU without expensive cabling. Should program relocations to another CPU arise in the course of the implementation, it will not be necessary to rewire the Station or the device.

Note

The PN communication which spans the CPUs can influence the performance capability of all the CPUs in the PN network.

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

In order to implement the application scenarios described in this chapter, a connection must be set up between the Engineering Station (ES) and the Automation System. The configuration procedure depends on the communications interface used. A distinction is made between:

- AS with additional CP
- Internal PN/Ethernet interfaces of the CPU

2.1.1 Establishing a connection using an additional CP in the AS

The following section describes how to establish a connection between ES and AS using the CP 443-1.

Requirements

In order to establish a connection between the ES and AS (via the CP), the modules must be fitted in the rack as shown in the Operating Manual.

Preliminary considerations

Before establishing communication, you must define whether you want to use TCP/IP or ISO. The addressing (IP address, MAC address) is carried out on the basis of the interface selection.

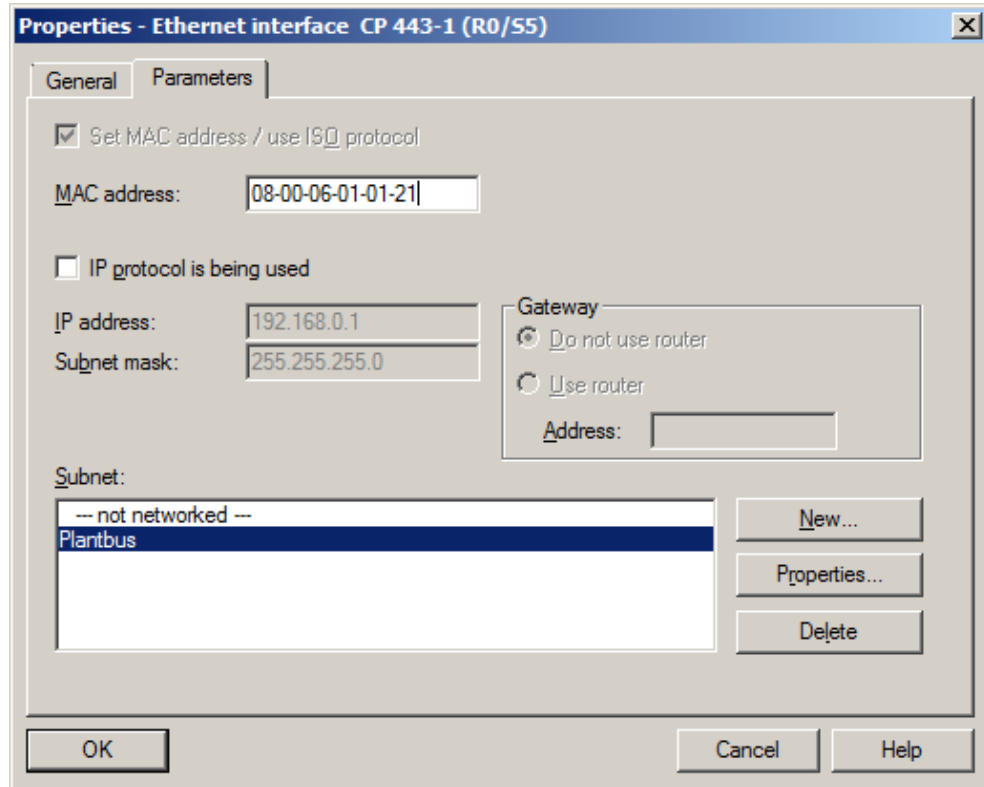
2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

Connection via ISO interface

The following points are a step-by-step description of how to establish a connection between the AS and the ES.

1. Configure the AS in the HW Config. and assign the address for the CP (MAC address) accordingly.

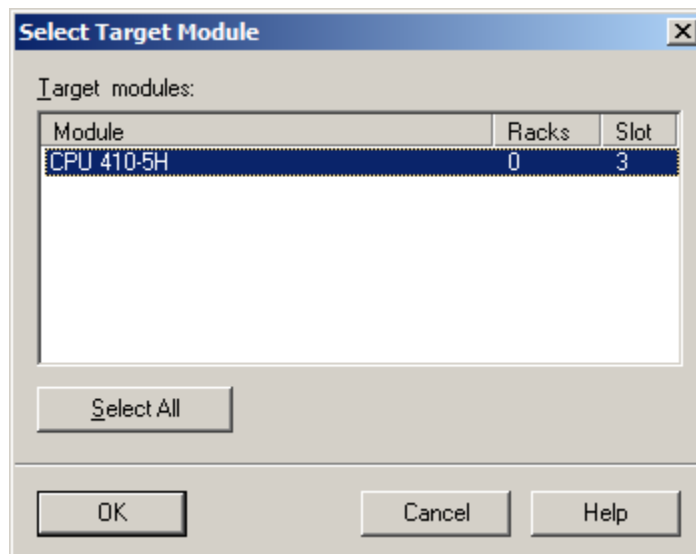


2. Save and compile the configuration.
3. From the menu command "Tools > Set PG/PC station..." in the SIMATIC Manager, set the "Interface parameter setting used" to "ISO" (e.g., CP1623.ISO.1).
4. Switch back to the HW Config.
5. Execute the menu command "Target system > Load in module...".

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

6. In the "Select Target Module" dialog window, select the relevant module and click on "OK".



2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

7. If you have not changed the MAC address for the CP (configured MAC address is the same as the factory-set MAC address), click on the "OK" button in the "Select Node Address" dialog window.

Over which station address is the programming device connected to the module CPU 410-5H?

Rack: 0

Slot: 3

Target Station: Local
 Can be reached by means of gateway

Enter connection to target station:				
MAC address	Module type	Station name	Module name	Plant designation
08-00-06-01-01-21				

Accessible Nodes

View

OK Cancel Help

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

If you have configured a different MAC address, then click on the "View" button. Then in the "Accessible Nodes" box, select the CP from which you want to load the configuration. Now click the "OK" button.

Over which station address is the programming device connected to the module CPU 410-5H?

Rack: 0
Slot: 3

Target Station: Local
 Can be reached by means of gateway

Enter connection to target station:

MAC address	Module type	Station name	Module name
08-00-06-01-00-00	CP 443-1		

Accessible Nodes

MAC address	Module type	Station name	Module name
00-1B-1B-7E-95-DD	SIMATIC-PC		
08-00-06-01-00-00	CP 443-1		
08-00-06-01-01-22	CP 443-1		
08-00-06-9E-73-AE	INC		

Update

OK Cancel Help

8. The configuration has now been loaded into the AS.

Note

After an address change, always load the configuration via the HW Config or NetPro. The accessible nodes to which you can make assignments by loading a new address are only shown here. When loading from the SIMATIC Manager, an attempt is made to load via the configured address. Since this cannot be accessed, the loading procedure is aborted, accompanied by an appropriate message.

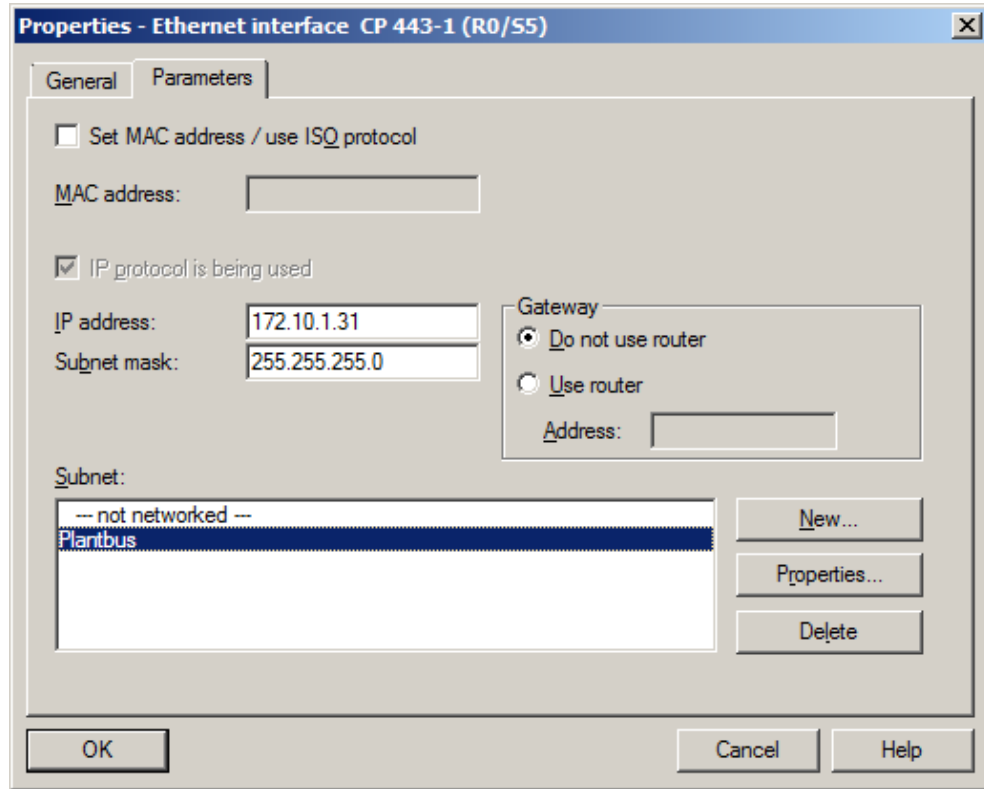
2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

Connection via TCP/IP interface

The following points are a step-by-step description of how to establish the connection between the AS and the ES.

1. Configure the AS in the HW Config and assign the IP parameters for the CP (IP address, subnet mask) accordingly.

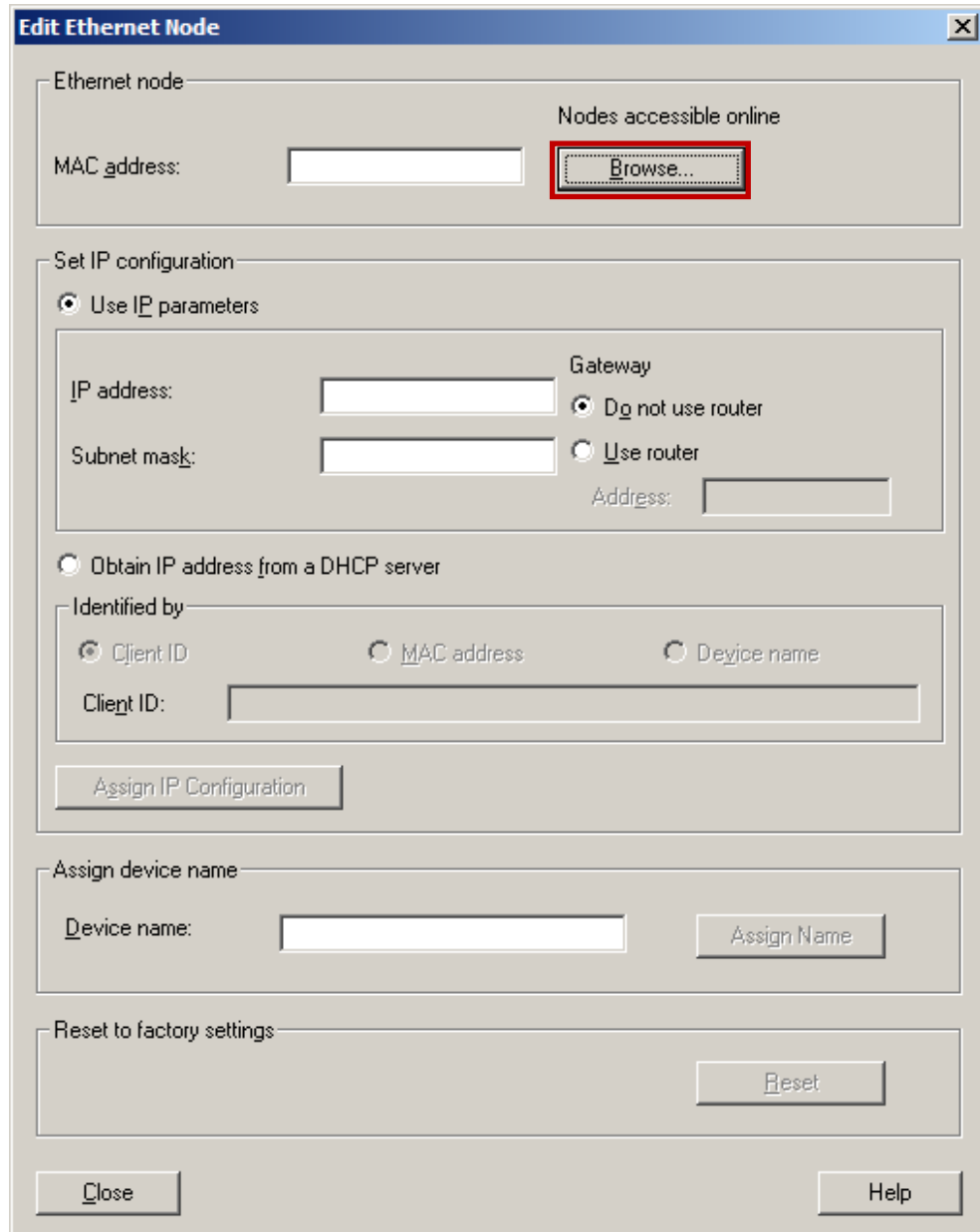


2. Save and compile the configuration.
3. From the menu command "Tools > Set PG/PC station..." in the SIMATIC Manager, set the "Interface parameter setting used" to "RFC1006" or "TCPIP" (e.g., CP1623.RFC1006.1).
4. Switch back to the HW Config.
5. Execute the menu command "Target system > Edit Ethernet Node".

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

6. Click on the "Browse" button in the "Edit Ethernet Node" dialog window.



The screenshot shows the "Edit Ethernet Node" dialog window. The window is titled "Edit Ethernet Node" and has a close button (X) in the top right corner. The dialog is divided into several sections:

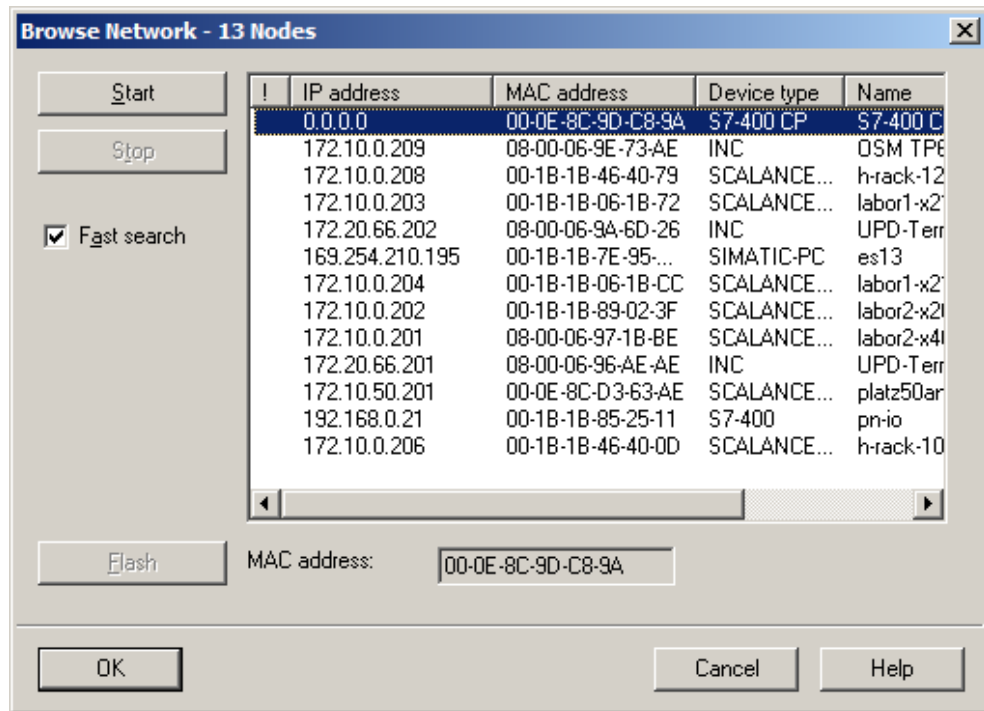
- Ethernet node:** Contains a "MAC address:" label and a text input field. To the right, there is a "Nodes accessible online" label and a "Browse..." button, which is highlighted with a red rectangle.
- Set IP configuration:** Contains a radio button labeled "Use IP parameters" which is selected. Below this, there are two text input fields: "IP address:" and "Subnet mask:". To the right, there is a "Gateway" label and two radio buttons: "Do not use router" (selected) and "Use router". Below the "Use router" radio button is a text input field labeled "Address:". Below this section is another radio button labeled "Obtain IP address from a DHCP server".
- Identified by:** Contains three radio buttons: "Client ID" (selected), "MAC address", and "Device name". Below these is a text input field labeled "Client ID:". Below this section is a button labeled "Assign IP Configuration".
- Assign device name:** Contains a "Device name:" label and a text input field. To the right is a button labeled "Assign Name".
- Reset to factory settings:** Contains a button labeled "Reset".

At the bottom of the dialog, there are two buttons: "Close" on the left and "Help" on the right.

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

7. In the "Browse Network" dialog window, select the CP by means of the MAC address and click on the "OK" button.



Note If not all or none of the connected nodes are displayed, check the settings for the network components used (switches, etc.).

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

8. The MAC address and the IP parameters for the CP are entered in the "Edit Ethernet Node" dialog window. Adapt the IP parameters according to your configuration in HW Config (see Step 1). Then click on the "Assign IP Configuration" button, followed by the "Close" button.

Edit Ethernet Node

Ethernet node

MAC address: 00-0E-8C-9D-C8-9A

Nodes accessible online

Set IP configuration

Use IP parameters

IP address: 172.10.1.32 Subnet mask: 255.255.0.0

Gateway

Do not use router Use router

Obtain IP address from a DHCP server

Identified by

Client ID MAC address Device name

Client ID:

Assign device name

Device name: S7-400 CP:00.0E.8C.9D.C8.9A

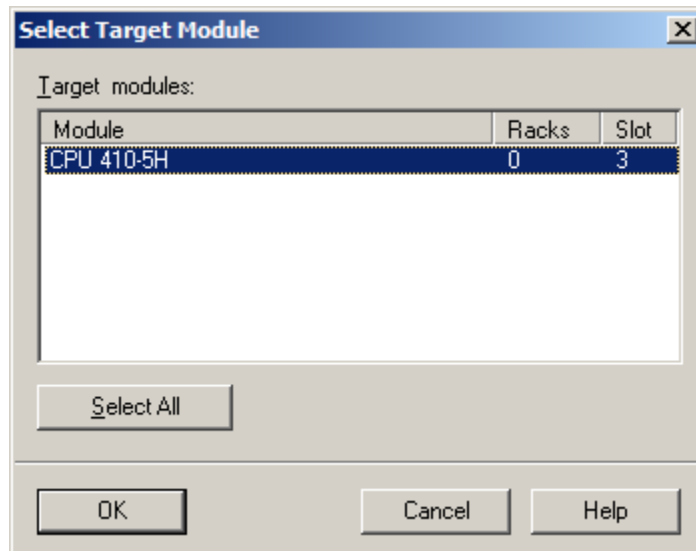
Reset to factory settings

Note If you start the search again, you can check to see if the parameters have been correctly accepted.

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

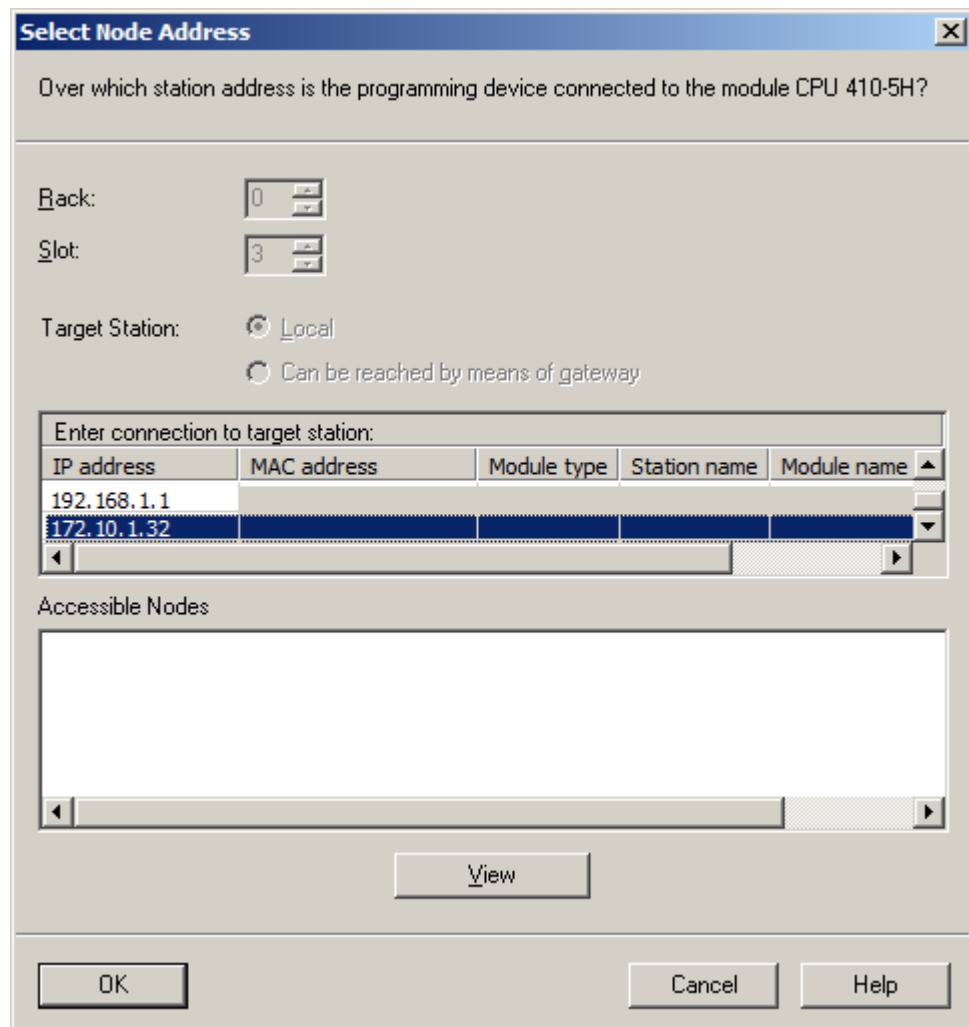
9. Execute the menu command "Target system > Load in module...".
10. In the "Select Target Module" dialog window, select the relevant module and click on "OK".



2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

11. In the "Enter connection to target station" box in the "Select Node Address" dialog window, select the relevant IP address and click on the "OK" button.



12. The configuration has now been loaded into the AS.

2.1 Configuring the communications interface and establishing a connection between the ES and AS

2.1.2 **Establishing a connection via internal PN/Ethernet interfaces of the CPU**

The following describes how to establish a connection between the ES and the AS using the internal PN/Ethernet interfaces of the CPU 410-5H.

Requirements

In order to establish a connection between the ES and the AS using the internal interfaces of the CPU 410-5H, the CPU 410-5H must be fitted in the rack as shown in the Operating Manual and be connected to the ES via the network (Ethernet).

Preliminary considerations

Before configuring, define which interface is to be used to connect the CPU to the plant bus. An IP address from the address range of the plant bus must be used for the interface.

Note

The ISO protocol is not supported by the internal PN/Ethernet interfaces.

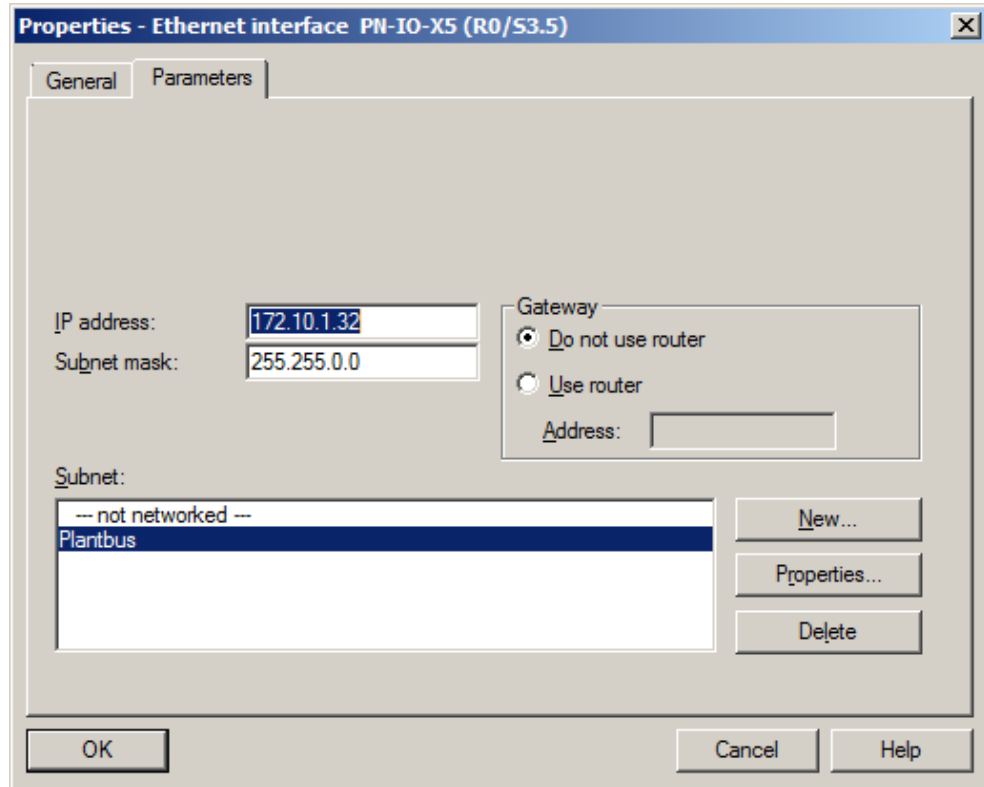
2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

Connection via PN/Ethernet interface

The following points are a step-by-step description of how to establish the initial connection between the CPU 410-5H and the ES.

1. Configure the AS in the HW Config and assign the IP parameters (IP address, subnet mask) in the PN/Ethernet interface.

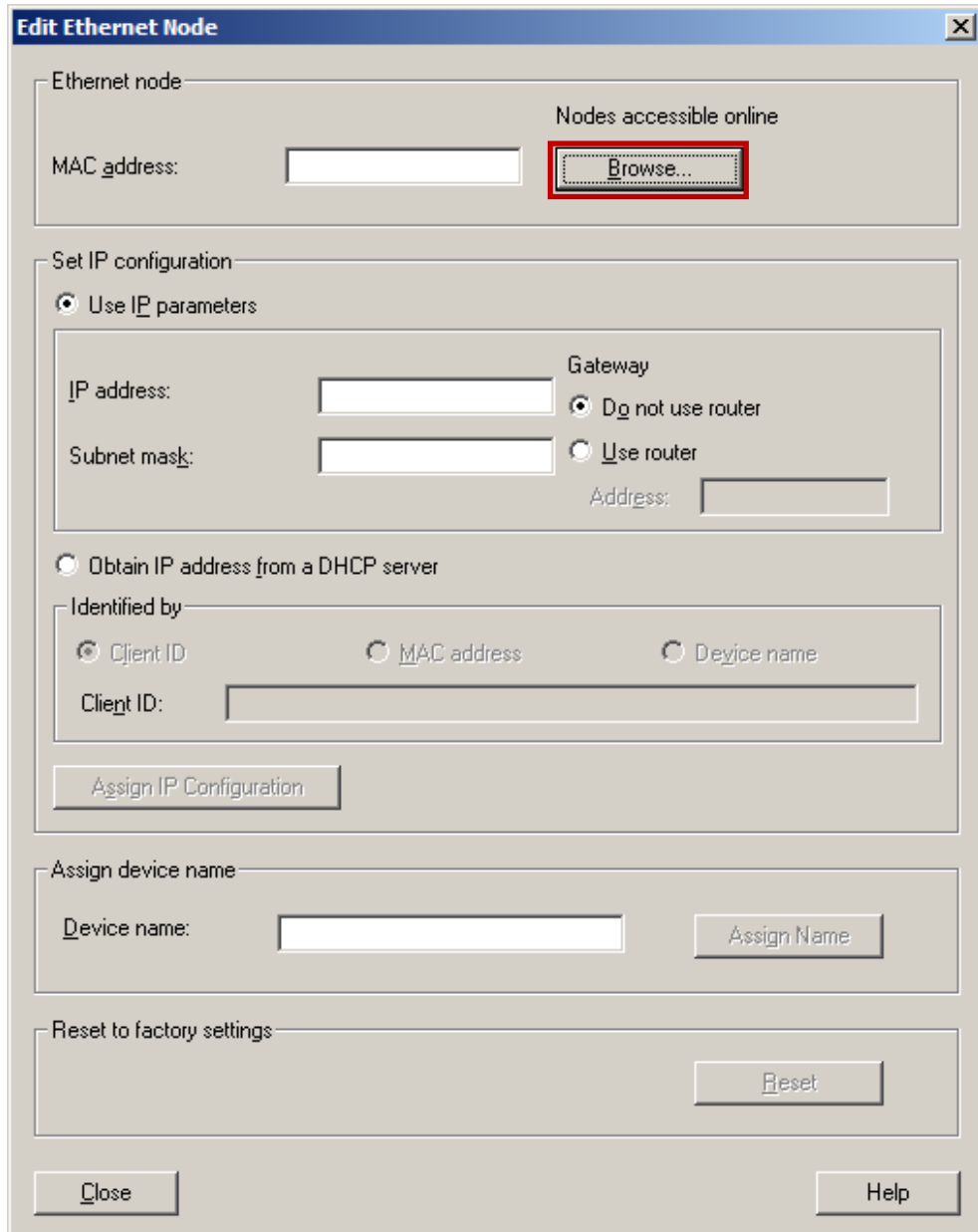


2. Save and compile the configuration.
3. From the menu command "Tools > Set PG/PC station..." in the SIMATIC Manager, set the "Interface parameter setting used" to "RFC1006" or "TCPIP" (e.g., CP1623.RFC1006.1).
4. Switch to the HW Config.
5. Execute the menu command "Target system > Edit Ethernet Node".

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

6. Click on the "Browse" button in the "Edit Ethernet Node" dialog window.



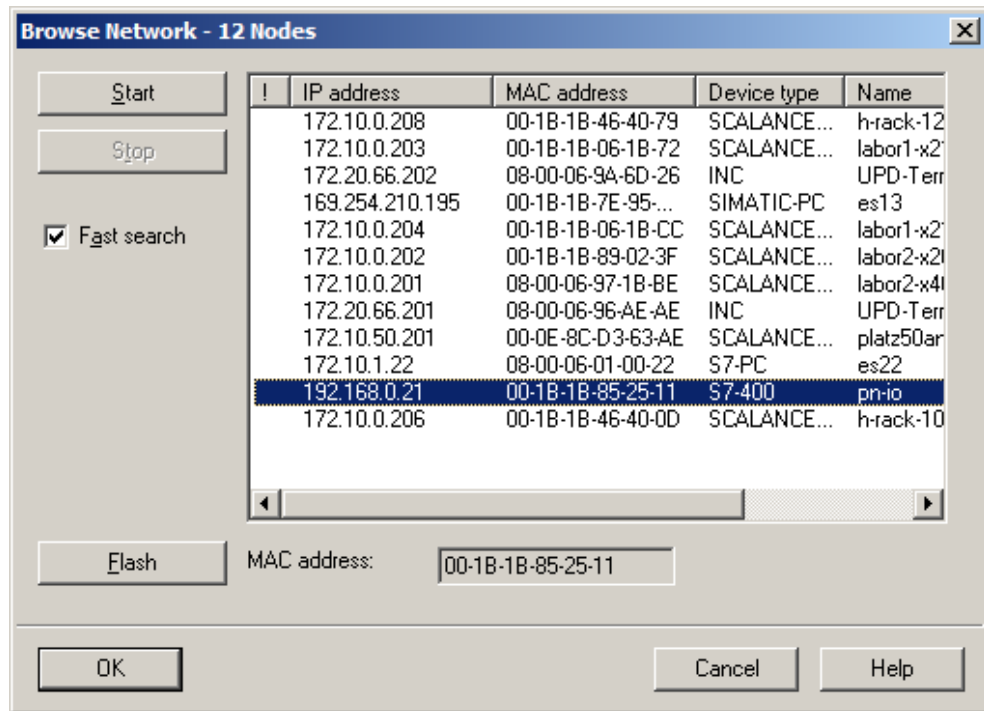
The screenshot shows the "Edit Ethernet Node" dialog window. The window is titled "Edit Ethernet Node" and has a close button (X) in the top right corner. The dialog is divided into several sections:

- Ethernet node:** Contains a "MAC address:" label and an empty text input field. To the right, there is a "Nodes accessible online" label and a "Browse..." button, which is highlighted with a red rectangle.
- Set IP configuration:** Contains a radio button labeled "Use IP parameters" which is selected. Below this, there are two text input fields: "IP address:" and "Subnet mask:". To the right, there is a "Gateway" label and two radio buttons: "Do not use router" (selected) and "Use router". Below the "Use router" radio button is an "Address:" label and an empty text input field.
- Obtain IP address from a DHCP server:** Contains a radio button labeled "Obtain IP address from a DHCP server" which is not selected.
- Identified by:** Contains three radio buttons: "Client ID" (selected), "MAC address", and "Device name". Below these is a "Client ID:" label and an empty text input field.
- Assign IP Configuration:** A button located below the "Identified by" section.
- Assign device name:** Contains a "Device name:" label and an empty text input field. To the right is an "Assign Name" button.
- Reset to factory settings:** Contains a "Reset" button.
- Close and Help:** At the bottom of the dialog, there are "Close" and "Help" buttons.

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

7. In the "Browse Network" dialog window, select the CPU by means of the MAC address and click on the "OK" button.



Note If not all or none of the connected nodes are displayed, check the settings for the network components used (switches, etc.).

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

8. The MAC address and the IP parameters for the Ethernet interface are entered in the "Edit Ethernet Node" dialog window. Adapt the IP parameters according to your configuration in HW Config (see Step 1). Then click on the "Assign IP Configuration" button, followed by the "Close" button.

Edit Ethernet Node

Ethernet node

Nodes accessible online

MAC address: 00-1B-1B-85-25-11

Set IP configuration

Use IP parameters

IP address: 172.10.1.32 Subnet mask: 255.255.0.0

Gateway

Do not use router Use router

Gateway Address: 192.168.0.21

Obtain IP address from a DHCP server

Identified by

Client ID MAC address Device name

Client ID:

Assign device name

Device name: pn-io

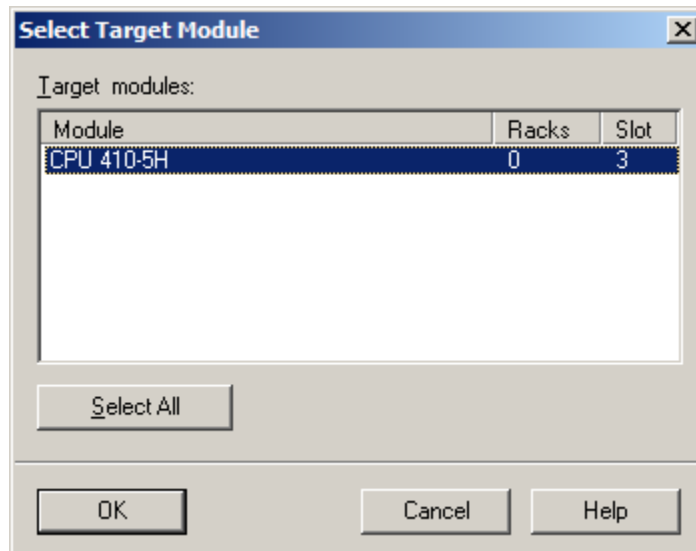
Reset to factory settings

Note If you start the search again, you can check to see if the parameters have been correctly accepted.

2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

9. Execute the menu command "Target system > Load in module...".
10. In the "Select Target Module" dialog window, select the relevant module and click on "OK".



2 Application scenarios

2.1 Configuring the communications interface and establishing a connection between the ES and AS

11. In the "Enter connection to target station" box in the "Select Node Address" dialog window, select the relevant IP address and click on the "OK" button.

Over which station address is the programming device connected to the module CPU 410-5H?

Rack: 0
Slot: 3

Target Station: Local
 Can be reached by means of gateway

Enter connection to target station:					
IP address	MAC address	Module type	Station name	Module name	P
172.10.1.32	00-1B-1B-85-25-11	S7-400			
192.168.1.1					

Accessible Nodes

View

OK Cancel Help

12. The configuration has now been loaded into the AS.

2.2 Loading interface changes from AS blocks in RUN mode (TCiR)

Introduction

The CPU 410-5H V8.1 supports type updating with interface changes in RUN mode (Type Change in RUN (TCiR)). It is thus possible to update the instances after an interface change to block types and load them into the target system in RUN mode. With the TCiR function you can, for example, also update a library without having to put the CPU in the STOP state (see Chapter 2.3).

CAUTION	<p>Please note that new data blocks (new number) are assigned to the instances of the modified block types loaded in the CPU via TCiR. The blocks are inoperable in WinCC until the OS server has been recompiled and reloaded.</p> <p>If a redundant OS server is present, you can compile it before loading the AS TCiR and load one of the servers. Thus, the system remains operational before and after loading the AS TCiR.</p> <p>However, please note that you may experience a loss of data in the archiving area.</p>
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CAUTION	<p>The following changes to the block can only be loaded in the STOP mode:</p> <ul style="list-style-type: none"> • Changed default value of a connection • Changed name of an input with configured message ("Message Event ID")
----------------	--

This chapter will describe as an example, how to add a new connection to the block and then load this change into the CPU 410-5H in RUN mode.

Requirements

The following requirements apply:

- A PCS 7 multiproject is open in the SIMATIC Manager.
- The automation program has been compiled and loaded into the CPU 410-5H PA.
- The automation program has been loaded with a CFC version V8.1 (or higher)
- The firmware of the CPU 410-5H PA is V8.1 (or higher)
- The CPU has sufficient memory for modified blocks
- The CPU has sufficient PO reserves

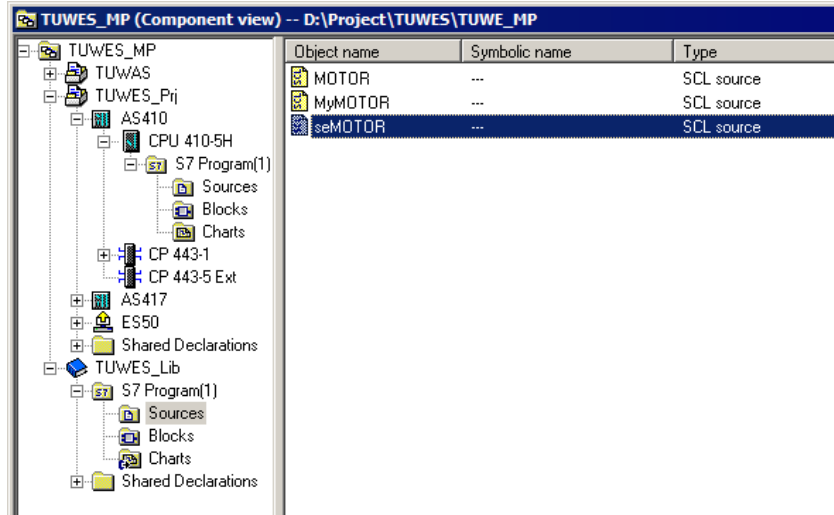
2 Application scenarios

2.2 Loading interface changes from AS blocks in RUN mode (TCiR)

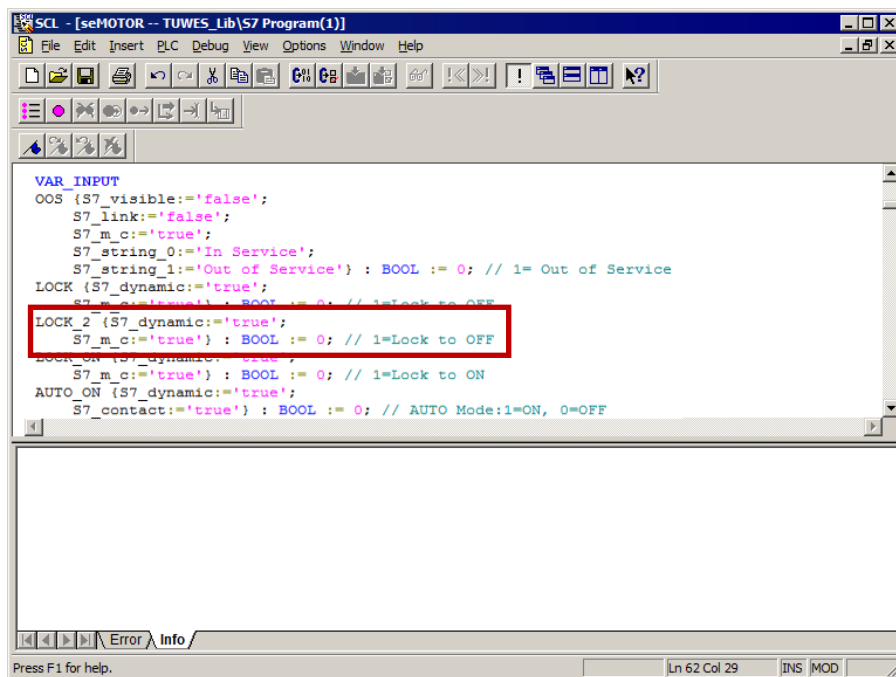
Making interface changes

Open the master data library for the project in the component view.

1. Open the "Sources" folder.
2. Open the SCL source file for the desired block type.



3. Perform the required changes.
In this example, the connection "LOCK_2" is added for an additional interlock on the block.



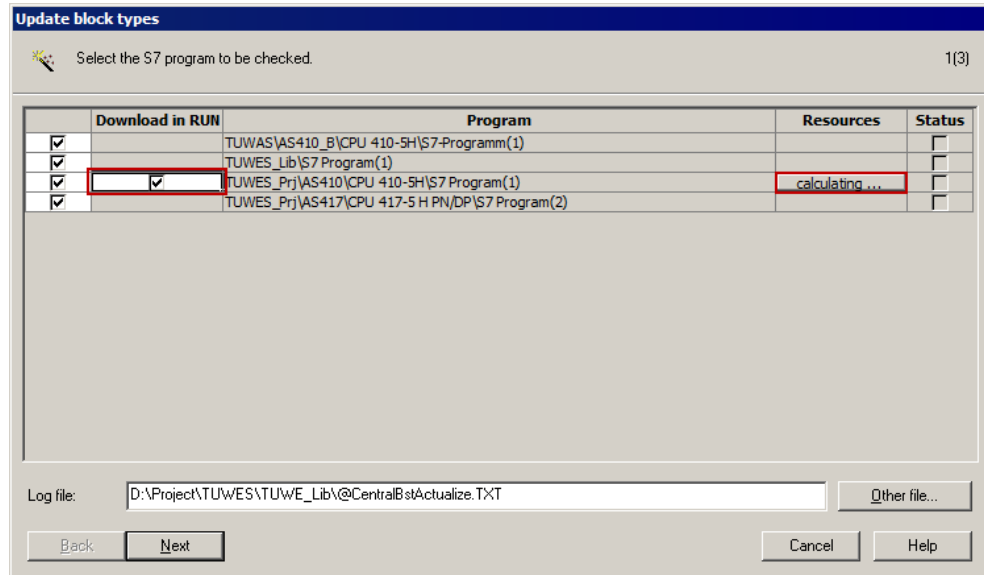
4. Save the changes and compile the SCL program.
5. Close the SCL source file.

2 Application scenarios

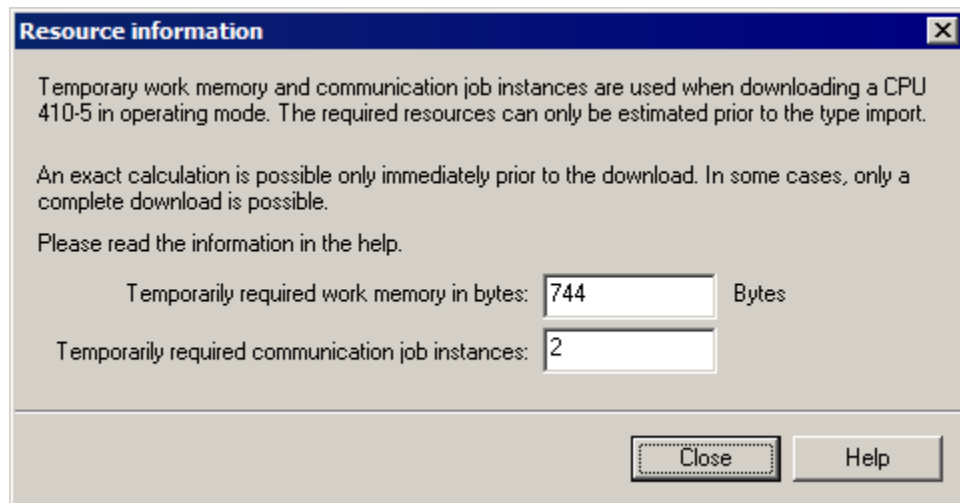
2.2 Loading interface changes from AS blocks in RUN mode (TCiR)

Loading interface changes in RUN mode

1. Select the "Blocks" folder in the master data library.
2. Execute the command "Options > Charts > Update block types".
The "Update block types" dialog will open.
3. Check the check box in the "Download in RUN" column and click on the "Calculate" button in the "Resources" column.



The "Resource information" dialog opens. This contains information about the resource requirements for type changing in the automation system in which the type change is made.



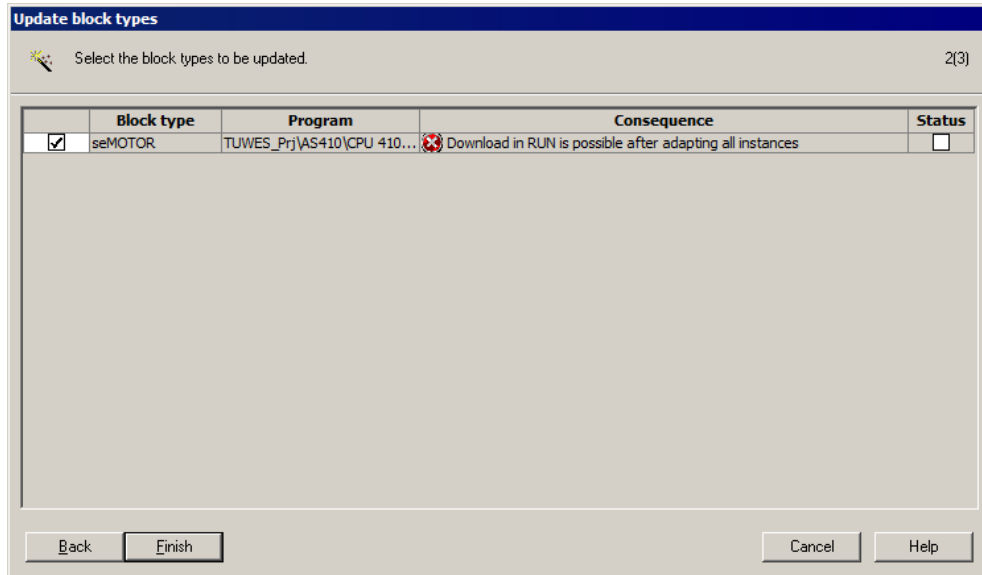
Note

Should there be insufficient resources, you have to use STOP to be able to download.

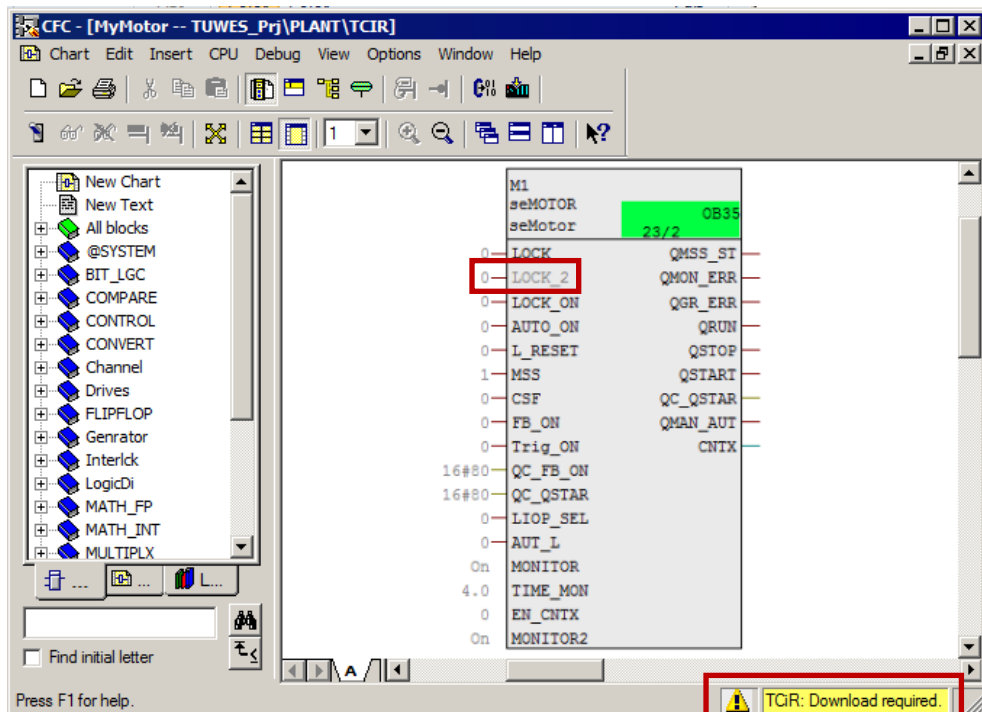
2 Application scenarios

2.2 Loading interface changes from AS blocks in RUN mode (TCiR)

4. Close the "Resource information" dialog.
5. Click the "Continue" button in the "Update block types" dialog.
In this step, you are shown whether the type change can be carried out in the RUN mode, based on the calculation in the "Consequence" field.



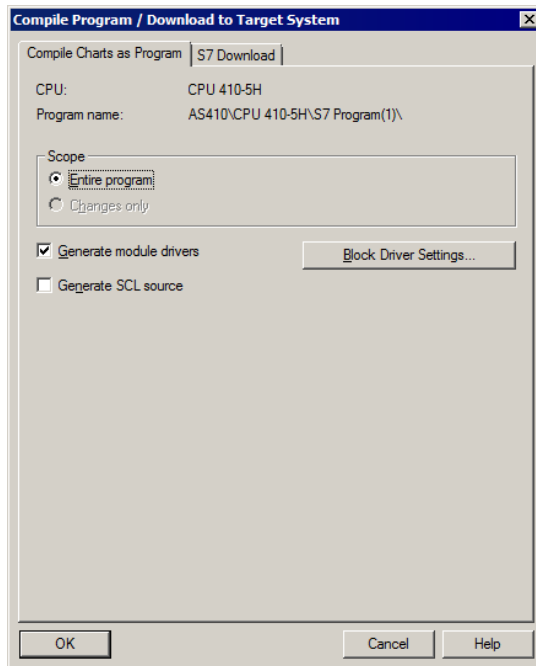
6. Click the "Finish" button. Wait until the updating procedure has successfully completed. A log file is displayed at the end of the procedure.
7. Select the "Charts" folder for the AS program and open a CFC chart.
The message "TCiR: Download required!" is displayed in the status bar.



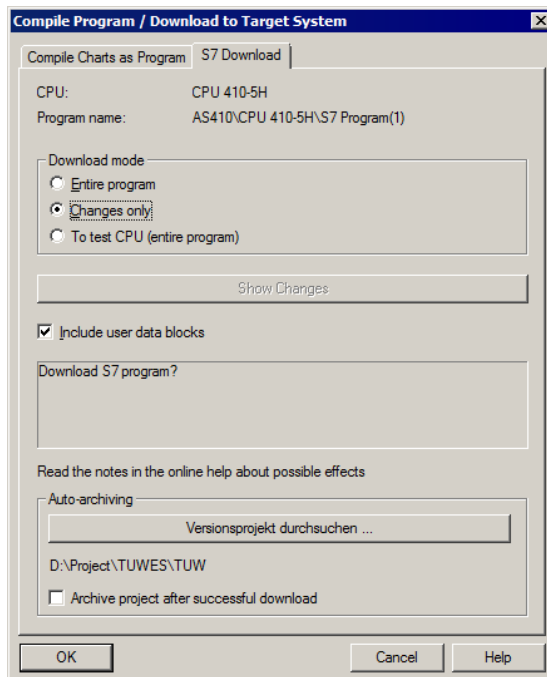
2 Application scenarios

2.2 Loading interface changes from AS blocks in RUN mode (TCiR)

8. Click the "Download" button in the toolbar.
The "Compile program / Download to target system" dialog will open.
9. Activate the "Entire program" option in the "Compile Charts as Program" tab.



10. Open the "S7 Download" tab and activate the "Changes only" option.



11. Click the "OK" button.
The interface changes are downloaded into the CPU 410-5H in RUN mode.

2.3 Updating the library with TCiR

Requirements

To update an entire library, the same conditions and rules apply as for updating a single block.

Note Generally speaking, the purpose of updating with TCiR is not to stop the AS, but it is not intended to migrate the project (the system) in runtime.

CAUTION Please note that new data blocks (new number) are assigned to the instances of the modified block types loaded in the CPU via TCiR. The blocks are inoperable in WinCC until the OS server has been recompiled and reloaded.

If a redundant OS server is present, you can compile it before loading the AS TCiR and load one of the servers. Thus, the system remains operational before and after loading the AS TCiR.

However, please note that you may experience a loss of data in the archiving area.

The procedure for updating a library is described in the manuals: "Software updates with utilization of new functions"
(<https://support.industry.siemens.com/cs/ww/en/view/39980937>).

License check

Please note that during updating more AS RT POs may be temporarily needed. This is the case when the AS RT PO license count is done after the memory in the CPU is allocated.

To ensure a sufficient number of POs, please follow the following procedure.

1. Right click the multiproject.
2. Select the menu command "PCS 7 license information".
3. Take note of the number of configured and issued POs and the maximum number of Poss.
4. Check whether the AS RT POs are counted after the memory allocation.

Note You can find detailed information about the PO count in the FAQ "[How are the licenses for the AS and OS counted in PCS 7 V7.0 onwards?](#)" in the Siemens Industry Online Support Portal.

If the AS RT PO are not counted after the allocated memory or sufficient PO reserves exist, continue to the section "Resource check" in this chapter.

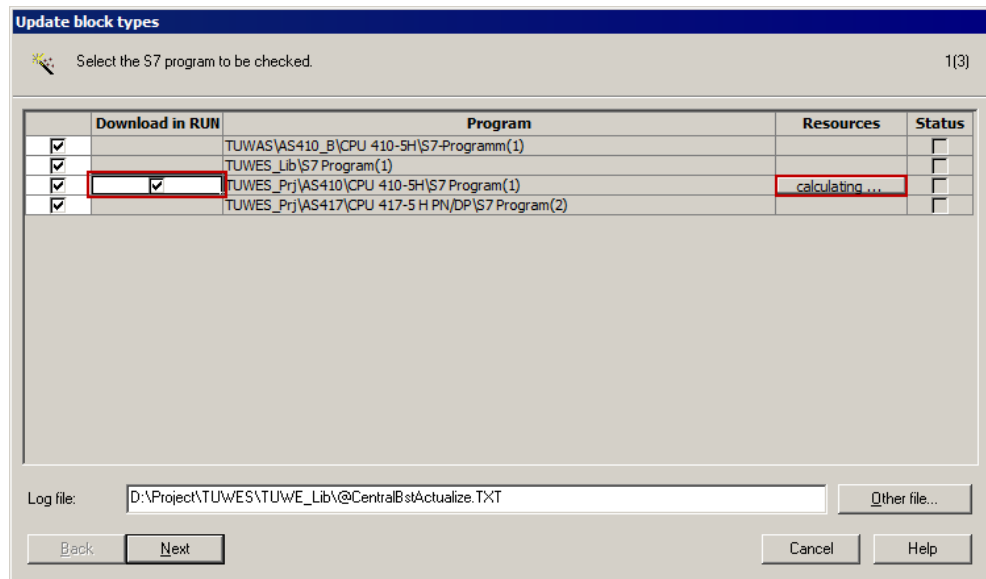
If the AS RT POs are counted after the allocated memory, download the program via STOP.

CAUTION	Should there be insufficient AS RT POs on the CPU during the TCiR download, the download will not be executed. The user program can only be updated after a complete download in STOP mode.
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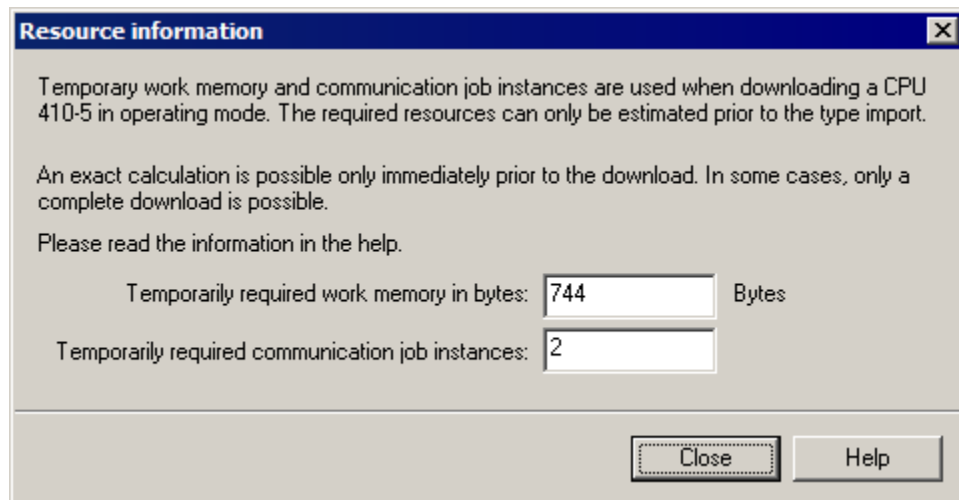
Resource check

After you update the blocks in the master data library, proceed as described below.

1. Select the "Blocks" folder in the master data library.
Execute the command "Options > Charts > Update block types".
The "Update block types" dialog will open.
2. Check the check box in the "Download in RUN" column and click on the "Calculate" button in the "Resources" column.



The "Resource information" dialog opens. This contains information about resource requirements for type changing in the automation system in which the type change is made.



2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

3. Then check if sufficient resources are present.
If yes, then proceed as described in Chapter 2.2, starting from step 4.

Note

Should there be insufficient resources, you have to use STOP to be able to download.

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

In this chapter you will find information about configuration options for the PN/Ethernet interfaces of the CPU 410-5H.

2.4.1 Configuring the interfaces for connection to the plant bus and the process bus without using an external CP

Due to its two PN/Ethernet interfaces, the CPU 410-5H can provide the option of implementing a connection to the plant bus and the process bus without using an external CP. This yields the following benefits:

- Reduction of hardware costs
- More space due to the use of compact mounting racks

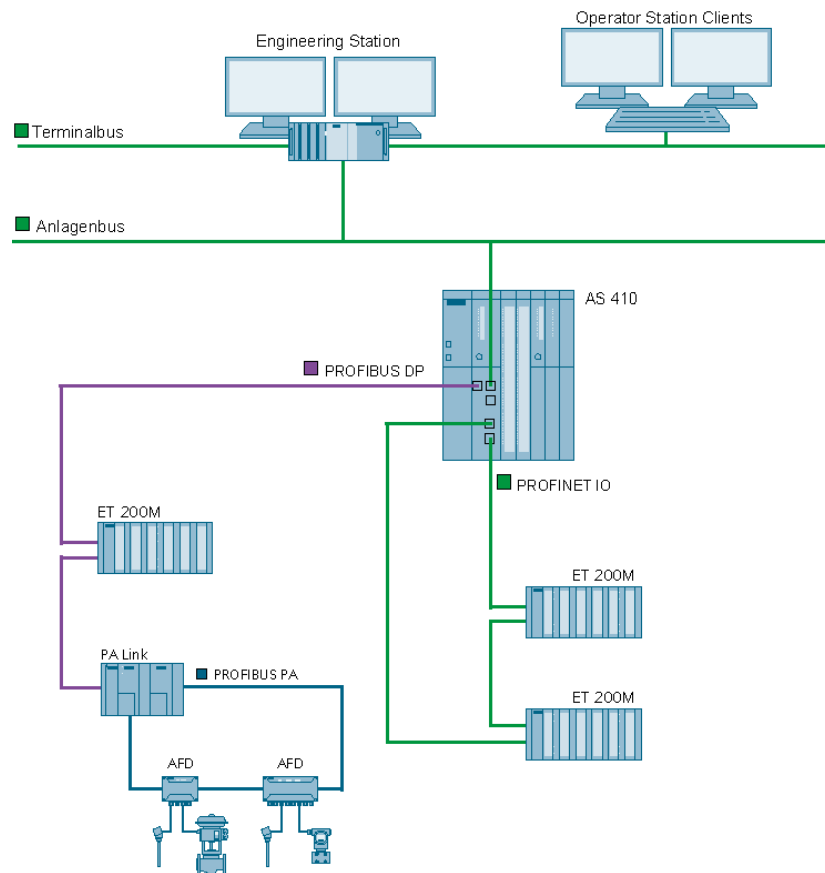
The configuration procedure is carried out in the following steps:

- Expand the project by one new AS Station
- Configure the interface for the plant bus
- Configure the interface for the process bus

2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

The following figure shows the configuration schematically:



Requirements

The following requirements must be met:

- There is a PCS 7 multiproject present.
- A CPU 410-5H is connected.

Expand the project by one new AS Station

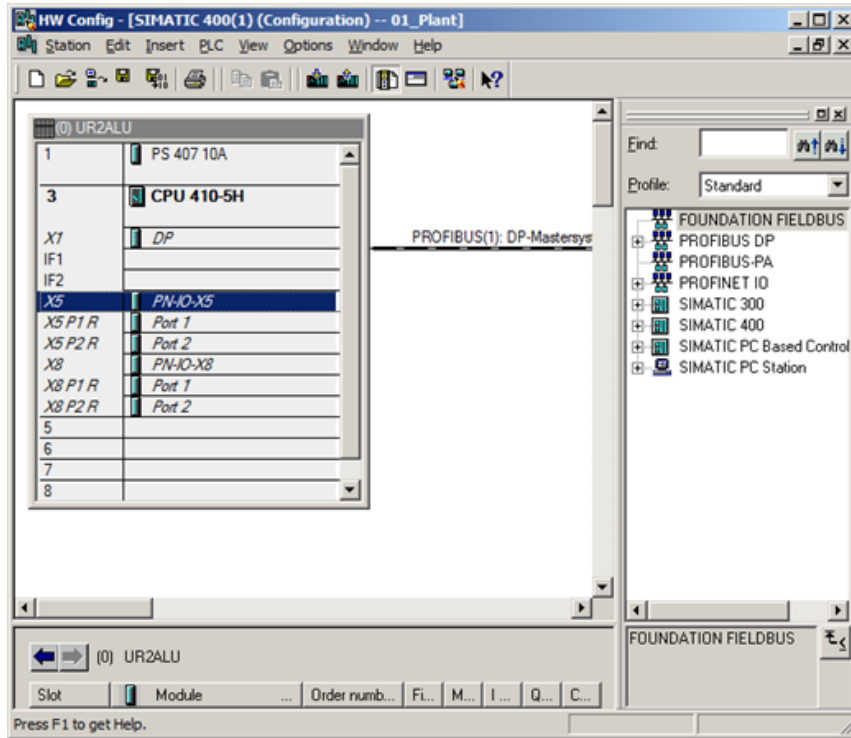
1. Open a PCS 7 multiproject in the SIMATIC Manager.
2. Insert a new sub-project using the "File > New project" command.
3. Right click the sub-project and select the command "Insert new object > Preconfigured station" in the shortcut menu.
The "PCS 7 Wizard: Expand project" dialog will open.
4. Select the CPU 410-5H without CP and insert the Station. In this example, the procedure is explained using the example of a Single Station (AS410-Single (1H)).
5. Open the AS Station with the CPU 410-5H in HW Config.

2 Application scenarios

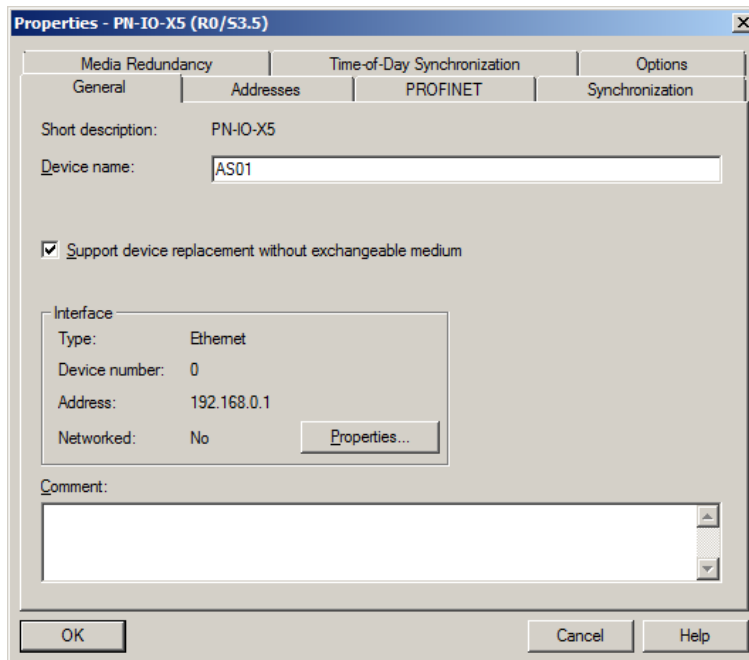
2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

Configure the interface for the plant bus

1. Open the properties for the "PN-IO-X5" interface of the CPU 410-5H in the HW Config.



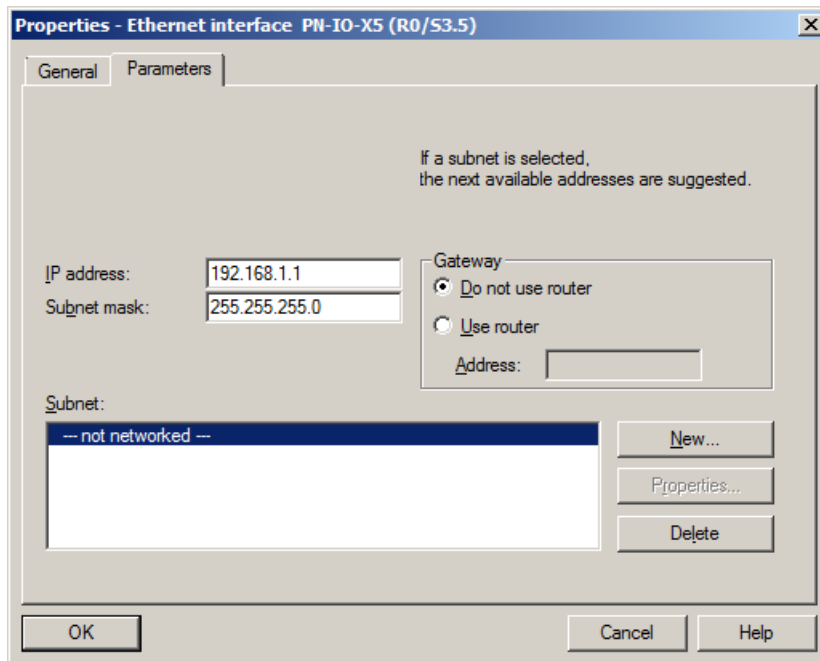
2. Enter a device name in the "General" tab.



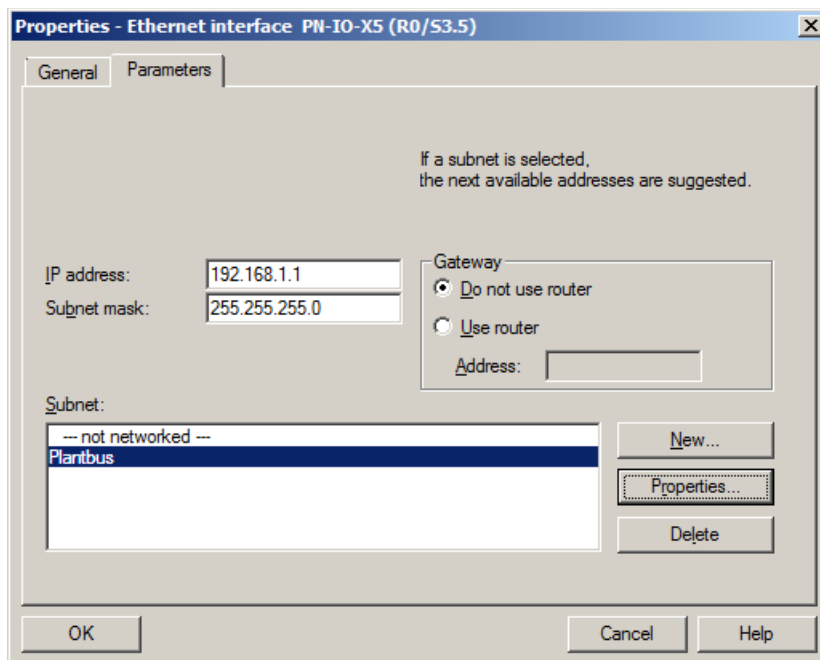
2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

3. Click on the "Properties..." button
4. Enter a valid IP address and subnet mask for the plant bus.



5. Assign an existing subnet to the interface or create a new subnet for it. In this example, a new subnet is created for the plant bus and assigned to the interface.



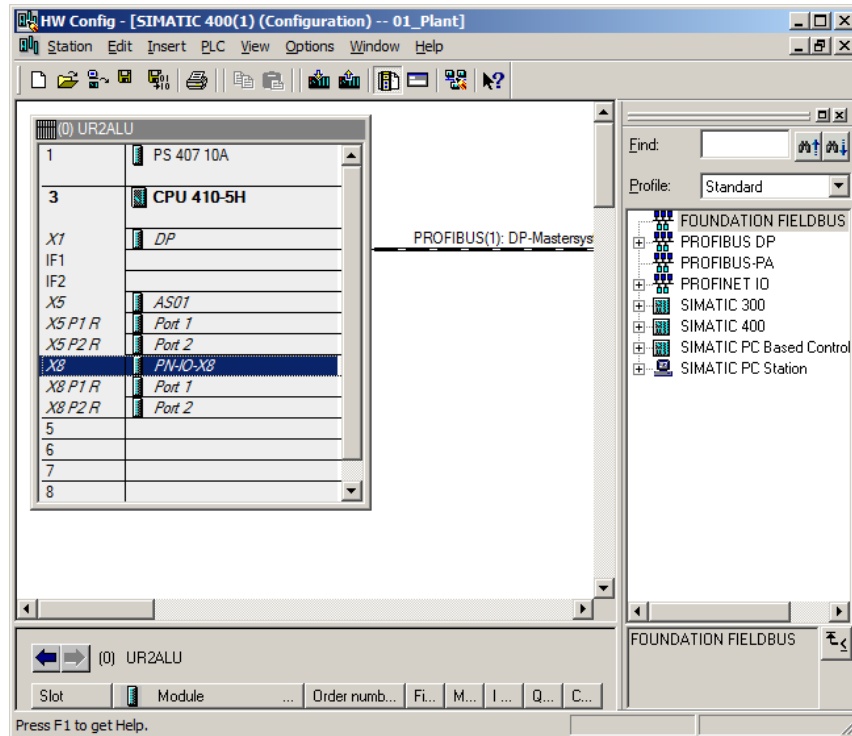
6. Click the "OK" button to confirm the settings. The interface is connected to the plant bus.

2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

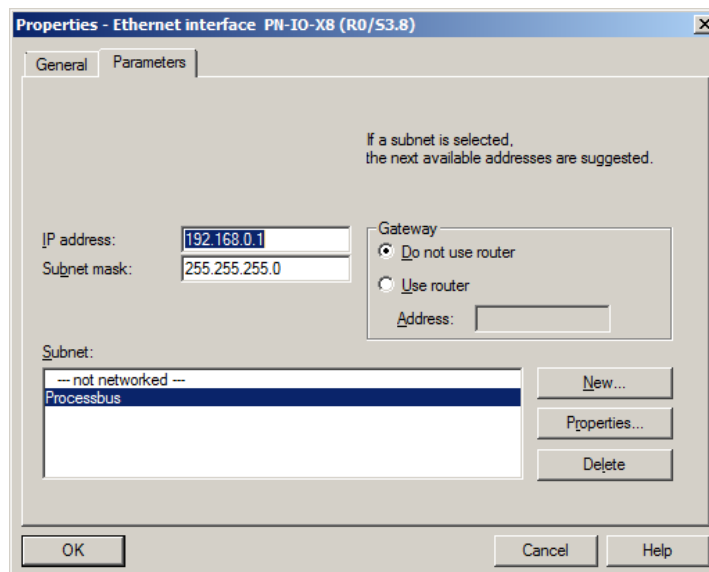
Configure the interface for the process bus

1. Open the properties for the "PN-IO-X8" interface of the CPU 410-5H in the HW Config.
2. Select the "PN-IO-X8" interface with the right mouse button and select the "Insert PROFINET IO system" command from the shortcut menu.



The "Properties..." dialog opens.

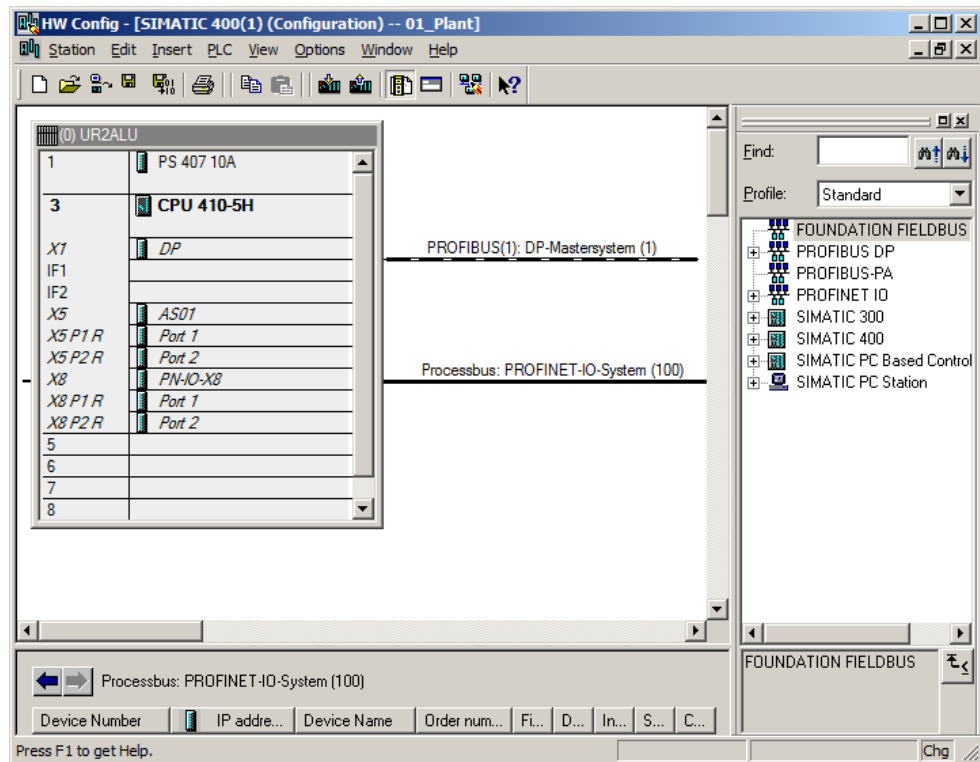
3. Enter a valid IP address and subnet mask for the process bus.
4. Assign an existing subnet to the interface or create a new subnet for it. In this example, a new subnet is created for the process bus and assigned to the interface.



2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

5. Click the "OK" button to confirm the settings.
A PROFINET IO system for connecting the PROFINET IO modules is created.



Further information on planning the PROFINET interface can be found in the application example "[SIMATIC PCS 7 with PROFINET – Typical Configurations](#)" (Chapter 4, "Configuration, Planning and Parameter Assignment").

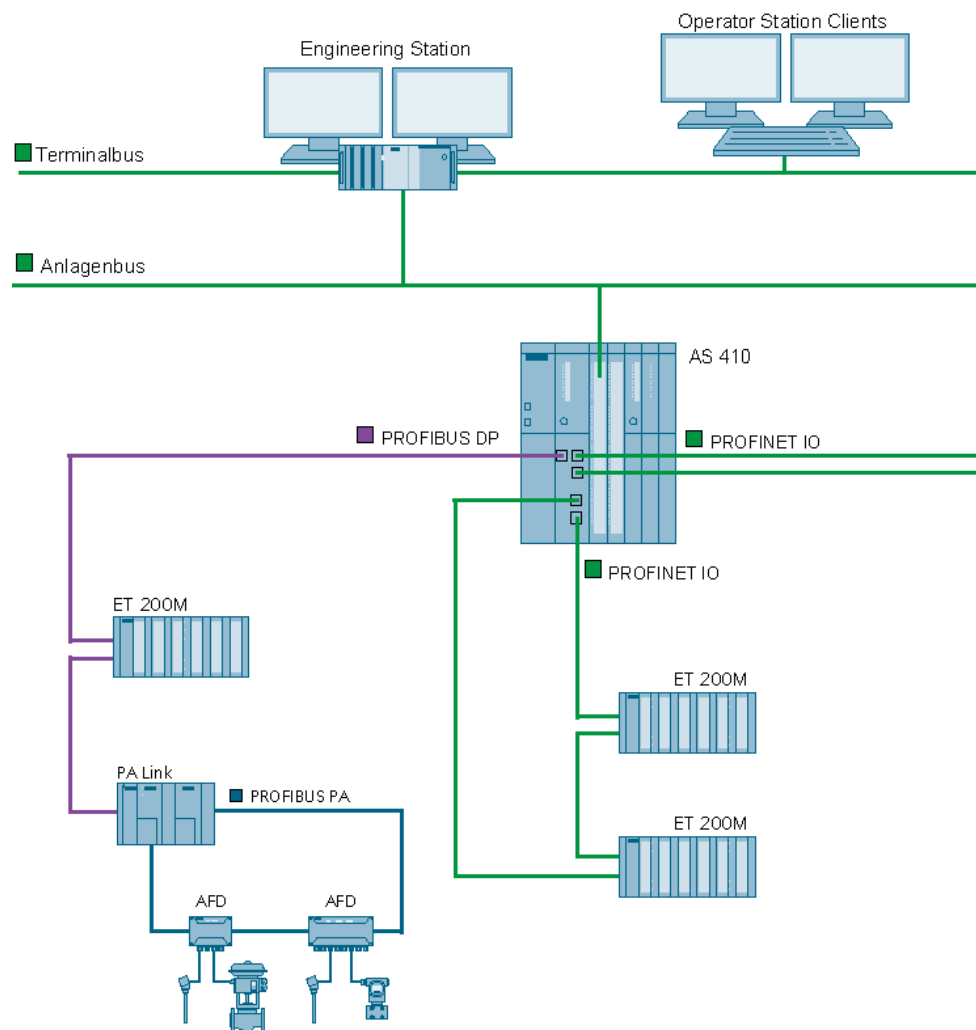
2.4.2 Configuring two separate PROFINET interfaces for connection to the process bus

When there is a large number of devices, the CPU 410-5 offers the option of configuring two PROFINET interfaces for connection to the process bus. In this case, the connection to the plant bus is made via an external CP.

The configuration procedure is carried out in the following steps:

- Expand the project by one new AS Station
- Configure the CP interface for the plant bus
- Configure two PROFINET interfaces for the process bus

The following figure shows the configuration schematically:



Requirements

The following requirements must be met:

- There is a PCS 7 multiproject present.
- A CPU 410-5H is connected.

2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

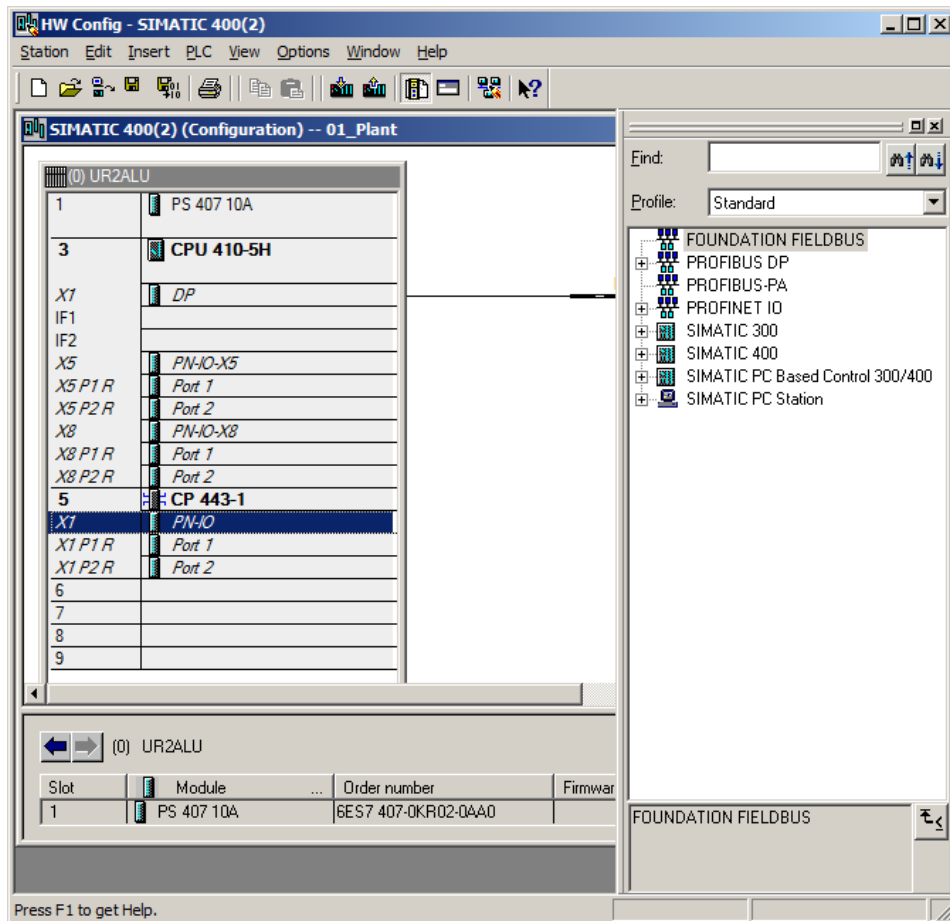
Expand the project by one new AS Station

Proceed as follows to configure two PROFINET interfaces for the process bus:

1. Open a PCS 7 multiproject in the SIMATIC Manager.
2. Insert a new sub-project using the "File > New project" command.
3. Right click the sub-project and select the command "Insert new object > Preconfigured station" in the shortcut menu.
The "PCS 7 Wizard: Expand project" dialog will open.
4. Select the CPU 410-5H with a CP and insert the Station. In this example, the procedure is explained using the example of a Single Station (AS410-Single (1H)) with a CP 443-1.

Configure the CP interface for the plant bus

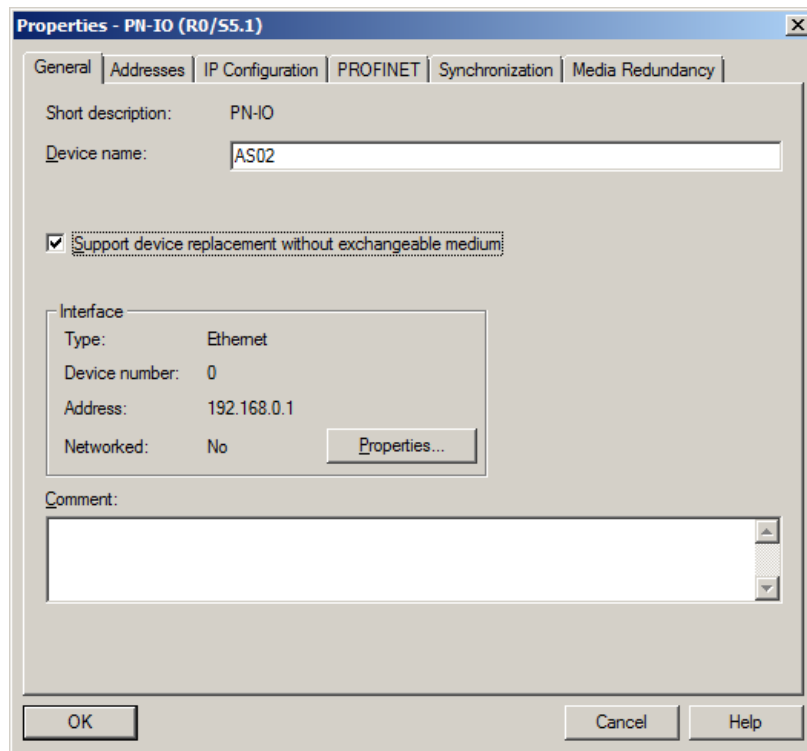
5. Open the AS Station with the CPU 410-5H in the HW Config.
6. Open the properties for the "PN-IO" interface of the CP 443-1.



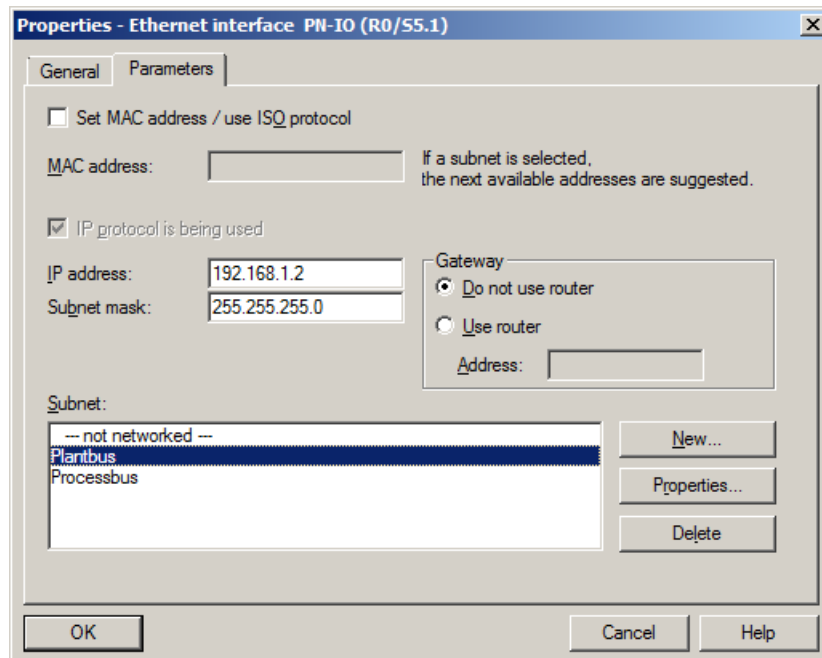
2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

7. Open the "General" tab and enter a meaningful device name.



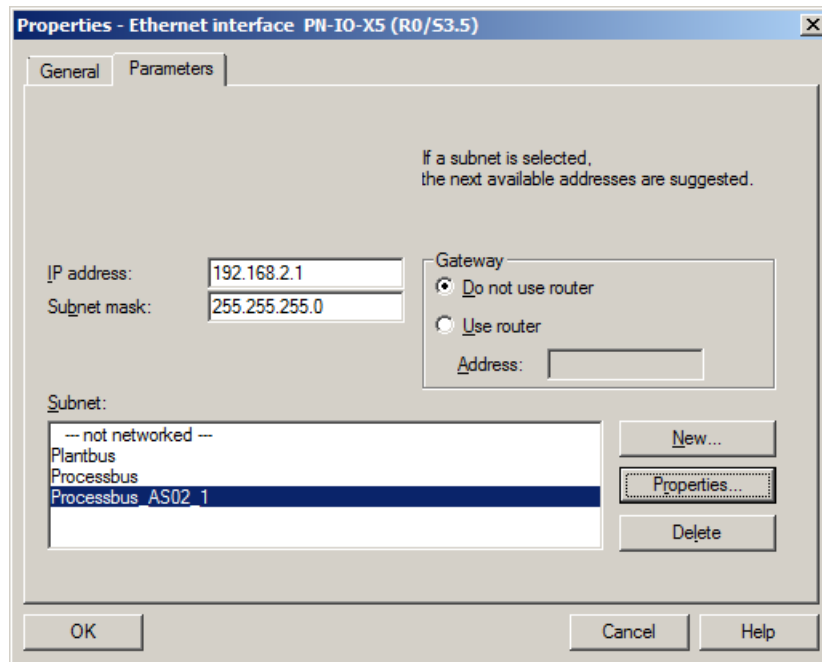
8. Click on the "Properties..." button
9. Enter a valid IP address and subnet mask for the plant bus.
10. Assign an existing subnet to the interface or create a new subnet for it.



11. Click the "OK" button to confirm the settings.
The interface of the CP443-1 is connected to the plant bus.

Configure the PROFINET interfaces for the process bus

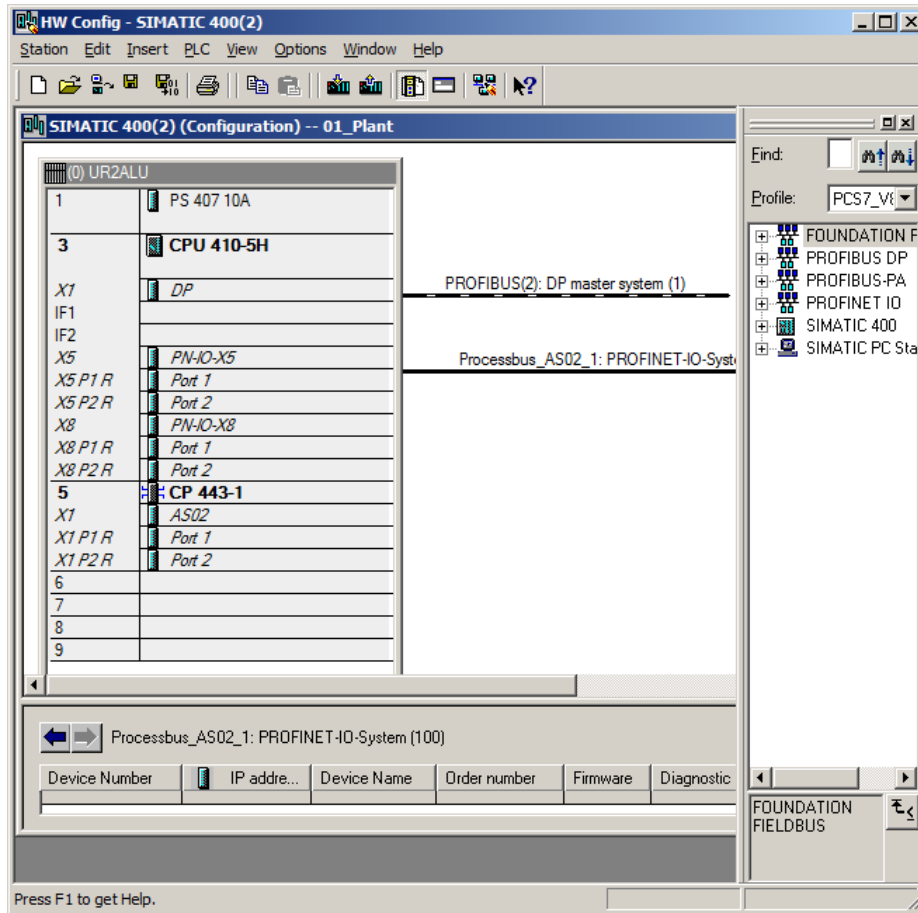
12. Open the HW Config.
13. Open the properties for the "PN-IO-X5" interface of the CPU 410-5H in the HW Config.
14. Select the "PN-IO-X5" interface with the right mouse button and choose the "Insert PROFINET IO system" command from the shortcut menu. The "Properties" dialog of the interface opens.
15. Enter a valid IP address and subnet mask.
16. Assign an existing subnet to the interface or create a new subnet for it. In this example, a new subnet ("Processbus_AS02_1") is created for the process bus and assigned to the interface.



2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

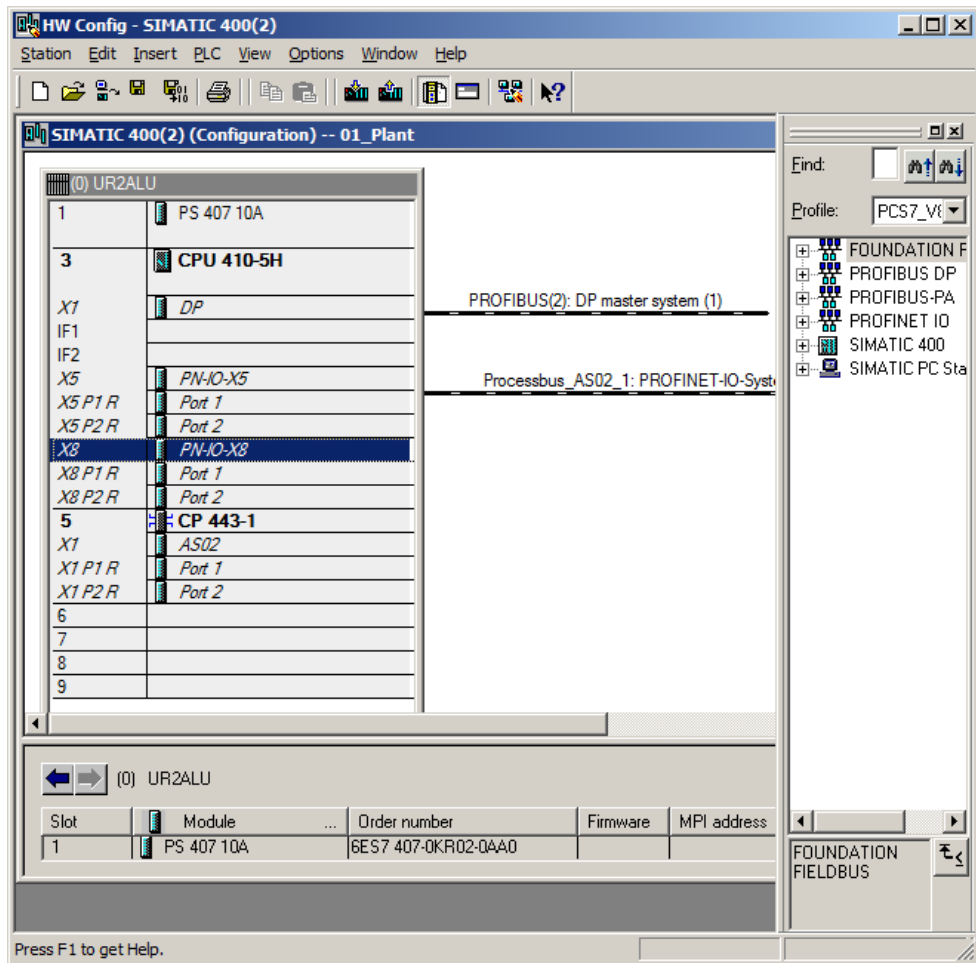
17. Click the "OK" button to confirm the settings.
The PROFINET IO system "Processbus_AS02_1" is assigned to the interface.



2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

18. Select the "PN-IO-X8" interface with the right mouse button and select the "Insert PROFINET IO system" command from the shortcut menu. The "Properties" dialog of the interface opens.

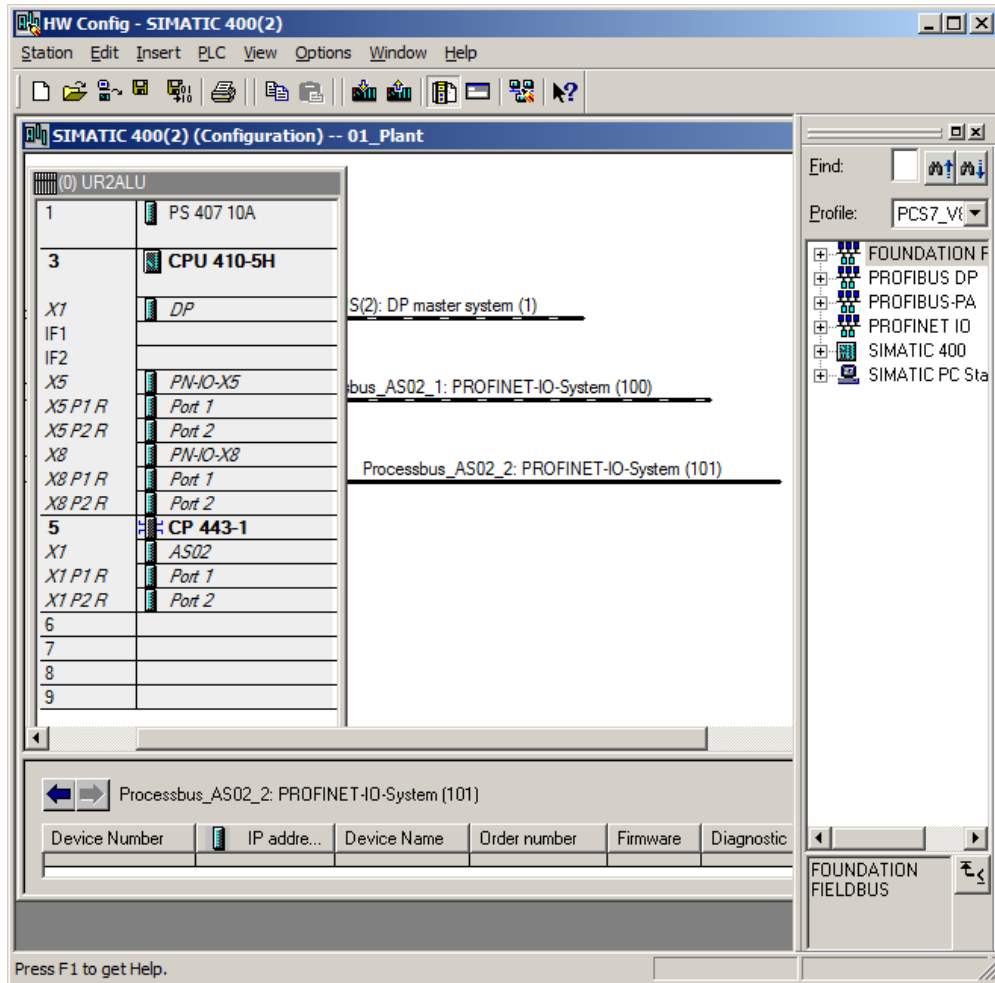


19. Enter a valid IP address and subnet mask.
20. Assign an existing subnet to the interface or create a new subnet for it. In this example, a new subnet ("Processbus_AS02_2") is created for the process bus and assigned to the interface.

2 Application scenarios

2.4 Configuring the PN/Ethernet interfaces of the CPU 410-5H

21. Click the "OK" button to confirm the settings.
The PROFINET IO system "Processbus_AS02_2" is assigned to the interface.



Further information on planning the PROFINET interface can be found in the application example "[SIMATIC PCS 7 with PROFINET – Typical Configurations](#)" (Chapter 4, "Configuration, Planning and Parameter Assignment").

2.5 Online upgrade of CPU 410–5H process objects

2.5.1 Introduction

When you load a PCS 7 project into the CPU, the system checks that the project can run with the current number of process objects (PO) in the CPU.

If the number is not sufficient, starting with PCS 7 V8.1 you have the option of increasing the PO volume by means of an online upgrade of the CPU 410-5H system expansion card (SEC).

Prerequisites for an online upgrade

- SIMATIC PCS 7 V8.1 or higher
- CPU 410-5H firmware V8.1 or higher
- The CPU 410-5H is configured with firmware V8.1 or higher in the HW Config
- The SEC of the CPU 410-5H has the product version 2 or higher

CPU 410 expansion packs

You will need at least one CPU 410 expansion pack for the online upgrade of the process objects of a CPU 410-5H.

The CPU expansion packs are available in the following sizes:

- 100 PO
- 500 PO

The expansion packs can be combined in any way up to the maximum size. However note that with a redundant system (2 CPUs), the CPU 410 expansion packs must be distributed symmetrically between the CPUs.

The volume of a CPU expansion pack must always be assigned in its entirety to a CPU or SEC of the CPU. Distribution between several CPUs or SECs is not possible.

After a PO upgrade, the POs that are assigned to an SEC/CPU can no longer be relocated.

Example

If the number of POs in the CPU is not sufficient to load the engineering project, you can increase the PO volume of the CPU by means of an online upgrade.

2 Application scenarios

2.5 Online upgrade of CPU 410-5H process objects

Table 2-1

Expansion by 300 PO (from 400 PO to 700 PO)	
	<p>With a single AS, to increase the number of POs by 300 you require <u>3 CPU 410 expansion packs</u>, each with 100 Poss.</p>
	<p>With a redundant AS (2 CPUs), to increase the number of POs by 300 you require <u>6 CPU 410 expansion packs</u>, each with 100 Poss. This is required since both CPUs must be expanded by 300 Poss.</p> <p>In this case you <u>cannot</u> combine expansion packs with 500 PO and 100 PO, since the PO volume of an expansion pack cannot be subdivided.</p>

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The following table contains further examples:

Table 2-2

PO expansion with	CPU 410 expansion packs required	
	Single AS	Redundant AS
400 PO	4 x 100 PO	8 x 100 PO
500 PO	1 x 500 PO or 5 x 100 PO	2 x 500 PO or 10 x 100 PO
600 PO	1 x 500 PO + 1 x 100 PO or 6 x 100 PO	2 x 500 PO + 2 x 100 PO or 12 x 100 PO
1000 PO	2 x 500 PO or 10 x 100 PO	4 x 500 PO or 20 x 100 PO

Unlimited POs


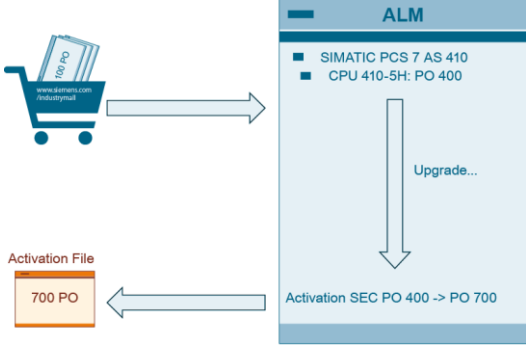
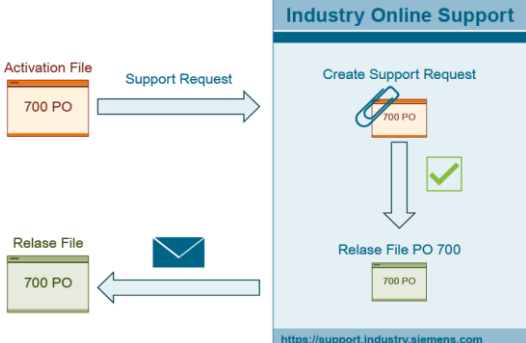
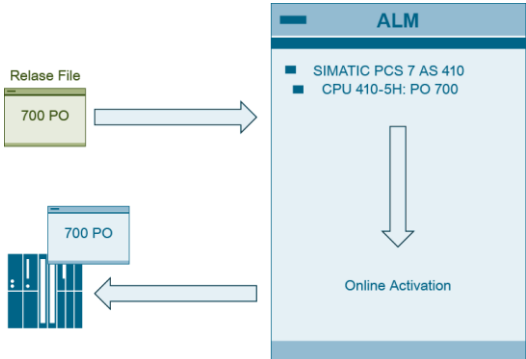
The number of POs can be upgraded to unlimited. In this case you can load as many POs until the physical memory is reached. To upgrade the POs to an unlimited amount there are two ways:

- Purchase of a CPU410-5H bundle with 2K+ PO as license. (Article number: 6ES7654-5CQ00-0XF0)
- Upgrade the existing number of POs with CPU expansion packs 100 and 500 until there are 2600 POs on the SEC. With 2600 POs on a SEC you can load unlimited POs to a CPU410-5H.

2.5.2 Overview of the steps

The online upgrade is carried out in the following main steps:

Table 2-3

Schematic representation	Step
	<p>1. Order the CPU 410 expansion packs.</p>
	<p>2. In the SIMATIC Automation License Manager (ALM), transfer the CPU 410 expansion packs to the CPU and create a PO activation file.</p>
	<p>3. Send the PO activation file for checking and activation by means of a support request.</p> <p>Within 48 hours you will receive an email containing a PO release file (for each PO activation file sent) as confirmation of the checking.</p>
	<p>4. Transfer the PO release file to the SEC of the CPU using the ALM.</p>

CAUTION	When performing an online upgrade of the process objects, pay attention to the information and notes in the manual "SIMATIC PCS 7 Service Support and Diagnostics (V8.1)".
----------------	---

2.5.3 Ordering the CPU 410 expansion packs

The CPU 410 expansion packs can be ordered in various ways:

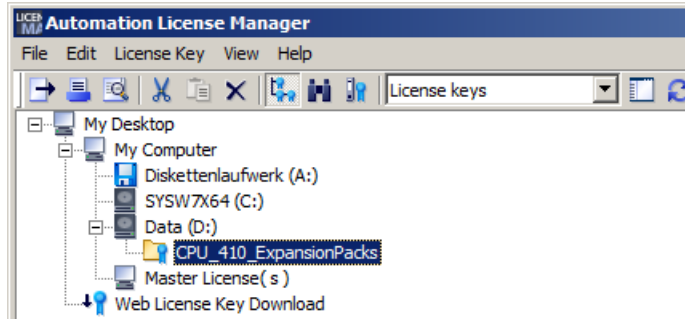
- Through your Siemens contact person (www.siemens.com/automation/partner)
- Online via www.siemens.com/industrymall

The screenshot shows the Siemens Industry Mall website interface. At the top, there is a navigation bar with the Siemens logo, 'INDUSTRY MALL' text, and links for 'Register now!', 'Login', 'Home', 'German', 'Contact', 'Help', and 'Site Explorer'. Below the navigation bar, a search bar contains the text 'cpu 410 expansion pack'. The search results are displayed in a table with columns for 'Product No. / Product Description' and 'Listprice / Your price'. There are four product entries listed, each with a checkbox and a 'Show prices' link. The product descriptions include details about SIMATIC PCS 7 software, CPU 410 expansion packs, and various options like 'UPGRADE OPTION F.1', 'INSTALLATION R-SW', and 'LICENSE KEY ON USB STICK'. A 'Filter your search results' section on the right includes a checkbox for 'Safety-related automation sy...' and buttons for 'Reset all filters' and 'Apply Filter'. A note at the bottom of the table states 'This product is downloadable only.'

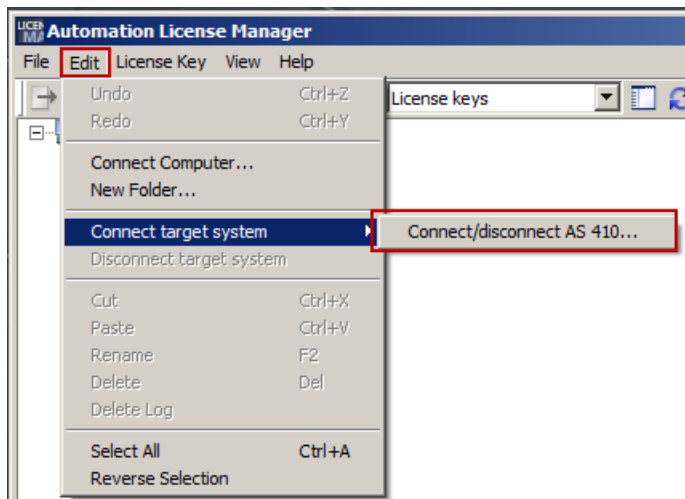
After you have received the CPU 410 expansion packs (by email or USB stick), transfer them to a disk drive that can be accessed by the Engineering Station.

2.5.4 Create the PO activation file using the Automation License Manager (ALM)

1. Store the CPU 410 expansion packs on a drive that can be accessed in the Automation License Manager (ALM).



2. Select the menu command "Edit > Connect target system > Connect/disconnect AS 410...".

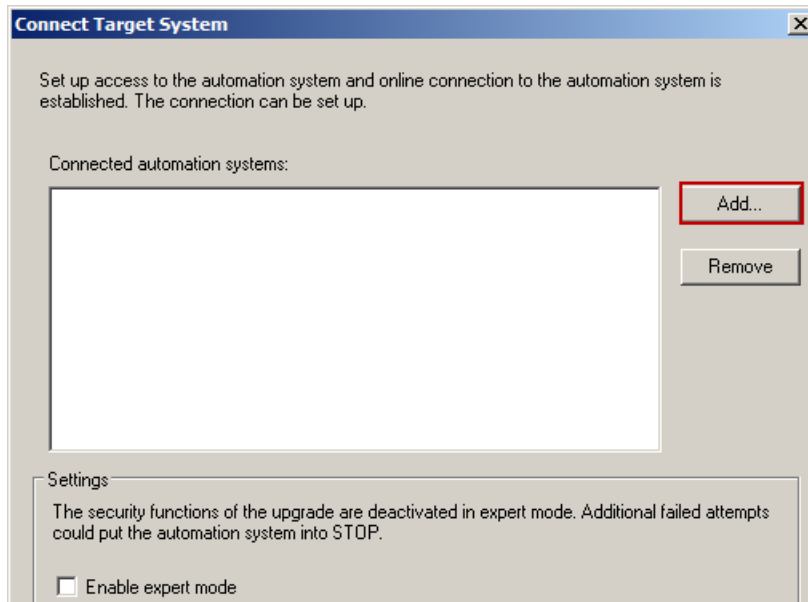


The "Connect Target System" dialog opens.

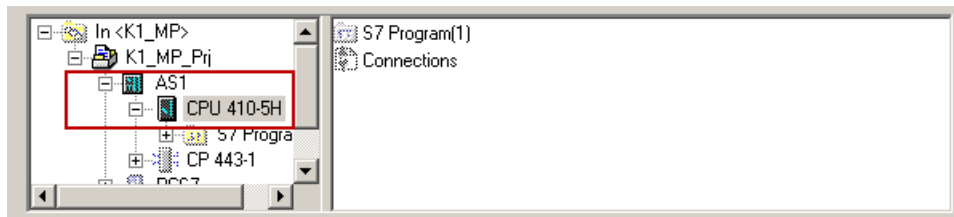
2 Application scenarios

2.5 Online upgrade of CPU 410-5H process objects

3. Click on the "Add" button to establish an online connection to a CPU 410-5H.



4. In the PCS 7 project, select the CPU to which you wish to transfer the CPU 410 expansion packs or PO. Then click on the "OK" button.

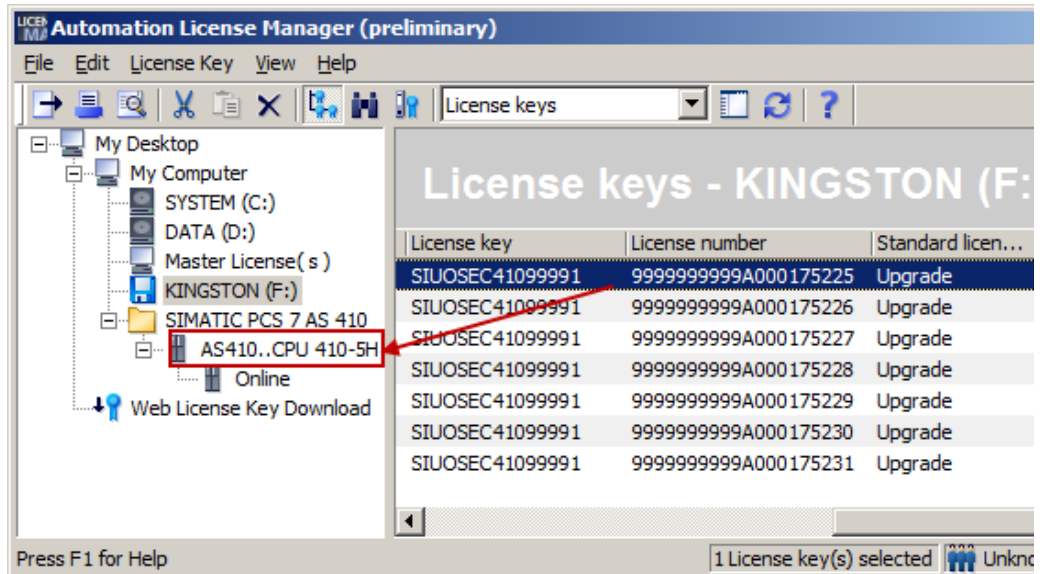


The CPU is displayed in the ALM.

2 Application scenarios

2.5 Online upgrade of CPU 410-5H process objects

5. Drag the license keys for the CPU 410 expansion packs and drop them on to the automation system for which you wish to perform the PO upgrade.



Note

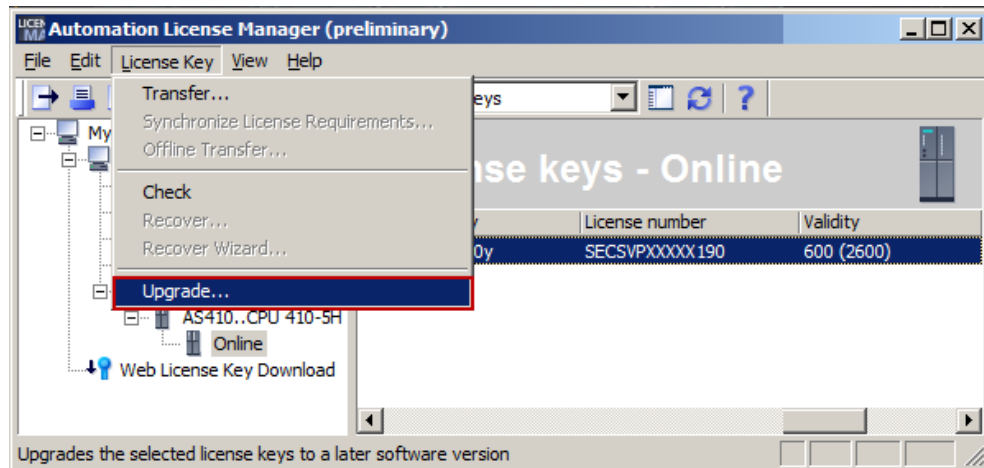
If you have selected the wrong automation system, you can move the license keys for the CPU 410 expansion packs using drag-and-drop.

2 Application scenarios

2.5 Online upgrade of CPU 410-5H process objects

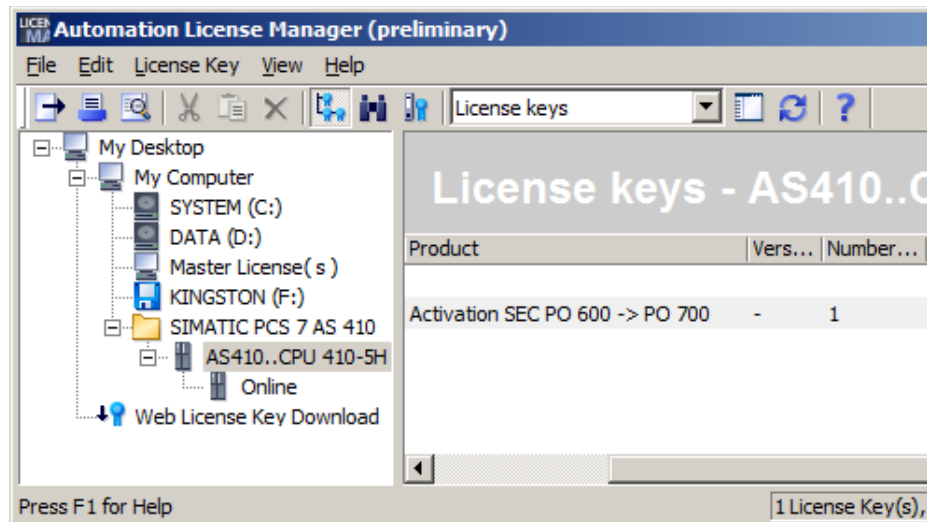
6. Open the "Online" folder in the tree view for the automation system.
7. Select the license and then select the "License Key > Upgrade" menu command.

CAUTION When you initiate the upgrade, the selected CPU 410 expansion packs are assigned to the SEC. Moving to another AS will no longer be possible.



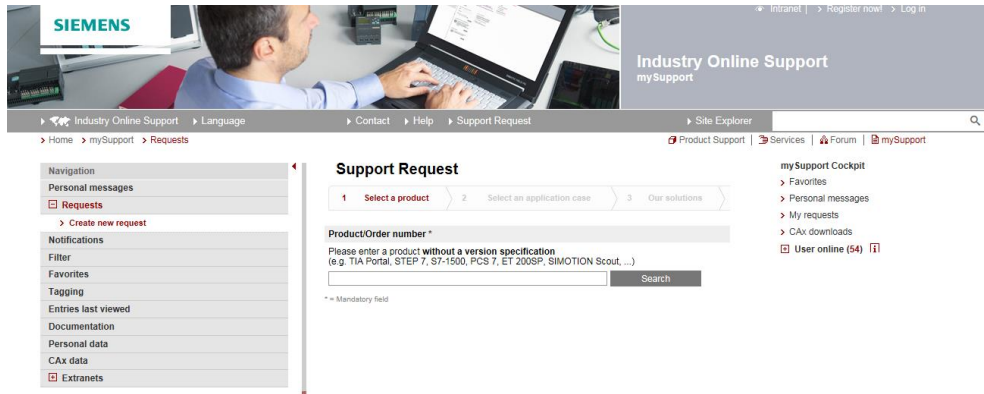
The license keys for the selected CPU 410 expansion packs will be deleted and a PO activation file will be created in the "My documents > Siemens > Automation > PCS 7 > Activations" folder.

The ALM will indicate that the PO activation file contains a volume expansion (in this example, from 600 to 700).

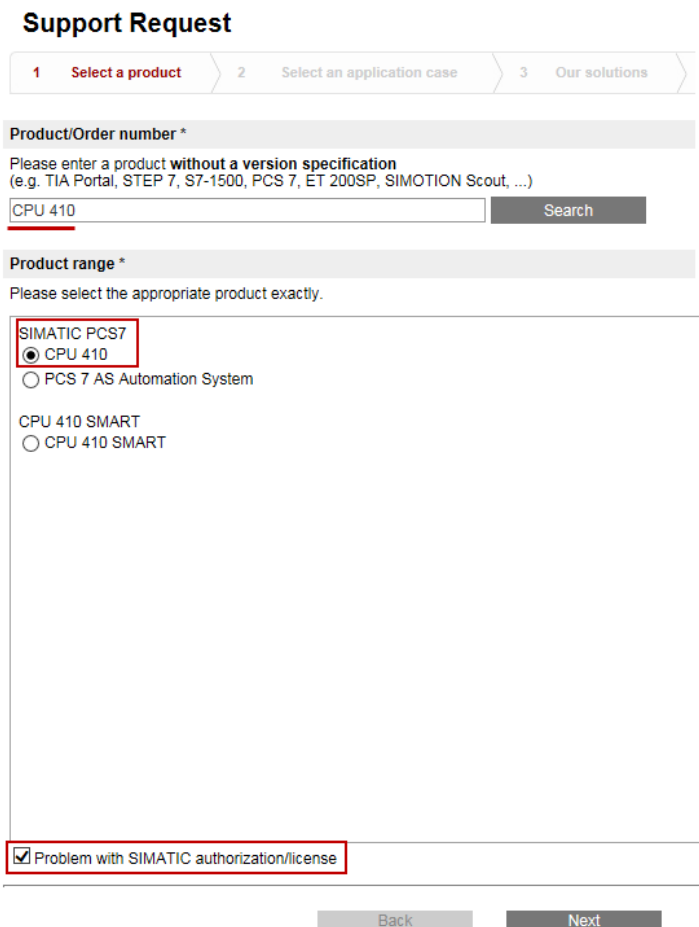


2.5.5 Sending the PO activation file via Support Request

1. Start a support request via the following web page:
<http://www.siemens.com/automation/support-request>.



2. "Select product" step:
 - Enter "CPU 410" in the "Product/Order number" text box and click on the "Search" button.
 - Check the "SIMATIC PCS 7 > CPU 410" radio button.
 - Check the "Problem with the authorization/license" check box and then click on the "Next" button.



2 Application scenarios

2.5 Online upgrade of CPU 410-5H process objects

3. "Select application" step: Enter "Upgrade CPU 410" in the text box and click the "Next" button.

Support Request

1 Select a product > 2 **Select an application case** > 3 Our solutions >

"CPU 410 (SIMATIC PCS7)"

When describing your application case, we will be able to give you **targeted** and **direct** advice Please give us a **subject** or **keyword** that best describes your problem:
(e.g. version, communication, installation, configuration, compatibility)

*

Back Next

* = Mandatory field

4. "Our solutions" step: Click on the "Next" button.

Forum

- [Simotion D 410 - 2 PN/DP](#)
- [AS 410 SE Card and AS Runtime PO](#)
- [CPU 410 Smart](#)
- [CF CARD CACTUS FOR SIMOTION D410-2](#)
- [D410-2 Synchronous Operation Over Prifinet.](#)

Downloads

- [Firmware V8.1.0 for CPU 410-5H Process Automation available for download](#)
- [Operating System Update for CPU 410-5H Process Automation](#)
- [Operating System Update for CPU 410-5H Process Automation](#)
- [Hardware Upgrade Package "HUP CPU410-5H" Available for Download](#)
- [SIMATIC PCS 7 Condition Monitoring Library V8.1 Available for Download](#)

Product notes

- [Change of the AS-Bundle Configuration for AS 410 Automation Systems](#)
- [Instructions for Updating the CPU 410 Operating System](#)
- [Sales Release for SIMATIC PCS 7 CPU 410-5H Process Automation](#)
- [SIMATIC PCS 7 CPU 410-5H Process Automation Released for Delivery](#)
- [Product Announcement for SIMATIC PCS 7 CPU 410-5H Process Automation](#)

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2 Application scenarios

2.5 Online upgrade of CPU 410-5H process objects

5. "Describe the problem" step:
 - Make the entries in the mandatory fields.
 - Enter the text "Request PO activation file" in the "Details" text box.
 - Insert the PO activation file as a Zip file using the "Choose File" button.

Note PO activation files are automatically created in the following Upgrade directory in the Engineering Station:
"My documents > Siemens > Automation > PCS7 > Activations"

Note You can send several PO activation files with one support request.

- Click on the "Next" button.

Details * Remaining characters: 1974

Request PO-Activation-File

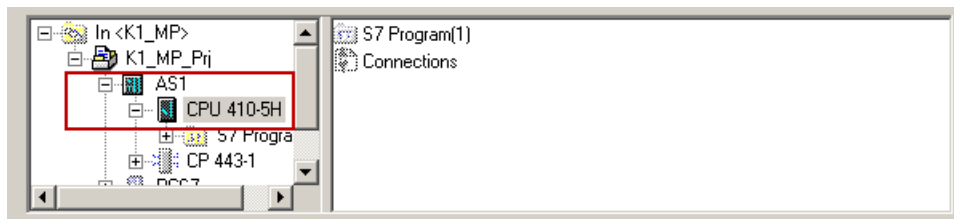
Attachment Choose File No file chosen
Please pack your attachments (e.g. screenshots, log files, projects...) into a ZIP archive (max. 10 MB). Already attached enclosures (0,00 KB):

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6. "Specify contact data" step: Specify your contact data, then click on the "Next" button.
7. "Summary and send" step: Check your details, then click on the "Send" button.
Within 48 hours you will receive an email containing a PO release file for each PO activation file sent.

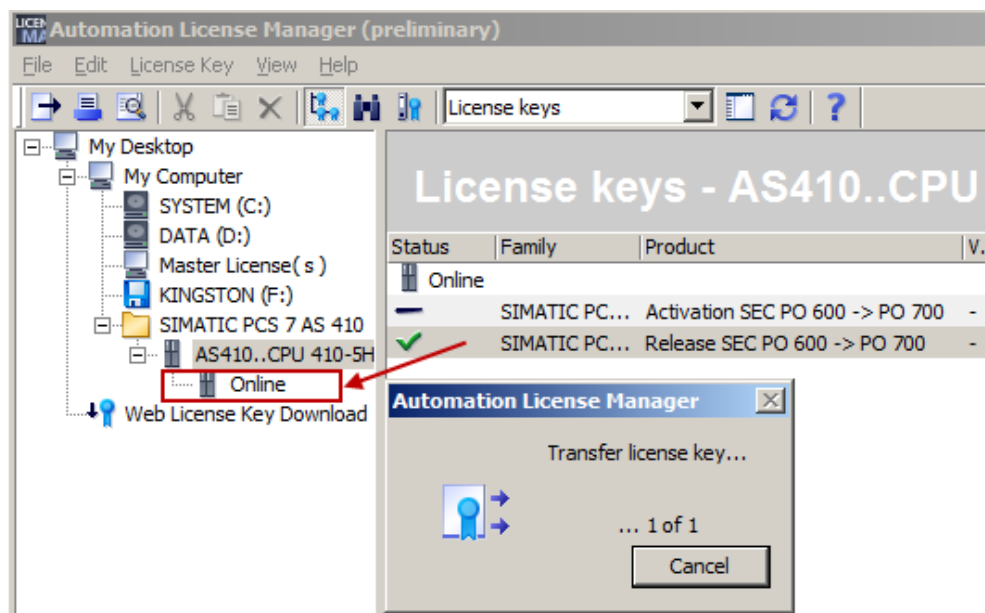
2.5.6 Transfer the PO release file to the SEC of the CPU

8. Transfer the PO release files received to the Upgrade directory in the Engineering Station:
"My documents > Siemens > Automation > PCS7 > Activations".
9. Open the Automation License Manager (ALM).
The automation systems that are connected to the Automation License Manager are shown in the list in the "Connect AS 410" dialog box.
10. Click on the "Add" button to connect a further automation system. In the PCS 7 project, select the CPU to which you wish to transfer the PO release file. Then click on the "OK" button.



The CPU is displayed in the ALM.

11. Drag the PO release file and drop it on to the "Online" folder of the desired automation system.



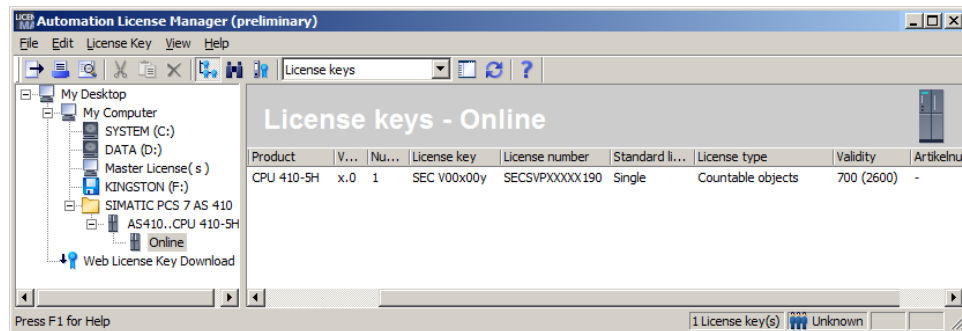
The upgrade is carried out. The time taken depends on the loading of the automation system.

After an upgrade is completed, the files used in the Upgrade directory are deleted (PO release file and PO activation file).

2 Application scenarios

2.6 Further information

The Automation License Manager shows the new number of POs for the updated SEC.



Note

You can also call up the volume of the SEC, as well as the process objects that are subject to license, in the SIMATIC Manager at "Options > PCS 7 license information".

2.6 Further information

2.6.1 Replacing an existing CPU with the CPU 410-5H

An existing CPU in the S7-400 series can be replaced by the CPU 410-5H with little effort. In addition to the hardware replacement, some adaptations must also be made to the hardware configuration of the PCS 7 project. Extensive information about this topic can be found at

<https://support.industry.siemens.com/cs/ww/en/view/85014617>.

2.6.2 Extending availability

With the standard SIMATIC PCS 7 AS 410 automation system, you already have the option of selectively increasing the availability by means of redundant configuration of the Industrial Ethernet communication module.

Thanks to its redundant CPUs, the Type AS 410H redundancy Station offers considerably greater availability. It works on the 1 of 2 principle, where the reserve system is switched in if the active subsystem fails. Starting from here, you can double the power supply or the Industrial Ethernet communication modules for each subsystem, and combine these measures.

You can find extensive information about the procedure for expanding a Single Station to a Redundancy Station at

<https://support.industry.siemens.com/cs/ww/en/view/82523363>.

3 References

Table 3-1

	Topic	Title
\1\	Siemens Industry Online Support	http://support.industry.siemens.com
\2\	Download page for this entry	https://support.industry.siemens.com/cs/ww/en/view/96839331 https://support.industry.siemens.com/cs/ww/de/view/96839331
\3\	SIMATIC PCS 7 process control system CPU 410-5H Process Automation	https://support.industry.siemens.com/cs/ww/en/view/74736822
\4\	SIMATIC Process Control System PCS 7 Service support and diagnostics (V8.1 SP1)	https://support.industry.siemens.com/cs/ww/en/view/90682682

4 History

Table 4-1

Version	Date	Change
V1.0	10/2014	First edition
V1.1	12/2014	Revision of chapter 2.2 Loading interface changes from AS blocks in RUN mode (TCiR)
V1.2	03/2015	<ul style="list-style-type: none"> • New chapter 3.1 Configuring the communications interface and establishing a connection between the ES and AS • Revision of chapter 3.4 Online upgrade of CPU 410-5H process objects
V1.3	06/2015	<ul style="list-style-type: none"> • Revision of chapter 2.5.5 Sending the PO activation file via Support Request
V1.4	03/2016	<ul style="list-style-type: none"> • New chapter 2.3 Updating the library with TCiR • Revision of chapter 2.2 Loading interface changes from AS blocks in RUN mode (TCiR)
V1.5	11/2016	New text block "Unlimited POs" in chapter 2.5.1.
V1.6	11/2016	New text block "Prerequisites for an online upgrade" in section 2.5.1