SIEMENS

SIMATIC

Component Based Automation Configuring Plants in SIMATIC iMap

Configuration Manual

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Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

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Note the following:

⚠WARNING

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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Preface

New functionality in SIMATIC iMap V3.0 SP1

The following new developments in configuring, commissioning and testing systems are available in SIMATIC iMap V3.0 SP1:

- Complex data types that can contain further complex date types, such as multidimensional arrays and structures of arrays and structures, are supported for devices in PROFINET Runtime version V2.3 and higher.

  Starting in SIMATIC iMap STEP 7 AddOn V3.0 SP4, PROFINET interfaces and PROFINET components of such devices can be created.
- Maintenance states of the PROFINET devices as from PROFINET Runtime Version V2.3 are displayed as icons in the online view.
- SIMATIC iMap can be executed under MS Windows Vista.
- Version numbers for functions can be specified when creating the PROFINET component and are displayed in SIMATIC iMap in the properties of the PROFINET component.
- Generation of the PROFINET devices without proxy functionality can be accelerated optionally.
- Typical values and absolute limits are displayed at power and utilization parameters of the devices as from PROFINET Runtime Version V2.3.

Purpose of the Manual

This manual offers support for systems engineering and commissioning in SIMATIC iMap.

It is intended for engineers working in the area of project planning, commissioning and servicing of automation systems with Component Based Automation.

We advise you to read the "Getting Started with SIMATIC iMap" documentation. It offers you a comfortable introduction to working in SIMATIC iMap.

Scope of the manual

The manual is valid for the software package SIMATIC iMap V3.0 SP1 or higher.

Basic knowledge requirements

This manual requires general knowledge of automation engineering.

Users should also be familiar with the operation of computers or auxiliary programming equipment similar to PCs (e.g., programming devices) operating under the operating system platform Windows 2000, XP or Vista. As the use of SIMATIC iMap on SIMATIC devices is based on the STEP 7 basic software, you should also know how to handle the basic software as described in the "Programming with STEP 7" manual.

Guide

The structure of this manual is based on three subject areas.

- Chapter 1 offers an overview of the overall concept, and of the product structure of Component Based Automation.
- Chapter 2 describes the software installation
- Chapters 3 to 6 describe the work in SIMATIC iMap
- The appendix contains a summary of all control elements as reference.
- Important terms are explained in the glossary.
- The index contains important key words, which allow quick access to associated text passages.

Position in the information landscape

This manual is part of the SIMATIC iMap documentation package. The documentation is installed with the software and includes the electronic manuals in PDF format:

- Getting Started in SIMATIC iMap
  Brief introduction to working with Component Based Automation and SIMATIC iMap.
- Configuring Plants in SIMATIC iMap – the current manual
  Contains detailed information and instructions for systems engineering and commissioning with the help of SIMATIC iMap.
- Creating PROFINET components
  Contains detailed information and instructions on the the creation of PROFINET components in STEP 7, and on applications for SIMATIC devices in Component Based Automation.
- Commissioning systems, tutorial
  Contains examples and step-by-step instructions, starting with the creation of PROFINET component, and concluding with the commissioning of the entire system.

The entire documentation is included in your SIMATIC iMap software as basic help in HTML format.

For general information on PROFINET and PROFINET CBA , refer to the PROFINET system description. This manual is included in the SIMATIC Manual Collection.

Notes

The next sections provide a guideline to the

- Creation of PROFINET components in STEP 7
- Configuring of systems in SIMATIC iMap
- Commissioning of systems in SIMATIC iMap

Each section contains a "thread" that leads you through all the manuals of Component Based Automation and SIMATIC iMap dealing with the relevant topic. The chapters are organized based on the order of the tasks to perform.

Notes on the creation of PROFINET components in STEP 7

Readership: Systems and mechanical engineers

	Chapter		
Manual	**Required**	**Optional**	**Header**
Getting Started with SIMATIC iMap		1	Getting Started - Introduction
		2	Step 1: Defining PROFINET components
		3	Step 2: Creating PROFINET components in STEP 7
Creating PROFINET components	1.1		Basic procedure
	1.3		Creating projects in STEP 7
	1.4.1		Properties of the PROFINET interfaces
		1.4.2	Using the PROFINET interface editor
	1.4.3		Creating PROFINET interfaces
		1.4.4	Changing PROFINET interfaces
	1.6.1		Creating PROFINET components in SIMATIC Manager
		1.7	Importing PROFINET components into a library
		1.8	Modifying PROFINET components
		2	SIMATIC devices as PROFINET components
Commission systems, tutorial		2	Part 1: Creating PROFINET components

Notes on the configuration of systems in SIMATIC iMap

Readership: Plant designers

	Chapter		
Manual	**Required**	**Optional**	**Header**
Getting Started with SIMATIC iMap		1	Getting Started - Introduction
		4	Steps 3 to 6: Configuring plants in SIMATIC iMap
Configuring systems		1	Component Based Automation - overview
	2		Installing SIMATIC iMap
	3.1		Running SIMATIC iMap
		3.3	Operating philosophy
	4.1		Basic procedure in system engineering
	4.2.1		Creating a new project
	4.2.2		Opening and closing the project
	4.3.2		Creating a new library
	4.3.3		Opening and closing libraries
	4.3.4		Importing PROFINET components
	4.4.1		Integrating PROFINET components in a SIMATIC iMap project

	Chapter		
Manual	Required	Optional	Header
	4.4.2		Connecting devices in the network view
	4.4.2.4		Assigning addresses
	4.4.3		Interconnecting technological functions
		3.3.3	Reading and editing properties
	4.4.4		Utilization check
		4.4.1.2	Creating nested charts
		4.5	Working with modified PROFINET components
		4.5.2	Replacing instances
	4.2.5		Generating the Project
		4.2.7	Documenting and printing a project
	4.2.4		Saving and backing up project data
		4.3.6	Backing up and restoring libraries
		5.11.1	Creating OPC symbol files
Commission systems, tutorial		3.3.2	Step 2: Configuring system no. 1 in SIMATIC iMap
		3.4.2	Step 2: Configuring system no. 2 in SIMATIC iMap
		3.5.2	Step 2: Configuring system no. 3 in SIMATIC iMap

Notes on system configuration in SIMATIC iMap

Readership: Plant operators

	Chapter		
Manual	Required	Optional	Header
Getting Started with SIMATIC iMap		1	Getting Started - Introduction
		5	Step 7: Generation and download
		6	Step 8: Diagnostics
		7	Step 9: Visualizing process data
Configuring systems	2		Installing SIMATIC iMap
	3.1		Running SIMATIC iMap
		3	Operating SIMATIC iMap
		4	Configuring systems
	5.1		Basic commissioning procedures
		5.2	Overview of the online functions
	5.3		Downloading programs and interconnections
	5.4		Diagnostics information in the online view
	5.5		Analyzing PROFINET components
	5.6		Checking availability of the devices
	5.7		Comparing online and offline data

	Chapter		
Manual	**Required**	**Optional**	**Header**
	5.8		Viewing and setting online values in the plant view
	5.9		Online test using the tag table
		5.10	Online device analysis
	5.12.1		Special features of systems containing SIMATIC devices
	5.12.2		Online operation of SIMATIC devices
		5.12.3	Editing instances in STEP 7
Commissioning systems, tutorial		3	Part 2: Systems commissioning

Conventions

Menu commands are written in bold letters, for example. **Project > Save**.

Placeholders are set in angled brackets, for example: <file name>.

Further assistance

If you have any questions relating to the products described in this manual, and do not find the answers in this documentation, please contact your Siemens partner at our local offices.

- SIMATIC partners (http://www.siemens.com/automation/partner)
- Component Based Automation (http://www.automation.siemens.com/cba)

See also

SIMATIC Technical Support (Page 259)

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Component Based Automation - overview

1

1.1 PROFINET CBA - concept

PROFINET

PROFINET is the open Industrial Ethernet standard for automation.

The PROFINET standard defines a manufacturer-independent communication and engineering model. PROFINET is implemented within the TIA framework based on two automation concepts:

- PROFINET IO - for communication between a PROFINET IO controller and PROFINET IO devices.
- PROFINET CBA.(Component Based Automation) - for machine-to-machine communication (between PLCs and intelligent field devices.)

PROFINET IO

Within the PROFINET framework, PROFINET IO represents a communication concept for the implementation of distributed applications based on the integration of field devices operating on Industrial Ethernet.

PROFINET CBA

PROFINET CBA represents an automation concept in modular systems engineering, based on ready-to-use components. PROFINET CBA incorporates the communication between the PLC and intelligent field devices (machine-to-machine communication) at unit level.

New automation concept with Component Based Automation

The diagrams below demonstrate how automation solutions are being transformed as a result of Component based Automation.

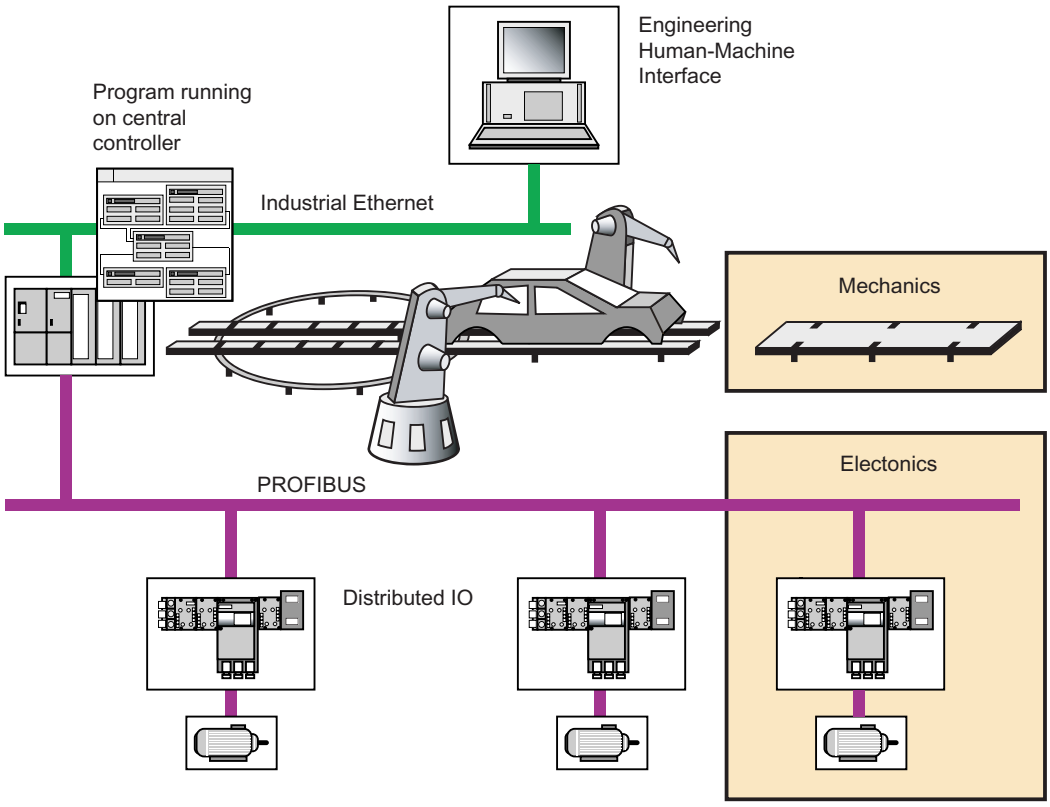


Figure 1-1 Previous automation concept with modular systems engineering

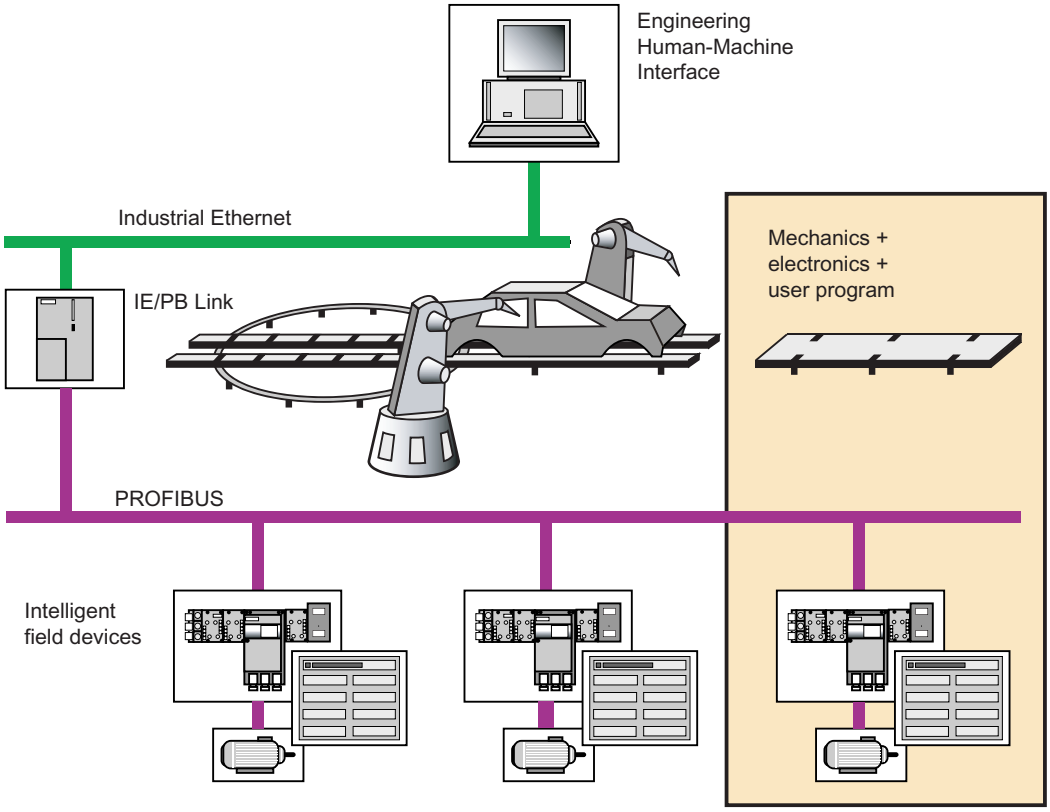


Figure 1-2 New: Modular concept with distributed intelligence

The objective in Component Based Automation is the integration of self-contained technological modules as standardized automation components, namely the **PROFINET components** in large-scale systems. Component Based Automation is implemented on the one hand by the PROFINET standard for automation devices, and on the other by engineering tools such as SIMATIC iMap.

Product range for PROFINET CBA

The range of products for Component Based Automation based on the PROFINET standard always comprises:

- PROFINET devices that conform to the PROFINET specification (CPU 317-2 PN/DP, for example)
- SIMATIC iMap, the engineering tool for Component based Automation, for configuring plants, and integrating vendor-specific programming, configuration and diagnostic tools.

In addition, a wide range of existing automation and field devices from various vendors can be used as PROFINET components.

1.2 PROFINET components

The mechanical, electrical and electronic parts of a programmable controller that perform a specific technological function within the automation system or production process, combined with the associated control program, form an independent technological module. If this technological module meets the communication requirements of the PROFINET specification, it is possible to create a PROFINET component from it in an engineering system.

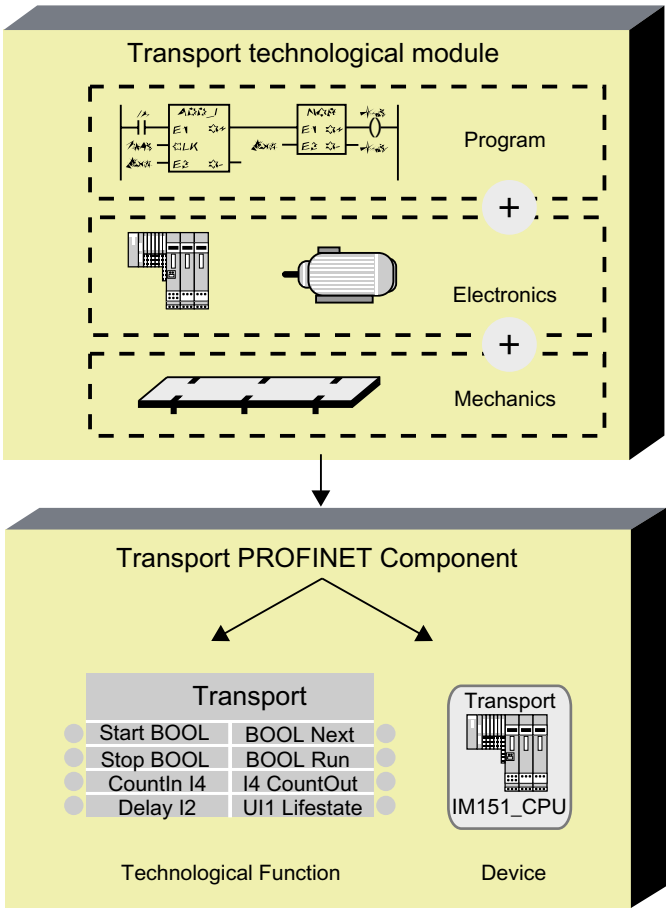


Figure 1-3 Creating a PROFINET component from a technological module

PROFINET components are modular hence they can easily be assembled and reused. This greatly simplifies the process of configuring automation systems.

PROFINET Component

A PROFINET component incorporates all the hardware configuration data, the module parameters and the associated user program. The PROFINET component is made up of:

- one or several (optional) technological (software) functions, and
- the associated device.

The technological function of the component comprises the interface to other PROFINET components in the form of interconnectable inputs and outputs.

The device is the representation of the physical programmable controller or field device, including any peripheral devices, sensors and actuators, the mechanical system and the device's firmware.

How are PROFINET components created?

The programmable controller or field device of the PROFINET component is configured and programmed using the configuration and programming tool supplied by the device manufacturer. A PROFINET component is then created from the configuration of the programmable controller and its user program, e.g. using a menu command. The device's functionality is also encapsulated with the application-specific programs. External applications can only access the technological interfaces (component interfaces) required for the interaction within the machine or system, diagnostics, visualization, and for vertical integration.

PROFINET Component Description (PCD)

The technological interfaces of the PROFINET components are described in XML (Extended Markup Language) and saved to an PCD (PROFINET Component Description) file. XML allows you to display information in a platform and vendor-independent format. A specification of the PCD file structure is given in the PROFINET engineering model.

The PROFINET component can incorporate information on the hardware configuration and on the user program, if necessary, in a device specific form.

Properties of PROFINET components

- Modularization and reusability

  The concept of the PROFINET component allows extensive modularization of automation systems. PROFINET components can be reused as often as necessary in different automation systems.

- Constant communication by support for the PROFINET specification

  Regardless of their internal functionality, each PROFINET component presents a uniform interface for communication with other components via Industrial Ethernet or PROFIBUS. The PROFINET specification describes the open communication interface for PROFINET-compliant devices.

- Cross-vendor engineering

  The technological functions of individual devices are programmed in the vendor-specific engineering tools. The the cross-plant interconnection of technological functions however vendor-independent engineering tools are used, e.g. SIMATIC iMap. They allow products from different vendors to be incorporated into PROFINET communication. Thus, all field device and programmable controller vendors have to do is extend their programming and configuration tools to allow them to be linked to the device-neutral engineering tool (e.g. SIMATIC iMap).

Programmable and fixed functionality

In an intelligent device, the application-specific functionality is defined by the user program that is downloaded to the device. More simple devices, such as drives or field devices, do not have their own user programs. The functionality of such devices is integrated into the firmware. We therefore differentiate between PROFINET components

- with programmable functionality

  The component has its own user program that can be downloaded from SIMATIC iMap to the device.

- with fixed functionality

  The component does not have its own user program.

Libraries, classes and instances

You can store PROFINET components in a SIMATIC iMap library and use them again. A PROFINET component forms a **class**, i.e. a template for one or several instances, and describes the internal structure of those instances. The insertion of a PROFINET component from a library in a SIMATIC iMap project generates an instance of the PROFINET component in the project, i.e. an application of this component class. Each instance is assigned additional properties, for example, a name and address. One or more instances of a PROFINET component can be inserted in a project.

The figure below shows some of the PROFINET components and their instances in the windows and views of SIMATIC iMap.

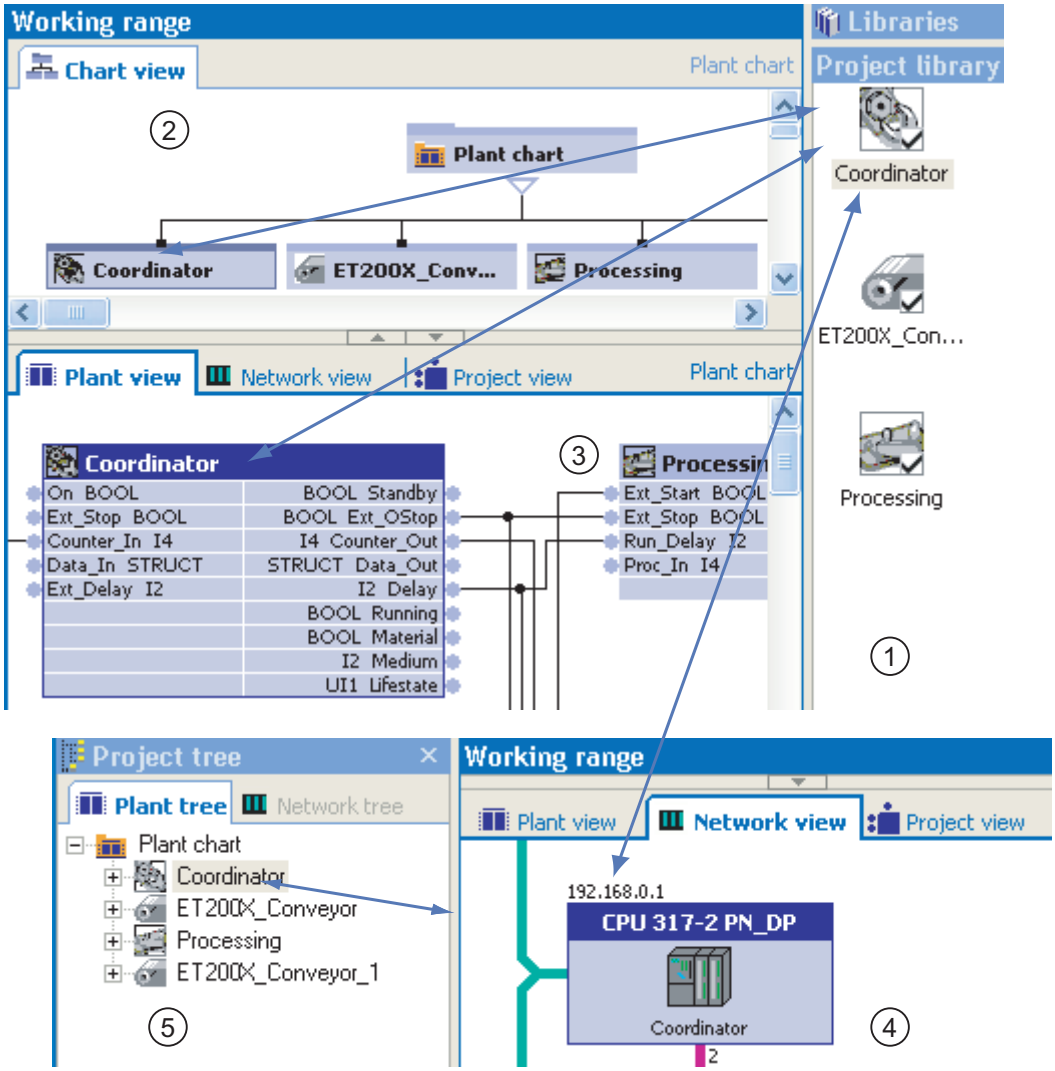


Figure 1-4 Representation of a PROFINET component in SIMATIC iMap

Legend	
1	Library - PROFINET compoenets "Coordinator" (type)
2	Plan view - "Coordinator" function (instance)
3	Plant view - "Coordinator" function (instance)
4	Network view - device "CPU 317-2 PN_DP" (instance)
5	Project tree, plant tree - "Coordinator" function (instance)

SIMATIC iMap represents the classes and instances of a PROFINET component in different forms:

- The PROFINET component (class) is represents as library element.
- This instance of a PROFINET component is represented in different views: the technological functions in the chart and plant views, and devices in the network view.
- The assignment of PROFINET components to the associated instances is represented in the project view (see diagram below).

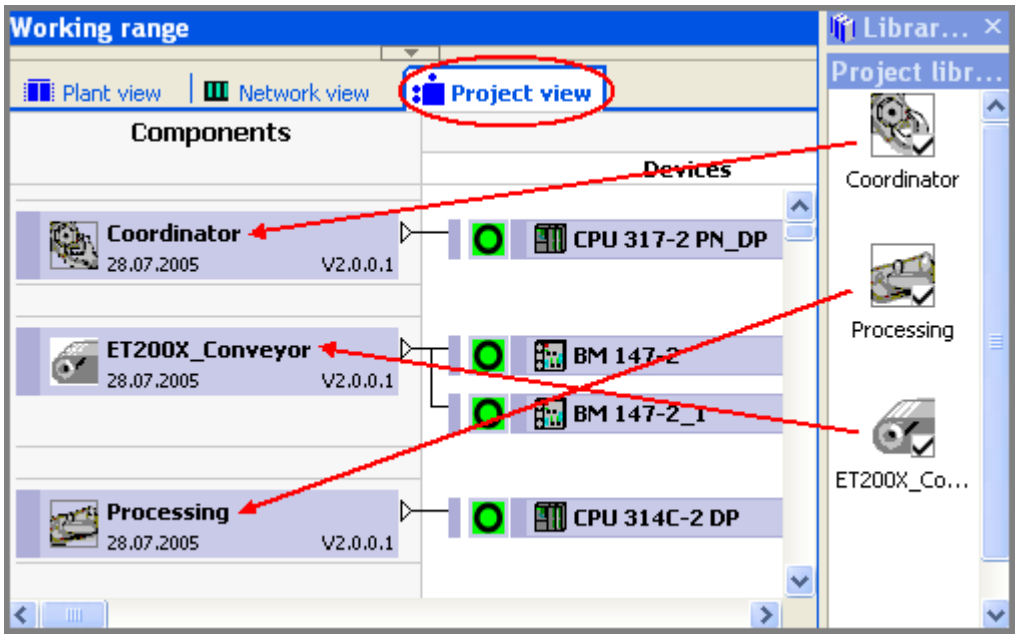


Figure 1-5 Project view in SIMATIC iMap

See also

Technological functions (Page 21)

Devices of PROFINET components (Page 22)

New engineering concept with SIMATIC iMap (Page 27)

1.3 Technological functions

Definition of a technological function

One or several technological functions of a PROFINET component comprise the application-specific functionality of an automation or field device, and the technological interfaces for the communication with other PROFINET components.

Technological interface

The technological interface defines the connections - i.e. the inputs and outputs - of the PROFINET component. The connections represent the external communication interface that is accessed via Ethernet or PROFIBUS. Every connection is characterized by the following features, as defined in the user program for the PROFINET component:

- Direction

  Each connection represents an input (consumer), or an output (provider.)

- Interconnectibility in SIMATIC iMap

  Inputs and outputs that are visible in SIMATIC iMap may be interconnected.

  Non-interconnectable connections are not represented graphically in SIMATIC iMap. They can be accessed via other communication mechanisms, e.g. OPC (OLE for Process Control), and are generally used for operator control and process monitoring.

- Name

  Any connection names can be selected, provided it conforms to the naming conventions and is no more than 24 characters long.

- data type

  A data type, e.g. BOOL, I1 or U2, is defined for each connection. Complex data types, such as arrays and structures, are also supported.

- Value

  The actual value of a connection can be viewed online in SIMATIC iMap in runtime. Online values of non-interconnected inputs may also be modified.

Representation of technological functions

The technological functions of a plant are represents by blocks with interconnectable inputs (1) and outputs (2.) Interconnections are visualized by connecting lines (3.)

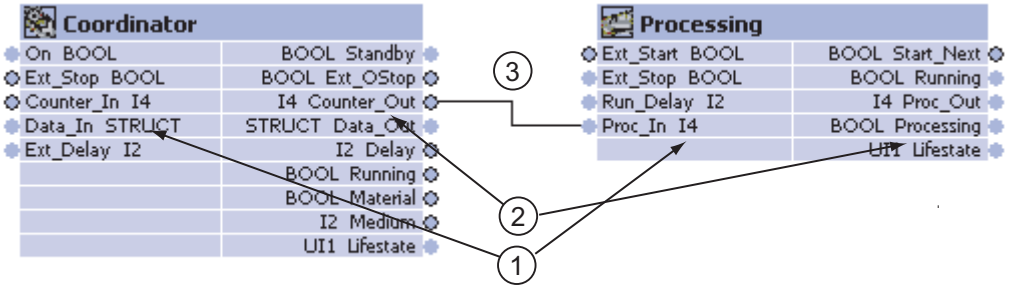


Figure 1-6 Interconnected technological functions

Interconnections

In SIMATIC iMap, an interconnection is the connection between an output and an input. An output can be interconnected to one or more inputs. Once the interconnections have been downloaded to the programmable controllers, the corresponding communication links are automatically established between senders and receivers.

1.4 Devices of PROFINET components

Devices in PROFINET components

The device is the part of the PROFINET component that contains the hardware-specific data for that component.

In Component Based Automation, a device is a representation of the physical device for which the PROFINET component was created. Such devices include programmable controllers, intelligent field devices and peripheral, hydraulic and pneumatic devices.

Devices and network types

PROFINET communication takes place via Industrial Ethernet. Existing PROFIBUS systems can easily be integrated in the PROFINET communication with the aid of the proxy concept (see figure "Devices and network types").

The main feature of a device is that it is integrated into the PROFINET communication via an Ethernet or PROFIBUS. We differentiate between the following types of device downstream of the bus connections:

- PROFINET devices

  A PROFINET device always has an Ethernet connection. A PROFINET device may also have a PROFIBUS connection, and thus act as a master with proxy functionality.
- PROFIBUS devices

  A PROFIBUS device has just one PROFIBUS connection and is always a slave. It cannot participate directly in PROFINET communication, and must always be integrated via a PROFIBUS master with proxy functionality.

The figure below shows the devices and network types.

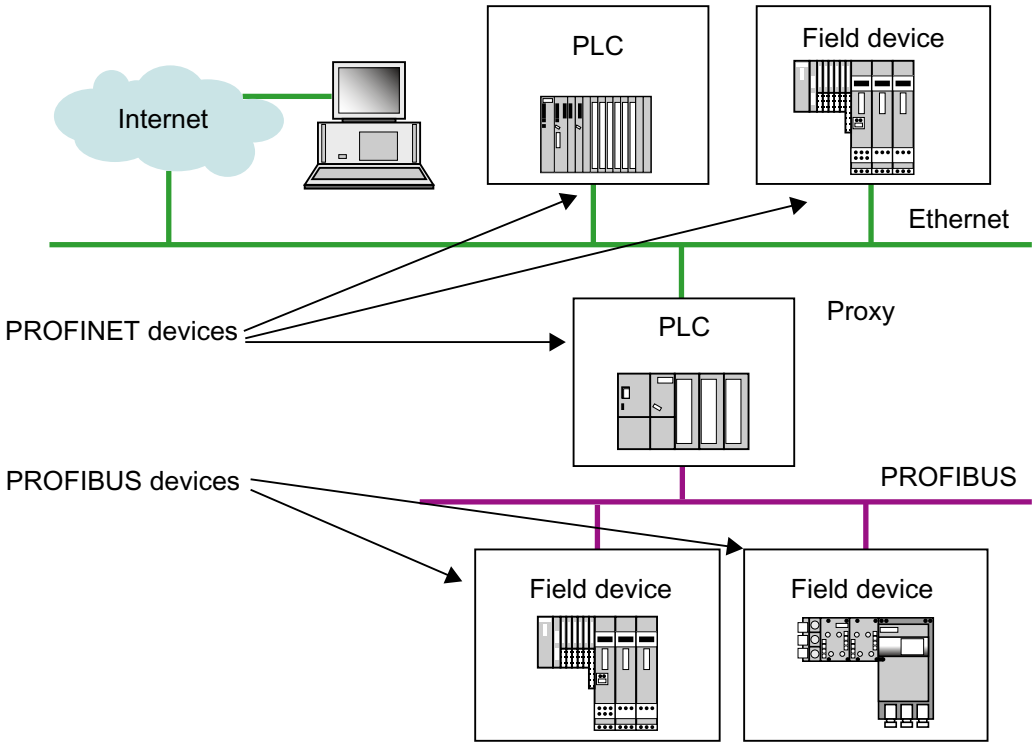


Figure 1-7 Devices and network types

The PROFINET device with proxy functionality is a proxy for PROFIBUS devices on Industrial Ethernet. The proxy functionality allows a PROFIBUS device to communicate with all participants in the PROFINET communication, as well as with its own master.

PROFINET IO systems and further devices on Industrial Ethernet (such as HMIs) may be integrated in PROFINET components. Although SIMATIC iMap does not visualize these objects graphically, these can be configured in object properties dialogs.

PROFIBUS devices may be connected to the local PROFIBUS of another PROFINET device (see below, "Examples - PROFINET and PROFIBUS devices".) This way already existing PROFIBUS configurations can be integrated in PROFINET components. The local PROFIBUS of a device is not visible in SIMATIC iMap.

Representation of Devices

The figure below shows a practical example of the instances of PROFINET and PROFIBUS devices in the network view of SIMATIC iMap.

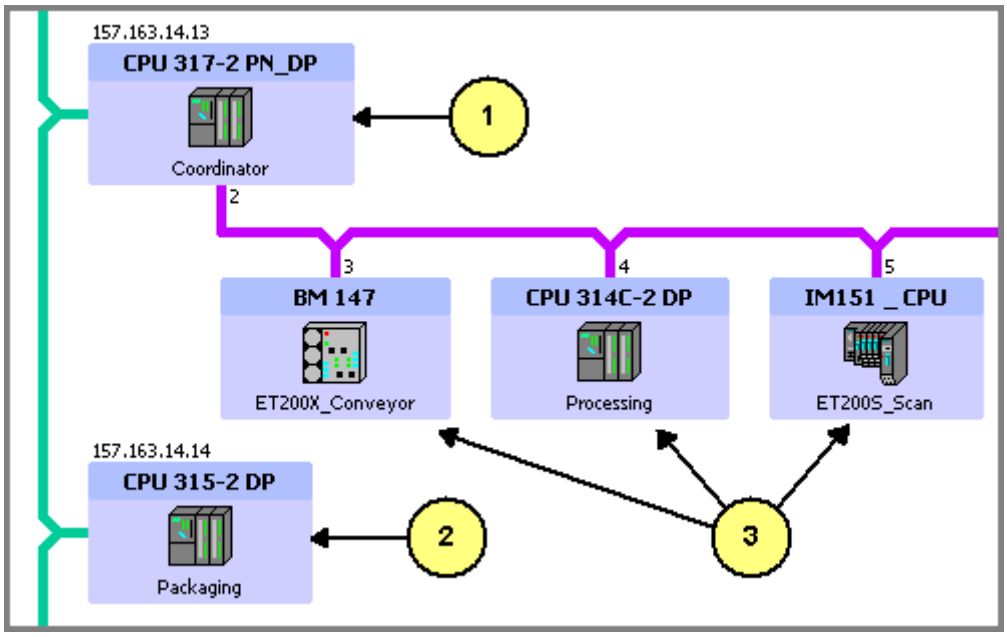


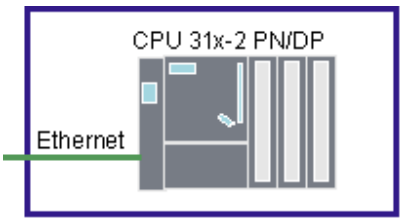
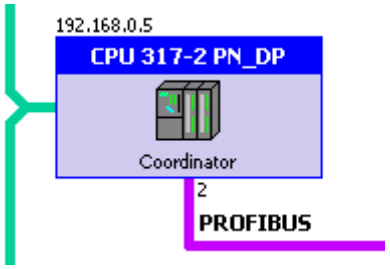
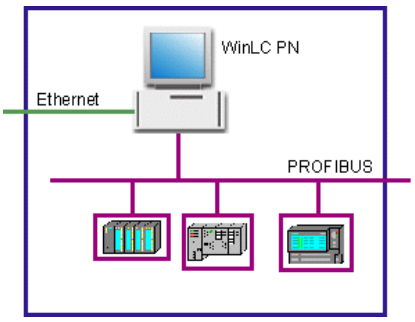
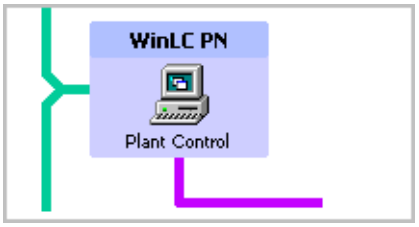
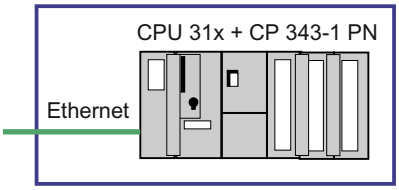
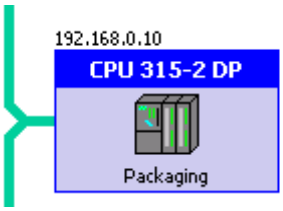
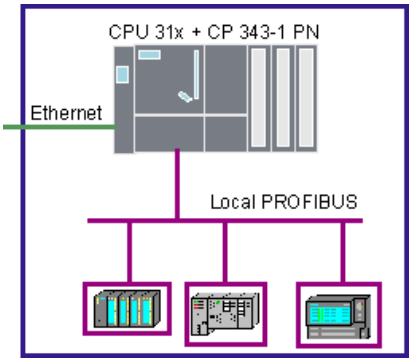
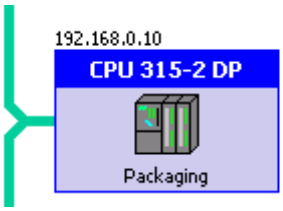
Figure 1-8 Example: Representation of the devices in the SIMATIC iMap network view

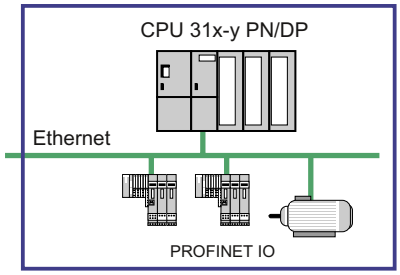
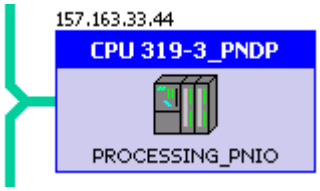
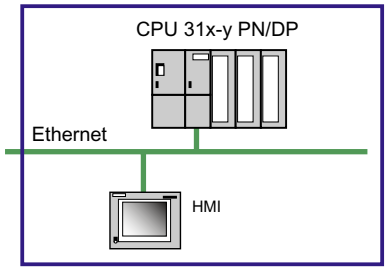
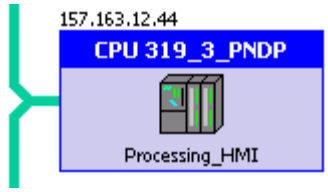
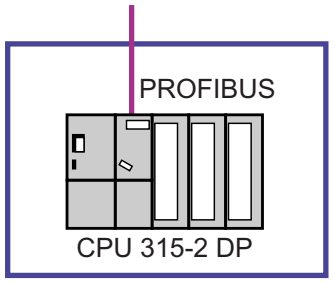
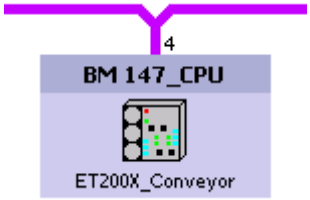
Table 1-1 Key

Symbol	Meaning
1	PROFINET device with proxy functionality
2	PROFINET device without proxy functionality
3	PROFIBUS devices

Examples - PROFINET and PROFIBUS devices

The table below shows the supported hardware configurations for PROFINET components, and the representation of the devices in SIMATIC iMap

Designation	Example configuration	Representation in SIMATIC iMap
PROFINET device with proxy functionality		
PROFINET device with proxy functionality and local PROFIBUS		
PROFINET device without proxy functionality		
PROFINET device (with local PROFIBUS) without proxy functionality		

Designation	Example configuration	Representation in SIMATIC iMap
PROFINET device with integrated PROFINET IO system		
PROFINET device with internal HMI on Industrial Ethernet		
PROFIBUS device (DP slave on PROFIBUS)		

Supported transfer types

Data transfer types supported in PROFINET CBA:

- Acyclic transfer of engineering data, and of data which are not time-sensitive (configuration and diagnostics data, for example.) Acyclic data transfer is based on the TCP/IP protocol.
- Cyclic transfer of time-sensitive process data (user data.) Cyclic data transfer is routed across a separate real-time channel (real-time communication on Industrial Ethernet).

1.5 New engineering concept with SIMATIC iMap

Device-independent engineering concept

In SIMATIC iMap, PROFINET offers you a standardized manufacturer-independent engineering interface for the configuration of PROFINET applications. This allows the comfortable integration of devices and components of different manufacturers simply in your plant via PROFINET.

SIMATIC iMap lets you join distributed automation applications in a graphical format, and visualize these on the entire system. All of the required PROFINET components are available in a standardized format in the form of library elements.

The communication connections between the devices do not need to be programmed, but can be configured graphically as interconnection lines.

SIMATIC iMap can download the instances of the PROFINET components, and their associated interconnections to devices of the plant. In the commissioning phase, and while the plant is in operation, you can use SIMATIC iMap to poll process and diagnostics data of the devices, and modify parameters and project data for testing purposes.

In addition to the technological plant view, SIMATIC iMap supports the integration of manufacturer-specific, proprietary programming and configuration tools for automation devices and intelligent field devices.

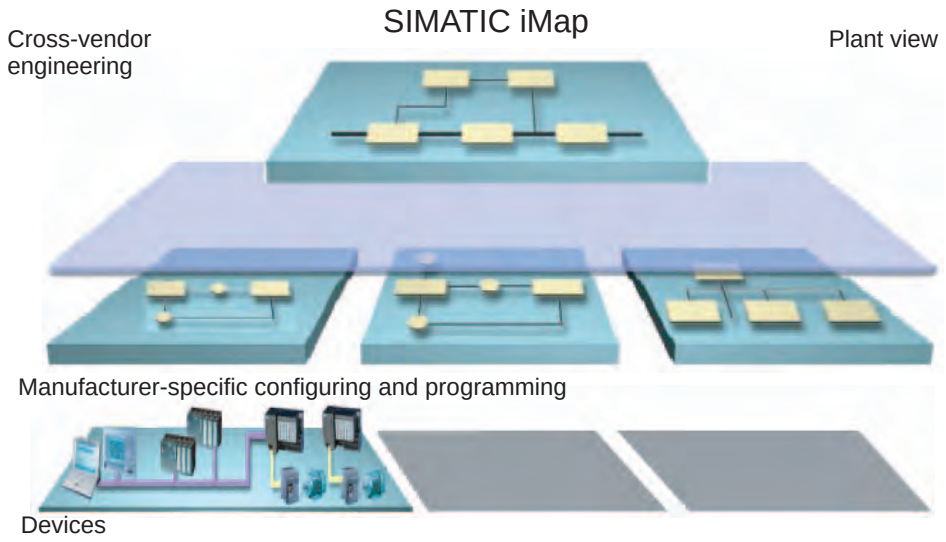


Figure 1-9 SIMATIC iMap engineering concept

The basic engineering procedure

The following steps must be carried out in order to structure and operate an automation system using SIMATIC iMap:

1. Planning the plant

   The plant planner defines the following aspects:

   – Which functions are needed

   – Which programmable controllers and field devices are to be used

   – Which functions can be combined to create reusable technological modules

   – NEW for Component Based Automation:
   Technological interfaces and interaction between PROFINET components, plus variables for diagnostics and visualization.

2. Creating PROFINET Components

   The systems and mechanical engineer creates the PROFINET component using the manufacturer-specific configuration and programming tool by:

   – Configuring and programming the hardware

   – Creating the description of the component interface

   – Creating the user program

   – Overall test of the technological module

   – Creating the PROFINET component (XML file and associated data)

   – Optional: Importing the PROFINET component into a SIMATIC iMap library.

3. Configuring the plant in SIMATIC iMap

   The plant configuration engineer creates the project in SIMATIC iMap by:

   – If necessary: Importing the new PROFINET component into the (project) library

   – Structuring plants

   – Inserting the PROFINET Components into the Project

   – Networking the devices in the network view

   – Assigning the device addresses (IP address and/or PROFIBUS address) to the devices (this step is device-specific)

   – Interconnecting the technological functions in the plant view

   – Modifying the properties of the devices and functions

   – Checking the configuration

   – Documenting and archiving the project.

4. Commissioning and testing the plant

   The plant operator is responsible for the following tasks:

   – Commissioning individual devices
   – Downloading project data to the devices in the plant
   – If necessary: Reworking devices and technological functions in the manufacturer-specific engineering tool
   – Testing the plant
   – Creating the symbol data for OPC access

5. Operating the plant
   – Monitoring and modifying process data online (vertical integration)
   – Diagnosing faults in the plant
   – Operator control and process monitoring
   – Carrying out maintenance and modifications

Support by SIMATIC IMap

SIMATIC iMap provides the following support for plant engineering:

- Storage of in-house and off-the-shelf PROFINET components in libraries:

  Libraries are used to administer PROFINET components that you create yourself or purchase. The content of these libraries can be configured as required.

- Structuring the plants in the chart view:

  In the chart view, you can define the plant structure by inserting charts and functions.

- Interconnection of technological functions in the plant view:

  In the plant view, you can position and interconnect technological functions graphically, and easily check and modify their properties.

- Networking devices in the network view:

  In the network view, you can link devices graphically to a PROFIBUS or Ethernet subnet, and assign the corresponding addresses.

- Online monitoring and control of variables:

  You can access the process data online at any time. To do this you use a variable table, incorporating HMI devices such as WinCC Flexible or ProTool/Pro into your plant or using OPC-based client programs.

- Diagnosing PROFINET devices and technological functions:

  The separate diagnostic window constantly displays the current status of PROFINET devices and technological functions. An online-offline comparison allows you to determine whether programs and/or interconnections need to be downloaded.

- Representation of the project in a hierarchical tree structure:

  All parts of the plant needed for easy navigation and other administration functions within the project are clearly displayed.

- Automatic creation of the plant documentation:

  Full documentation of the configured plant, including all devices, technological functions and their connectors, plus a graphical representation of the networking and interconnections can be created automatically in SIMATIC iMap.

- Checking the configuration:

  You can check the configuration in SIMATIC iMap with reference to the device-specific performance parameters even before you generate the project.

- Looking up the device's online data:

  The online device analysis allows you to look up the online data for individual devices for testing and diagnostic purposes.

manufacturer-specific configuration and programming tools

SIMATIC iMap provides the following functions for integrating manufacturer-specific configuration and programming tools:

- Software for creating PROFINET components for SIMATIC devices in STEP 7.
- Access to manufacturer-specific tools for configuring and diagnosing devices.

Transparent data access

PROFINET communication supports access to process data from different levels of the plant. Due to the integration of PROFINET, users can now implement standard communication and IT mechanisms such as OPC or XML in automation technology. This means that office-bound company managers can directly access the data from PROFINET devices at the control and production levels.

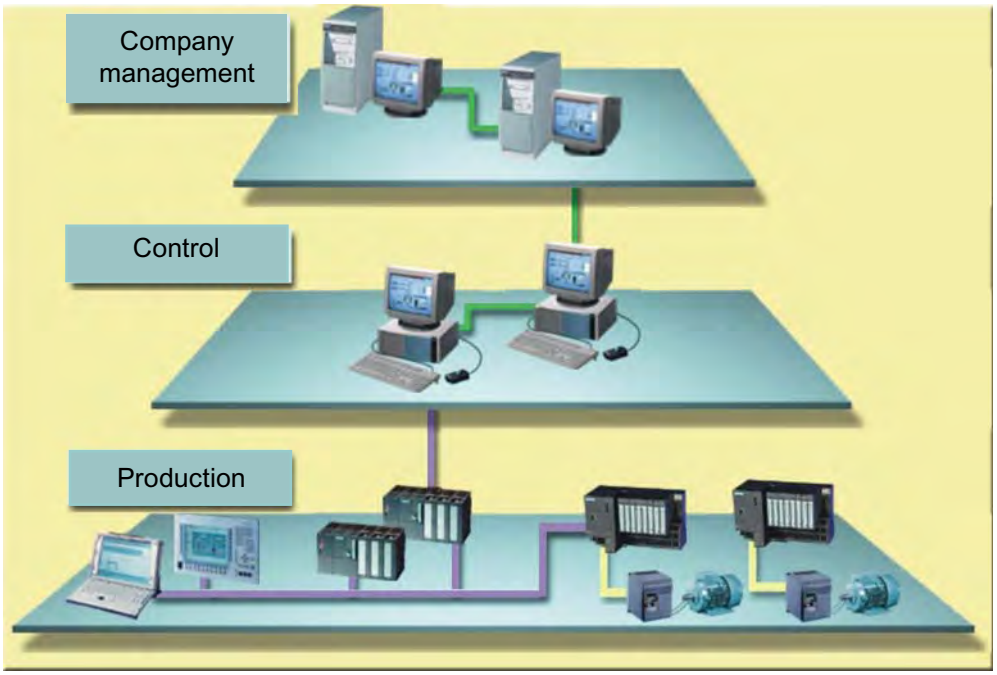


Figure 1-10 Access to process data

1.6 User documentation for SIMATIC iMap and Component Based Automation

User documentation

The SIMATIC iMap and PROFINET documentation is broken down into various activities and target groups. The contents contain different levels of information.

Manual	Type of description	Contents	Target group
Getting Started with SIMATIC iMap	Brief introduction	• Creating PROFINET components with STEP 7 • Configuring plants with SIMATIC iMap • Online Monitoring and Diagnostics with SIMATIC iMap	Beginners
Creating PROFINET Components	Extensive description and instructions	• Creating PROFINET components with STEP 7 • Using SIMATIC Devices as PROFINET components	Systems engineers Mechanical engineers
Configuring Plants with SIMATIC iMap - manual	Introduction	• Component Based Automation • SIMATIC iMap • PROFINET components	Beginners Plant planners
	Comprehensive description and instructions	• Installing SIMATIC iMap	Plant designers
		• Working with SIMATIC iMap	
		• Configuring plants	
		• Commissioning plants	Plant operators
		• Online Operation and Diagnostics	
Commissioning Systems - Tutorial	Detailed step-by-step instructions with reference to an example	• Creating PROFINET components with STEP 7 • Configuring plants with SIMATIC iMap • Commissioning Plants with SIMATIC Devices	All

Options for accessing the user documentation

You can call up documentation about SIMATIC iMap:

- To view the various documents in PDF print format, select **Start > Program files > Component Based Automation > Documentation > SIMATIC iMap > ...** on the Windows task bar.
- In SIMATIC iMap, you can open the complete documentation as online help using the **Help > Help Topics** menu command.

Additional information

For general information on PROFINET, refer to the PROFINET System Description.

The associated product documentation contains information on related topics, e.g. descriptions of individual devices.

Installing software

2

2.1 Prerequisites

Hardware Requirements

The computer on which SIMATIC iMap is installed must have at least the following configuration:

- Pentium processor, 1 GHz or higher
- RAM: 512 MB or more

General software requirements

- Operating system:

  SIMATIC iMap V3.0 SP1 is released only for the operating systems
  - MS Windows 2000 Professional + SP4, or
  - MS Windows XP Professional + SP1 and higher
  - MS Windows Server 2003 + SP1 and higher
  - MS Windows Vista 32 Business or Ultimate
- Microsoft Internet Explorer V6.0 SP1 or higher, depending on the operating system

  Is required in order to open SIMATIC iMap project documentations (HTML).
- Acrobat Reader V5.0 and higher, depending on the operating system

  Is required in order to open the electronic manuals (PDF).

Recommendation:

We recommend that you also install the Microsoft Windows security patches.

Required authorizations under MS Windows 2000, XP and Server 2003:

- You need administrator rights for the installation of SIMATIC iMap.
- You need at least main user rights to operate SIMATIC iMap.

Software requirements for SIMATIC devices

If you are using PROFINET components of SIMATIC devices, you will also need the following software packages:

- STEP 7 V5.3 + SP3 and higher, or
- STEP 7 Professional V5.3 SP3 and higher
- STEP 7 V5.4 and higher, or
- STEP 7 Professional V5.4 and higher
- Software required for the SIMATIC devices used:

Device/Function	Software required
WinAC PN	WinAC PN V1.1 and V4.1 and higher SIMATIC NET IE SOFTNET-S7 V6.2 SP1 and higher
HMI Process Visualization	ProTool/Pro Configuration V6.0 + SP2 and higher WinCC flexible 2005 V1.1 SP1 and higher
Access to process varaibles by means of OPC	SIMATIC NET PN OPC-Server V7.0 and higher
Access to non-interconnectable process variables via OPC	SIMATIC NET IE SOFTNET-S7 V7.0 and higher SIMATIC NET PN OPC-Server V7.0 and higher

You may need further software packages, depending on the modules and devices used. For information on component requirements, refer to the relevant product description.

Note

SIMATIC iMap can be used without being integrated in STEP 7.

2.2 Installing

Installation units of SIMATIC iMap

- SIMATIC iMap - the engineering tool for configuring PROFINET CBA communication.

  Lets you to configure and interconnect existing PROFINET components and use some of the online and diagnostic functions.

  SIMATIC iMap STEP 7 AddOn is required to perform device-specific functions, such as generating the SIMATIC iMap project, downloading a program, or reading device-specific diagnostics data.

- SIMATIC iMap STEP 7 AddOn - the optional software for creating PROFINET components in STEP 7.

  This installation unit contains the link to STEP 7 needed to define PROFINET interfaces and create PROFINET components. It also supports the execution of device-specific functions in SIMATIC iMap.

  The installation unit requires STEP 7.

The installation units can be installed separately.

Requirement

The conditions described in the "Requirements" section must be fulfilled.

Note

SIMATIC iMap may not be installed on a network drive.

Select a folder on the local hard disk drive.

To install SIMATIC iMap

1. Insert the SIMATIC iMap CD into the CD-ROM drive.

   Continue at step 4 if the Setup program starts automatically. Otherwise, continue from step 3.
2. Select the CD-ROM drive in Windows Explorer.
3. Double click on the setup.exe file to start the setup program.
4. Run the necessary setup programs in the order specified by clicking on the relevant buttons.

   During installation you are requested to install the license key. Following instructions in the "Authorization" section.

   Note

   Perform a restart if the setup program requests it after it has been executed.

Please follow the notes on installing and using SIMATIC iMap in the readme file, which is also on the CD-ROM.

See also

Authorization (Page 36)

Prerequisites (Page 33)

2.3 Authorization

A product-specific authorization (use permission or license key) is needed in order to use the SIMATIC iMap engineering software. The full scope of SIMATIC iMap functionality is only available if the system detects the required authorization on the PG/PC hard disk drive.

Authorization on USB stick

For authorization, you need the USB stick containing the license key, which is included in the scope of delivery. This contains the actual authorization. Automation License Manager is required to view, install and remove the authorization. This program is included on your SIMATIC iMap V3.0 SP1 CD-ROM.

Note

For the SIMATIC iMap engineering software you will receive a license key on USB stick.

CAUTION
Follow the instructions in Automation License Manager > Disk1 > ALM-Readme.wri on the CD-ROM. If you do not follow these instructions, you risk losing the authorization permanently.

You can also use SIMATIC iMap without the authorization to get to know the user interface and range of functions. However, you can only really use the program with the authorization installed. If you have not installed the authorization, you will be prompted at regular intervals to install it.

If you lose your authorization ...

An authorization can be lost if a hard disk fault occurs, for example, and you are unable to uninstall the authorization from the defective hard drive.

If you lose the authorization, you can access the emergency authorization. This is also on the USB stick. This emergency authorization allows you to continue to use the software for a limited period. In this case, the time remaining until the authorization expires is shown on start-up. You should obtain a replacement for the lost authorization during this period. To do this, contact your local SIEMENS dealer.

Note

The time limit for the emergency authorization starts to run when you install the authorization, even if SIMATIC iMap is not started. The time limit will not stop even if you write the authorization back to the USB stick.

Installing Automation License Manager

Automation License Manager is required to view, install and remove the authorization. This program is included on your SIMATIC iMap V3.0 SP1 CD-ROM. SIMATIC iMap Setup offers this program as an option and installs it if selected.

Note

The path of the Automation License Manager program:

Start > SIMATIC > License Management > Automation License Manager.

Running the authorization at initial installation

You should run the authorization when a message prompts you to do so during the initial installation of SIMATIC iMap. The procedure is as follows:

1. Insert the data medium with the authorization when you are prompted to do so.
2. Then confirm the prompt.
3. The authorization is transferred to a physical drive.

Running the authorization at a later date

If you start SIMATIC iMap and there is no authorization installed, a message to this effect appears. You can run Automation License Manager to install the authorization at a later time. The Help for this program contains detailed information on the procedure.

Note

The authorization will not work unless you are approved for write access on a local hard drive.

Operating SIMATIC iMap

3

3.1 Starting SIMATIC iMap

Requirement

SIMATIC iMap must be installed on your PC/programming device.

Starting SIMATIC iMap

There are two ways to start SIMATIC iMap:

- In the Windows taskbar click on the **Start / Programs / Component Based Automation / SIMATIC iMap** command or
- Double-click on the iMap icon on your desktop 

.

Result

The SIMATIC iMap user interface is opened:

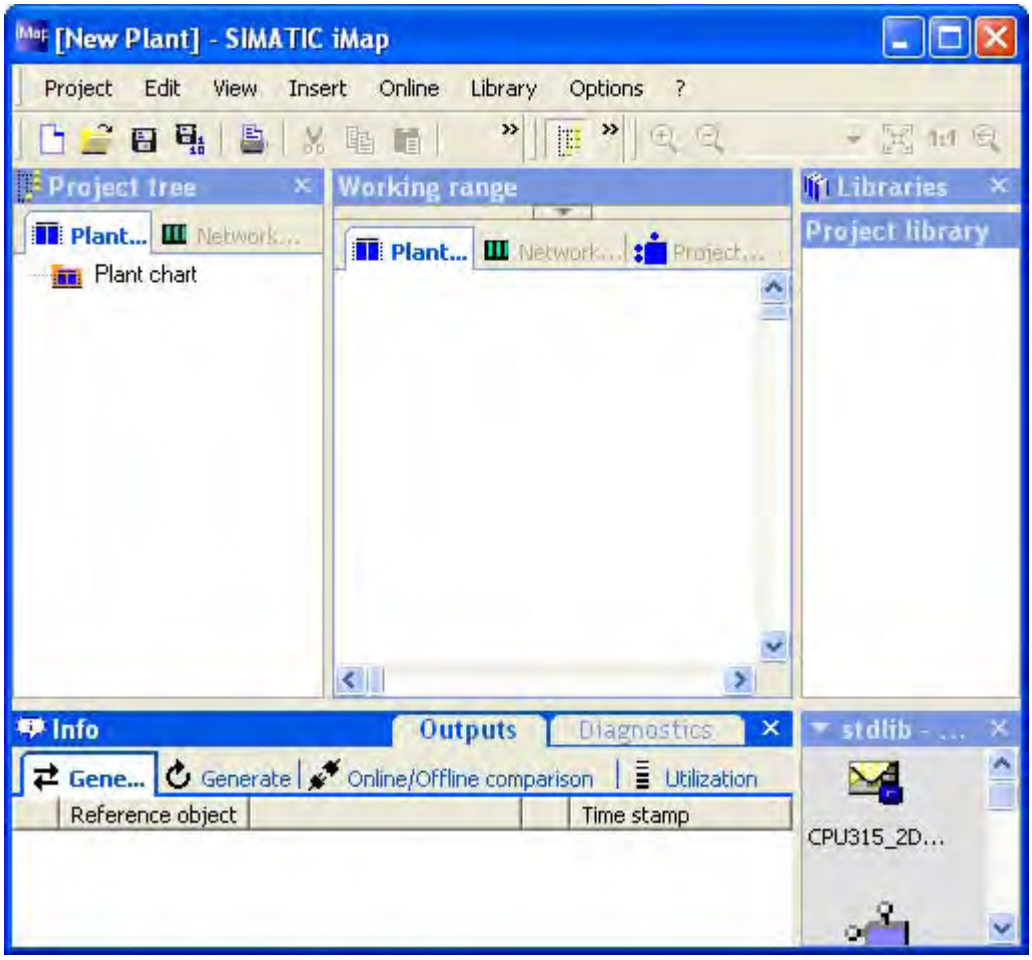


Figure 3-1 Start SIMATIC iMap: User interface

See also

SIMATIC iMap user interface (Page 49)

3.2 Help functions in SIMATIC iMap

Online help

SIMATIC iMap's built-in help system provides targeted information for the points in the program at which you need help. You can thus quickly and efficiently access the information you need. The ways in which you can obtain help for each procedure are described below.

Via the "?" menu

- **Help:** displays information about the selected object or on the active dialog box or window.
- **Help Topics:** opens the online help for "Component Based Automation and SIMATIC iMap". You can then use the Content, Index and Find tabs to navigate within the online help.
- **Getting Started:** describes the first steps that you have to carry out to create a working application.
- **About:** opens an information box listing the most important properties of the installed software version.

In dialog boxes

In all dialog boxes containing a "Help" button, you can click on this button to obtain a description of the dialog box.

In messages

In all message boxes containing a "Help" button, you can click on this button to obtain a detailed description of the message.

Via the F1 function key

Use the F1 function key to move directly from your current working context to the point in the online help that describes this aspect. For example, if there is a dialog box on screen, a description of this dialog will be called.

In the status bar

The status bar displays a short help text that describes the selected command from the main or pop-up menu (opened by clicking the right mouse button).

Via the Tooltip texts

If you move the cursor slowly over a button in the toolbar, a brief description appears for a short time.

SIMATIC iMap documentation

You can call up documentation about SIMATIC iMap:

- To view the various documents in PDF print format, select **Start > Program files > Component Based Automation > Documentation > SIMATIC iMap > ...** on the Windows task bar.
- In SIMATIC iMap, you can open the complete documentation as online help using the **Help > Help Topics** menu command.

3.3 Operating philosophy

3.3.1 Objects and object hierarchy

Simple operation

SIMATIC iMap's graphical user interface is designed to be as straightforward and intuitive to use as possible. It therefore contains objects with which you are familiar from your daily work: devices, functions and charts.

Object-oriented operation

In the SIMATIC iMap user interface, objects are represented by graphical symbols. You can open and edit the objects by selecting the symbols. In most cases, when you work with SIMATIC iMap you will use the normal Windows conventions.

Object hierarchy

Projects have a hierarchical structure in SIMATIC iMap. At the bottom of the object hierarchy are the instances of the technological functions and devices, which are automatically set up as soon as PROFINET components are inserted in a project. The project can be structured subordinate charts which in turn include charts and functions.

The plan view shows the technological hierarchy of the plant. It shows the charts and instances of the functions in a tree structure.

The "plant tree" and "network tree" views are automatically created in the project tree. The charts and technological functions are listed under "plant tree", while the devices with their network connectors can be found under "network tree". When opening a chart in the project tree, the objects already contained in that chart are displayed, similarly as in Windows Explorer.

Example: Object hierarchy

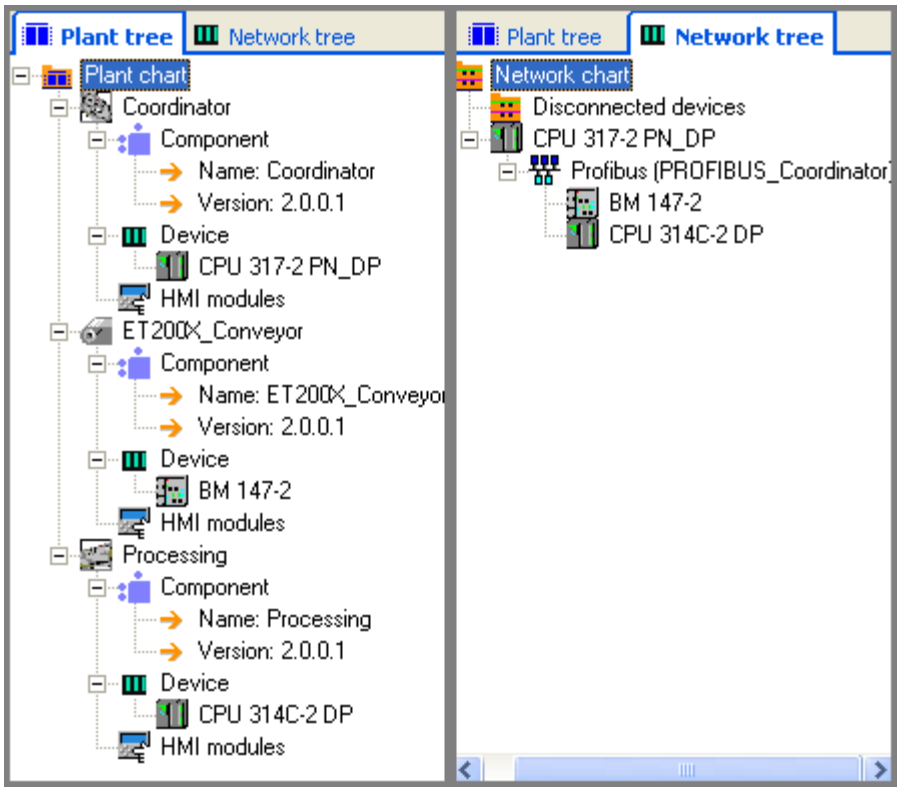


Figure 3-2 Project tree, example of an object hierarchy

Object properties

Objects have properties such as addresses and connectors. Once you have selected an object, you can open a dialog box using the **Properties** shortcut menu, for example, in order to make certain object-specific settings.

Specific properties or states are displayed directly at the objects by text or symbols. An overview of symbols and their meaning is available in the appendix.

Associated objects

The associated objects in a SIMATIC iMap project are: a PROFINET component and its instances (devices and optionally technological functions). A simple double-click on a single object selects the associated objects from all views. The following diagram show how they fit into the project.

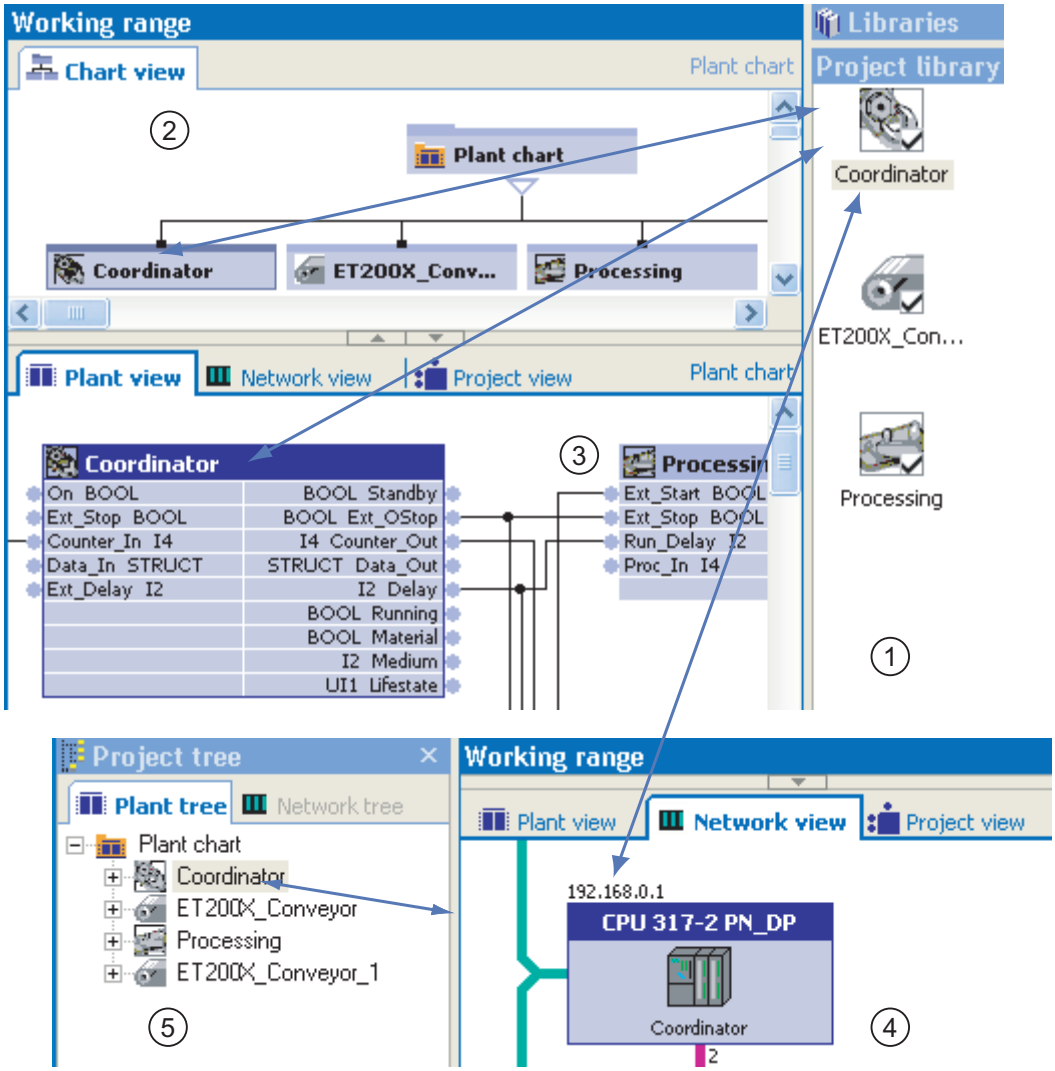


Figure 3-3 Representation of a PROFINET component in SIMATIC iMap

Legend	
1	Library - PROFINET components "Coordinator" (type)
2	Plan view - "Coordinator" function (instance)
3	Plant view - "Coordinator" function (instance)
4	Network view - device "CPU 317-2 PN_DP" (instance)
5	Project tree, plant tree - "Coordinator" function (instance)

3.3.2 Editing objects

Basic actions

Certain basic actions for objects are the same for all objects. These basic sequences of actions are summarized below. In the following chapters of this manual, we have assumed that you already know how to use them when we describe individual procedures.

You can carry out certain actions on each object, e.g. Copy, Cut, Paste. When you select an object, the commands that you can carry out on that object are displayed in the shortcut menu. Illegal menu commands are grayed out. If you attempt to carry out an illegal action, you will be stopped and the cursor will change into a Stop sign.

The usual sequence of actions for handling objects is as follows:

- Create the object
- Select the object
- Perform actions with the object

Creating objects

With SIMATIC iMap you can create new libraries, projects and charts. Use the following menu commands to create objects:

- **Library > New**
- **Project > New**
- **Insert > New chart**

The PROFINET components themselves are created with a device-specific programming and configuring tool, e.g. STEP 7 and can be inserted or copied into the library with the menu command **Library > Import components**.

Instances of the PROFINET components are inserted in the project by drag & drop or by copying.

Selecting objects - Multiple selection

You can select multiple objects (multiple selection) in all views. To do so, press the left mouse button and draw a lasso around the relevant objects.

The multiple selection function only allows the selection of objects which are of the same type, and not nested within the hierarchy. Example: only the technological functions and charts in the plant view. Objects are selected in the following order: If the lasso contains complete technological functions and charts, these objects will be selected. If this is not the case, any complete connections that they contain are selected. If there are no connections, then any interconnections that they contain are selected.

Note

Tip: You can also make multiple selections with the left mouse button by holding down the "Shift" or "Ctrl" key at the same time.

Opening objects

In SIMATIC iMap you can open libraries, projects and charts. These objects are opened using the following menu commands:

- **Library > Open**
- **Project > Open** or by double clicking a SIMATIC iMap project file (extension.cbp)
- **Edit > Open Selected Chart** or by double clicking on the chart.

Once you have opened an object, you can then create or modify its content. You cannot, however, open projects that are currently in use.

Cutting, pasting and copying

Most objects can be cut, pasted and copied as is usual under Windows. The associated menu commands can be found in the **Edit** menu and the shortcut menus that you access by clicking the right mouse button.

You can also drag & drop objects to copy or move them. If you attempt to drop the object at a destination that is not permitted, the cursor changes into a Stop sign.

The nested hierarchy of a chart is always included when you cut or copy it. This feature opens extensive options of reusing system units you already developed.

Copied and cut functions or charts can only be pasted into charts (not in the network view.)

You can only cut, copy and paste complete instances (see "Editing function units of multifunction components".)

NOTICE
When pasting cut instances, you may loose configuration data such as interconnections, chart assignments, or master / slave connections on PROFIBUS. You thus need to reassign such data separately.

Moving objects

In SIMATIC iMap, you can move the following objects using Drag&Drop:

- Devices in the network view from one Ethernet or PROFIBUS network to another.
- Technological functions in the plant view.
- Charts within the chart view, plant view or project tree.

Deleting objects

You can delete both folders and objects. When you delete a chart, you also delete all the objects contained in that chart.

The project tree and the SIMATIC iMap net, plant and project views are different representations of the same project. If an object is removed from one of the windows, it automatically disappears from the other windows.

You can only delete complete instances (see "Editing function units of multifunction components".)

CAUTION
The deletion operation cannot be reversed. If you might need an object again, then you should archive the entire project first. When you delete an object, you also delete the corresponding interconnections of the technological functions! It may therefore be necessary to reconnect the inputs and outputs to other technological functions.

Accessing iMap libraries and projects

SIMATIC iMap libraries and projects behave just like normal documents. You can open, modify, save and archive them in SIMATIC iMap.

NOTICE
The content of a SIMATIC iMap project folder must only be edited with SIMATIC iMap. If you change the project data using Windows Explorer, for example, it may no longer be possible to open the project in SIMATIC iMap.

The actual project folder may be renamed, moved, copied or deleted in Windows Explorer, however.

You cannot access several SIMATIC iMap projects at the same time.

Deleting SIMATIC iMap libraries and projects

You can delete SIMATIC iMap libraries and projects by deleting the relevant folders from the file system in Windows Explorer.

Processing function units of multifunction components

The actions listed below are always performed for all instances of multifunction components, regardless whether you selected all function units:

- Copy
- Paste

The actions listed below are always performed for all instances of multifunction components, you always have to select all function units:

- Cut
- Deleting

Refer to chapter "Special PROFINET component types" for more information on multi-function components.

Setting object properties

Object properties are the data of an object that define its behavior. The **Properties** shortcut menu opens the dialog box in which you can read or set the properties of the highlighted object.

Note

If you change the settings of objects, e.g. interconnections, offline in SIMATIC iMap, they do not take immediate effect on the plant. These changes will not become active until you download the data to the target system.

Renaming objects

In SIMATIC iMap you can change the names of technological functions, devices and charts. The names of PROFINET components in the libraries cannot be changed, however.

The instances of technological functions and devices are assigned the names of the PROFINET component class by default. If several instances of a PROFINET component are used, then the name is supplemented by a consecutive number, regardless of which level of the hierarchy the component is located, e.g. Processing_1.

When a new chart is inserted, it is called "New Chart" by default. A second chart is called "New chart_1", and so on.

The following options are available for renaming:

- Edit the name directly on the object.
- Highlight the desired object and select **Edit > Properties...**. Change the name in the dialog box and click on the "OK" button. When you close the Properties dialog, the object is renamed and appears with the new name.

3.3.3 Reading and editing properties

Properties - Overview

In SIMATIC iMap you can view and, if necessary, modify the properties of the following objects:

- Project
- Instance
- Chart
- Interconnection
- Connection
- library
- PROFINET component

A description of the properties can be found in the context-sensitive help for the "Properties" dialog boxes.

To modify the properties of objects:

Procedure:

1. Open the required window.
2. Select the object, and then select one of the following menu commands:
   - **Edit > Properties** from the menu bar or
   - **Properties** from the shortcut menu.

     The "Properties" dialog box is opened.
3. Modify the desired properties and click "Accept" to confirm your changes.
4. Close the dialog box:
   - Click on OK if you want your changes to take effect
   - Click "Cancel" if you want to cancel all your changes.

Tip: Direct input of the properties

You can edit certain properties directly at the object, for example, object names and IP addresses. You can select PROFIBUS addresses directly from a list in the network view.

In order to reach the direct input mode, select the desired object and click on the area that you would like to change, e.g. the names, the IP addresses or the PROFIBUS address. The field can be edited and you can enter the property directly.

3.4 Windows and views

3.4.1 SIMATIC iMap user interface

Structure

The SIMATIC iMap user interface is made up of various windows and views that can be opened and closed as required by clicking on the icons in the toolbar, if necessary.

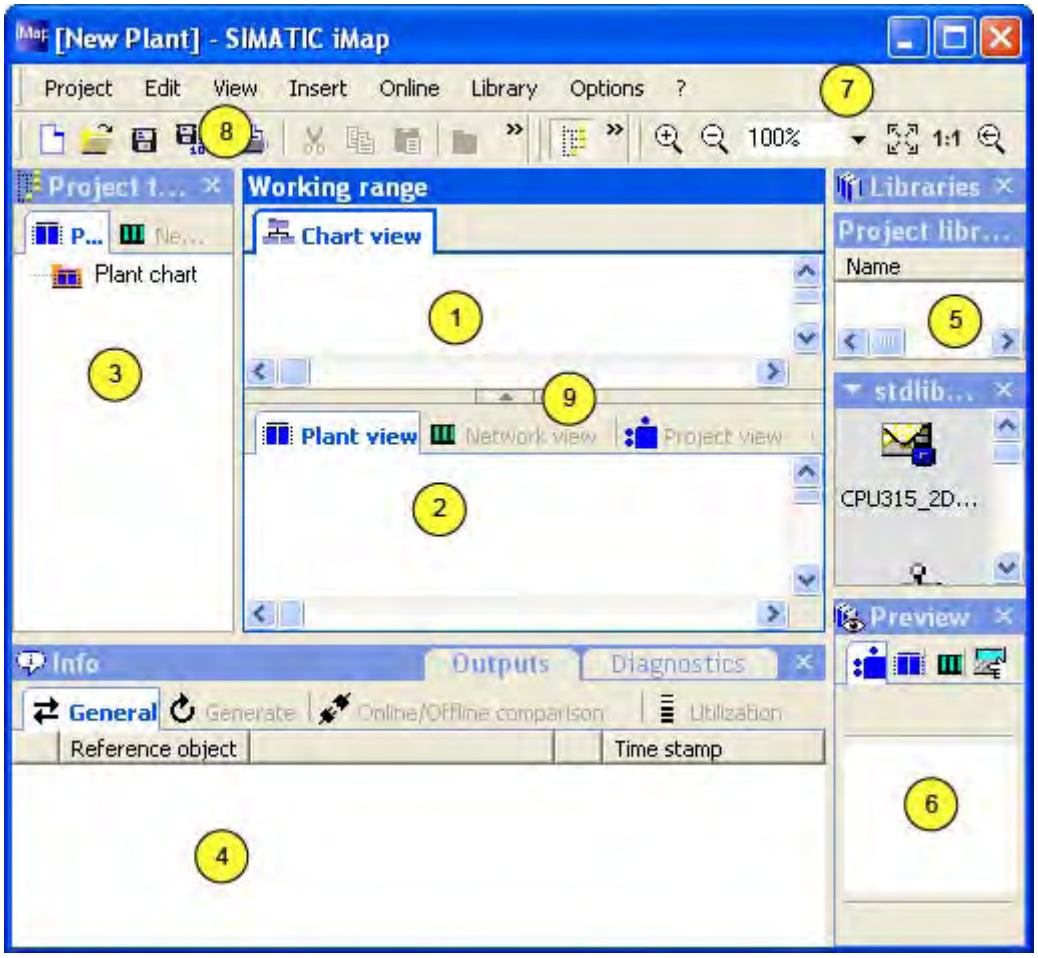


Table 3-1 SIMATIC iMap user interface

No.	Window	Icon
1	Chart view (always opened)	
2	Plant view, network view or project view (always open)	
3	Project tree	
4	Information window	
5	Library window	
6	Preview window (can only be opened in conjunction with the library window)	
7	Menu bar (see description in the appendix)	
8	Toolbar (see description in the appendix)	
9	Arrow keys for showing and hiding views	

Working with SIMATIC iMap

Depending on which window is active, various actions can be carried out. Features used in Windows applications are available here:

- Menu commands (menu bar, shortcut menus or icons in the toolbar),
- Drag & drop,
- Keyboard input

Calling help

To call up help about a window in the user interface, click in the window and press function key F1.

See also

Basic procedure for configuring the plant (Page 77)

Network view (Page 57)

Library window (Page 63)

Diagnostics window (Page 70)

Preview window (Page 64)

Project tree (Page 61)

Plant view (Page 56)

3.4.2 Representation and navigation

This chapter describes the navigation possibilities in SIMATIC iMap.

The windows and views of SIMATIC iMap offer various representations of the SIMATIC iMap project. The interface can be flexibly adapted by means of

- opening and closing the windows and views
- Hiding and showing the status bar and the toolbars

Opening and closing windows

The options for opening or closing a window are as follows:

- Select the menu command **View > <Window name>,** e.g. **View > Library window**, or
- press the symbol for the desired window.

Hiding and showing the status bar and the toolbars

- Select the menu command **View > Toolbars**, in order to hide and show the toolbars.
- Select the menu command **View > Status bar**, in order to hide and show the status bar.

Showing and hiding views

The window of the working area comprising plan view and plant view / network view / project view can not be closed. You can however choose whether you wish to have just one or both views open. Use the arrow keys to alternate between showing and hiding one of the views:

Table 3-2 For arrow keys are located on the work area:

Representation	Layout	Opened views	Effect
	Separating line between the chart view and plant view / network view / project view	Both	Close one of the views
	Bottom edge of the work area	Only the chart view	Open the plant view /network view / project view
	Top edge of the work area	Only the plant view / network view / project view	Open plant view

Showing and hiding content

In order to show or hide content or levels of the hierarchical structure you have the following possibilities:

- Menu commands, e.g. **View >...> Show all levels/Hide all levels**
- graphic symbols (+/- or arrows) directly on the objects
- Double-click an object or a chart

Navigation help "Go to"

To navigate directly to a specific window or object, use the men command **Edit > Go to >**. The offered objectives are dependent on the selected object type.

If you select a specific object (function or device) and choose the menu command **Go to** with a window as a destination, then the desired window is opened and the associated object selected. E.g.: If you select a function in the plan view and then select **Go to > Project view** , the project view opens and the function of the respective instance selected.

Finding objects

With the **Edit > Find...** menu command you can find all the objects that have specific characteristics or properties e.g.

- objects the names of which include a specific string of characters
- functions with connectors that can be hidden
- highlighted interconnections
- functions that have no chart assigned to them

The objects found are then listed in the task window, "General" tab. By double-clicking an entry in the task window, the respective object is selected in the various windows and views.

Highlighting associated objects

Once you have highlighted an object, you can double-click on that object or use the **Edit > Select in all Windows** menu command to highlight all the associated objects (PROFINET component, device and technological function, if applicable) in the other windows as well.

Example: Double-click on the technological function of an instance in the chart view selects the following objects:

- in the library: the PROFINET component the instance of which contains the selected function,
- in the project view: the function at the instance of the PROFINET component,
- in the plant view and in the plant tree of the project tree: the same technological function,
- in the network tree of the project tree and in the network view: the associated device.

Tip: Always select the source object from the chart view, for it will then remain visible, and you can navigate to the associated objects in the other windows and views.

3.4.3 Chart view

Description

The plan view contains the plan hierarchy of the plant with all the functions and charts. The plan hierarchy is represented as a tree structure. By showing and hiding levels you can reduce or expand the representation as you wish. With the "Go to" command you can also simply navigate through large plan hierarchies. Multiple selection as well as operation via menu commands, shortcut menus, mouse and keyboard enables a comfortable handling of the objects.

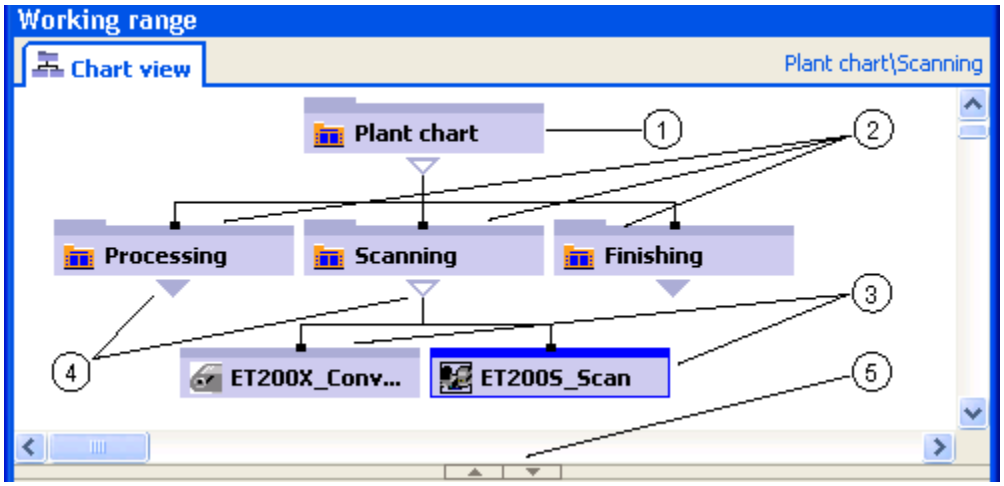


Figure 3-4 Plan view

Table 3-3 Key

1	Main chart (plant chart)
2	subordinate charts
3	Functions
4	Arrow keys for showing and hiding levels
5	Arrow keys for hiding and showing the plan view in the work area

Actions

The main actions available in the plan view are as follows:

- Set up, structure and change the plan hierarchy of the plant by copying, inserting, moving and deleting functions and charts.
- Inserting instances of PROFINET components from the libraries
- Inserting and deleting new charts.
- Copying individual functions from the project view to the chart hierarchy by means of drag-and-drop.
- Explicitly removing unused functions from the chart hierarchy. The application status of the functions is indicated in the project view.
- Finding associated objects in other windows and views.
- Displaying and modifying properties of instances.
- Downloading interconnections and programs to the destination devices of the plant
- Comparing online with offline data
- Diagnosing technological functions.
- Printing charts.

Reference to other windows and views

When you insert the instance of a PROFINET component in the chart view, the associated objects are automatically shown in the various windows and views:

- the instance in the project view
- the function in the plant view, and in the plant tree of the project tree, and
- the device in the network view, and in the network tree of the project tree.

Originating from an object selected in the chart view, you can change directly to the associated object in another window by selecting **Go to** from the shortcut menu.

3.4.4 Plant view

Description

In the plant view, the instances of the inserted PROFINET components are visible as technological functions. The interconnections, i.e. the logical data connections between two or more technological functions, are represented by lines. These lines cannot be manipulated. Lines which cannot be displayed, for example, due to a lack of space are replaced by "continuation" connectors.

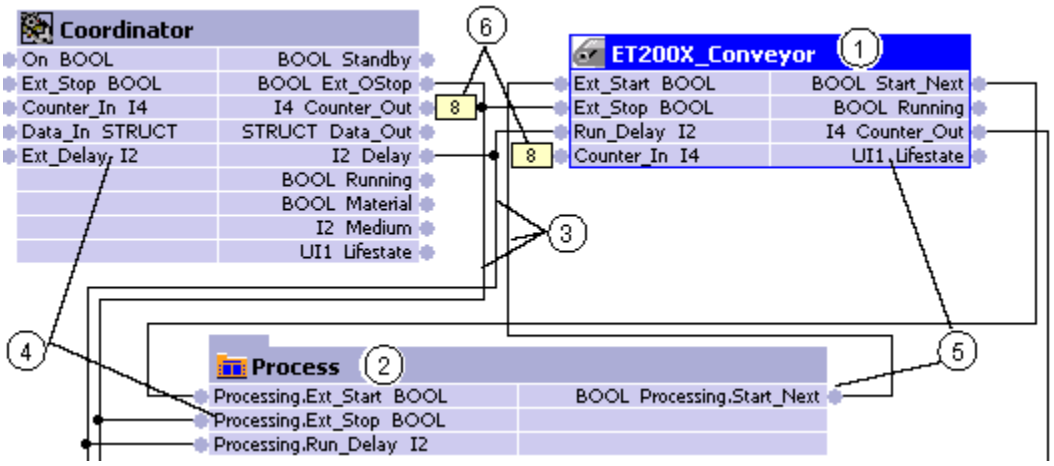


Figure 3-5 Plant view

1 Technological function of the instance
2 Chart
3 Interconnections
4 Inputs
5 Outputs
6 Continuation connectors

Actions

The main actions available in the plant view are as follows:

- Inserting instances of PROFINET components from the libraries
- Displaying and modifying properties of instances.
- Creating and deleting interconnections
- Displaying and modifying properties of connectors
- Downloading interconnections and programs to the devices of the plant
- Inserting and deleting new charts.
- Printing charts.
- Set and display online values
- Comparing online and offline data
- Diagnosing technological functions and interconnections

Reference to other windows and views

If, in plant view, the instance of a PROFINET component is inserted, the associated objects are automatically displayed in the various windows and views:

- the instance in the project view
- the function in the plant view, and in the plant tree of the project tree, and
- the device in the network view, and in the network tree of the project tree.

From a highlighted object in the plant view you can use the **Go To** shortcut menu to jump directly to the associated object in one of the other windows.

See also

SIMATIC iMap user interface (Page 49)

Interconnecting Technological Functions (Page 123)

3.4.5 Network view

Description

In the network view the instances of inserted PROFINET components are displayed as objects with one or more network connectors. They are designated as "Devices" in the network view. The devices each have IP and/or PROFIBUS addresses.

The Ethernet is created as a green line and the PROFIBUS network as a violet horizontal line when a PROFINET component of a PROFIBUS master with proxy functionality is inserted from a library. Possible insertion positions are highlighted in color.

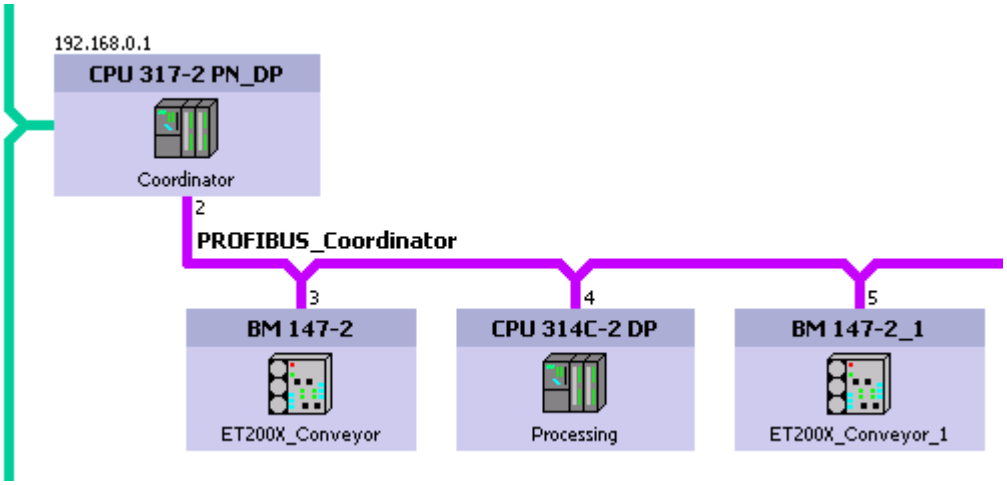


Figure 3-6 Network view

Actions

The main actions available in the network view are as follows:

- Inserting PROFINET components from the libraries.

  Note: When inserting in the network view the associated functions cannot be assigned charts and are therefore not visible in the plant view. Instances of functions that are not assigned charts are designated "unused" and are only visible in the project view. Unused functions can be assigned in the plan hierarchy at a later time.
- Moving, copying, cutting or deleting devices.
- Displaying and modifying properties of instances.
- Inserting, cutting, moving and deleting Ethernet nodes.
- Coupling uncoupled PROFIBUS devices to a PROFIBUS network.
- Assigning addresses.
- Downloading programs and interconnections to all or just the selected devices.
- Printing the network view.
- Online monitoring and diagnostics of devices.
- Comparing online and offline data.

Reference to other windows and views

If a PROFINET component is inserted in the network view, the instance is automatically displayed in the project view.

From a highlighted object in the network view you can use the **Go To** shortcut menu to jump directly to the associated object in one of the other windows.

Uncoupled PROFIBUS devices

Uncoupled PROFIBUS devices are saved in the network view above a separating line in the following cases:

- when pasting the component into the chart view, or plant view, or project view,
- if no PROFINET component with proxy functionality has been inserted yet or
- when the instance of the PROFINET device with proxy functionality to which is was connect was deleted.

Uncoupled PROFIBUS devices can, for example: be coupled by drag & drop to a PROFIBUS network.

See also

Connecting devices in the network view (Page 115)

3.4.6 Project view

Description

The project view represents the association between the PROFINET components in the library and the inserted instances - functions and devices. The instances present in the project plus the integrated HMI devices (if present) and their generation status are displayed for every PROFINET component.

The information is shown in table format (see diagram below).

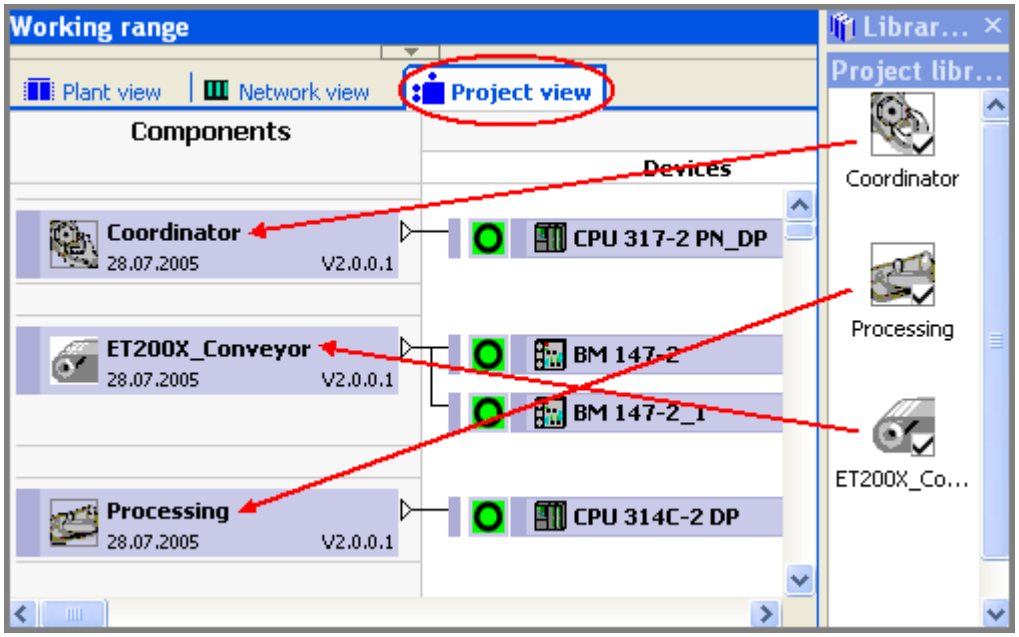


Figure 3-7 Information in the project view

Legend - project view

	Column	Contents
1	Components	Name, version and date of creation of the PROFINET component
2	Generation status of the instance	Graphical representation (symbol)
3	Devices	Icon and name of the device
4	Functions	Icon and name of the technological function
5	Generation status of the HMI module	Graphical representation (symbol)
6	HMI	Integrated HMI module

Icons for generation status and usage

Icon	Generation status of the instance	Meaning
	Generated	The generation was successful.
	Not generated	Generation is required

Symbol	Using the function in the chart hierarchy	Meaning
	In use	The function is assigned to a chart
	Not in use	The function is not assigned to a chart

Tip: The generation status and usage are indicated as tooltips.

Actions

You can carry out the following actions in the project view:

- Cutting, copying or deleting instances
- Replacing instances
- Looking up and modifying properties
- Assigning functions to a chart (in the chart view or plant tree) with drag-and-drop, and thus marking it "in use."
- Showing/hiding instances

Showing/hiding instances

You can show and hide information about instances as follows:

- Selected components using the menu commands:
  - **View > Project view > Show instances** or
  - **View > Project view > Hide instances**
- or the commands of the shortcut menu
  - **Show instances** or
  - **Hide instances**
- If nothing is marked, the command of the shortcut menu refer to all instances of the project:
  - **Show all instances** or
  - **Hide all instances**
- By clicking on the arrow symbols in the component column.

See also

Generation status (Page 90)

3.4.7 Menu bar

The menu bar contains the menu commands for SIMATIC iMap. A brief description of the selected menu command is displayed on the SIMATIC iMap status bar. A summary of all the menu commands can be found in the appendix.

3.4.8 Project tree

Description

In the project tree, the objects in the project are shown hierarchically. The project tree has two parts:

- The plant tree - corresponds to the plant view
- The network tree - corresponds to the network view

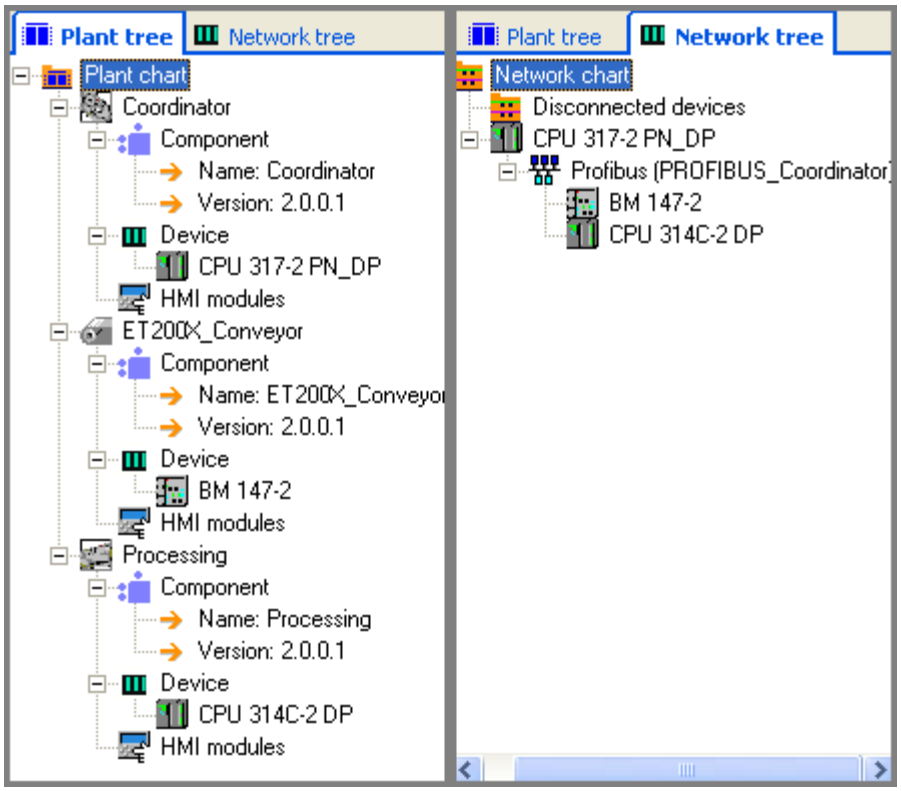


Figure 3-8 Project tree

The technological functions of the instances are displayed in the plant tree and the devices in the network tree when PROFINET components are inserted into the project. Subordinate charts are also displayed hierarchically in the plant tree. Instances of PROFINET components that do not contain a technological function, e.g. the IE/PB link, are only displayed in the network tree.

The plant tree contains the designation of each function, while the network tree contains the designation of the device, e.g. BM 147.

Changing the view of the project tree

You can use the **View > Project tree >...** menu command to:

- display additional information about the objects and
- show/hide hierarchical levels.

Actions

The main actions available in the project tree are as follows:

- Navigating between different charts.
- Moving, copying, inserting and deleting objects.
- Looking up and modifying properties.
- Downloading programs and interconnections to the devices of the plant.
- Comparing online and offline data.
- Creating and opening subordinate charts in the plant tree.

Reference to other windows and views

Any changes in the arrangement of objects in the network tree are automatically applied to the network view, and vice versa.

Any changes in the arrangement of objects in the plant tree are automatically applied to the plant view, and vice versa.

When you insert the instance of a PROFINET component into the SIMATIC iMap project, the technological function is automatically displayed in the plant tree and the device in the network tree.

Double-clicking on an object in the project tree highlights all the associated objects in the other windows.

See also

SIMATIC iMap user interface (Page 49)

3.4.9 Library window

Description

Libraries contain the reusable PROFINET components for configuring the plant. They enable the structured storing of PROFINET components.

The library window includes the project library and optionally one or more further global libraries. The project library is assigned to the most recently opened project. It is automatically opened, saved and closed together with the project.

The PROFINET components from a library can be displayed with large or small icons or as a list with or without detailed information via the **View** pop-up menu.

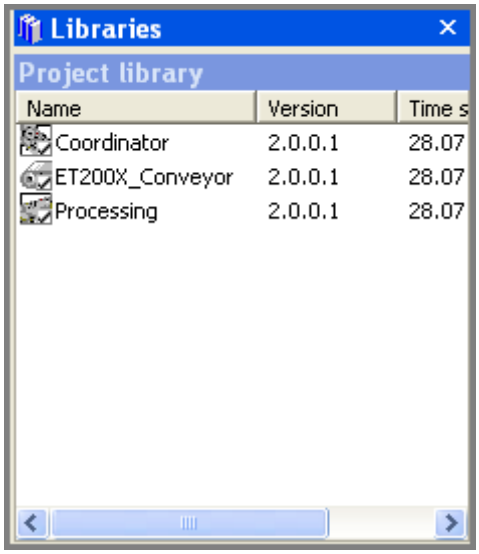


Figure 3-9 Library window

Actions

You can carry out the following actions in the library window:

- Creating, opening and closing libraries.
- Importing PROFINET components from the file system into a library.
- Inserting instances of the PROFINET components from a library into the SIMATIC iMap project.
- Cutting or copying PROFINET components and pasting them into other libraries.
- Displaying the properties of a PROFINET component.
- Upgrading PROFINET components.

Note

Libraries are stored in the file system as folders. From there they can be moved, copied, inserted or deleted. Libraries which are deleted in Explorer can no longer be opened via SIMATIC iMap.

Reference to other windows

If a PROFINET component is selected in the library window, information on this component is displayed in the preview window.

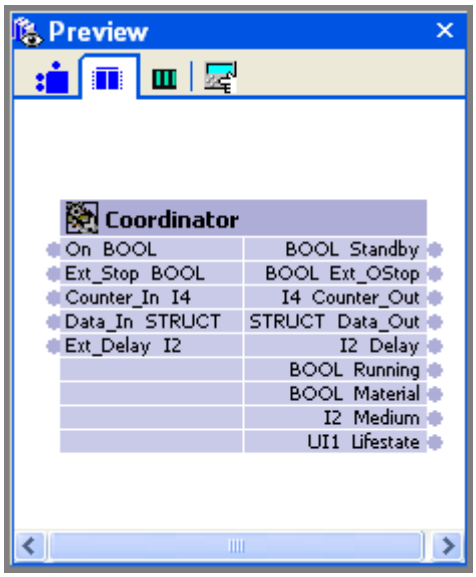


Figure 3-10 Preview window

See also

Preview window (Page 64)

Library types (Page 102)

3.4.10 Preview window

Description

This preview window displays information regarding the PROFINET component selected in a library.

The library window must be open in order to open the preview window.

Tip: The name of the current tab is indicated as Direct Help.

"General" tab

This tab includes general information on the PROFINET component selected in a library, like component type, version and runtime version.

Double-click on the "Documentation" link to open the documentation for the PROFINET component. The link is only displayed if the component contains a documentation link.

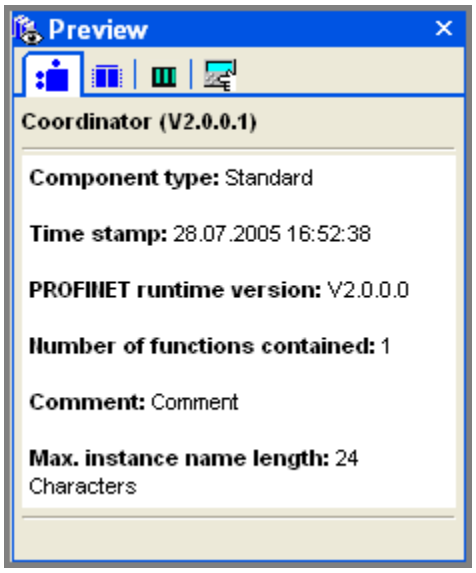


Figure 3-11 Preview window, General tab

"Function" tab

This tab displays the technological function of the PROFINET component selected in a library.

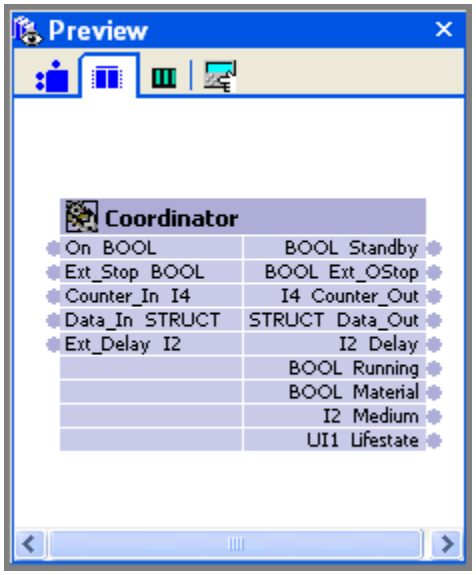


Figure 3-12 Preview window, Function tab

"Device" tab

This tab displays the device for the selected PROFINET component in the bus connectors.

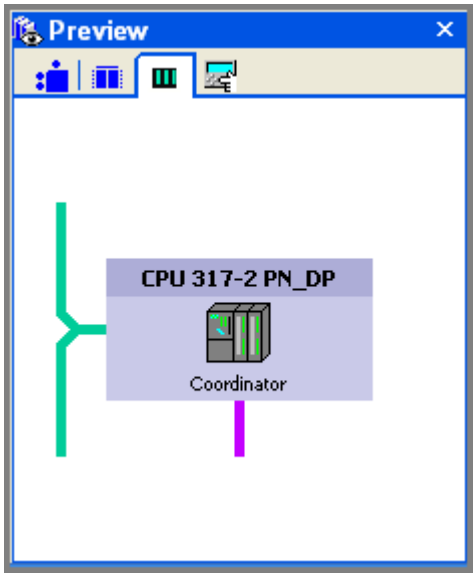


Figure 3-13 Preview window, Device tab

"HMI" tab

This tab displays information regarding the HMI units of the selected PROFINET components (if available).

Actions

You can carry out the following actions in the preview window:

- In the "General" tab: Open the documentation stored for a PROFINET component (if available).
- On the "Function" tab: Display the technological function.
- On the "Device" tab: Display the device.
- On the "HMI" tab: Display the HMI units.

Reference to other windows and views

The preview window can only be opened if the library window is open. The preview window is closed when the library window is closed.

3.4.11 Information window

Description

The information window displays diagnostics information and information about current actions in SIMATIC iMap. The appropriate tab is opened automatically when new information arises about an action.

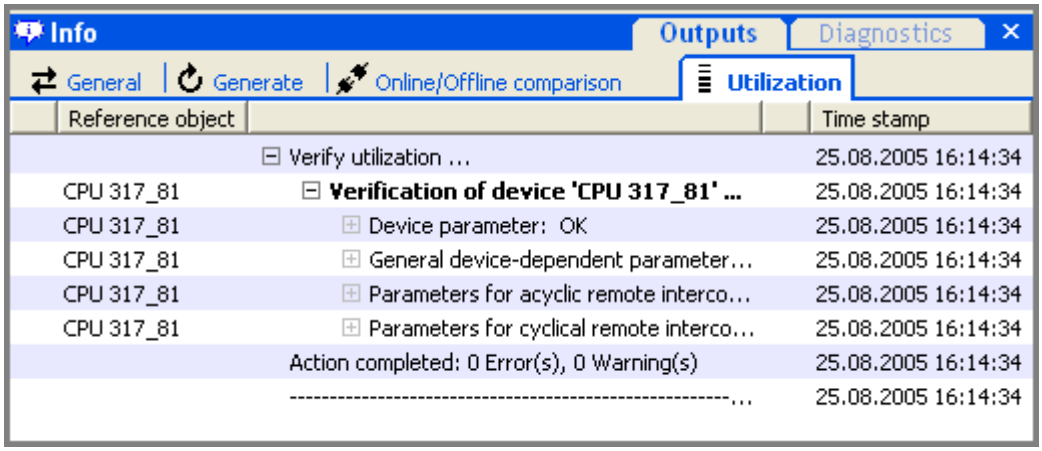


Figure 3-14 Information window

Content of the information window

The information window contains two tabs:

- Edition

  The output window displays information about current actions in SIMATIC iMap.

- Diagnostics

  In the diagnostics window diagnostics information is displayed in online mode. In addition you can edit the variable table of the project under the "Variable table" tab and monitor variables online.

3.4.11.1 Output window

Description

The output window displays information about current actions in SIMATIC iMap.

The appropriate tab is opened automatically when new information arises about an action.

Content of the output window

The following messages are automatically displayed on the tabs in the output window:

Tab	Contents
General	Status and progress of the action, plus any errors that occur while running commands, such as Open and Save, Download or Online Connection. Results when searching for objects.
Generate	Generation status and progress
Online/Offline comparison	Result of the online/offline comparison of programs and interconnections
Utilization	Result of the utilization check for devices and functions

The "Reference object" column lists the names of the objects to which the messages relate.

Note

The old content of the output window is not automatically deleted when new messages are displayed.

Editing the content

You can edit the content of the output window as follows:

- Use the **Edit > Output window > Copy All** menu command to copy all the messages in text format to the clipboard so that they can be further edited, e.g. by pasting them into a text editor.
- Use the **Edit > Output window > Delete All** menu command to delete all the messages.

Reference to other windows

Double-click on a reference object to highlight the associated object in the relevant view.

See also

Explanation of the error numbers

Generating the Project (Page 86)

Diagnostics window (Page 70)

Output window, "General" tab

Displays information about actions, such as opening or creating projects and libraries in SIMATIC iMap. This output window tab opens automatically when new information arises about such actions.

Output window, "Generate" tab

Displays the progres and any errors during generation of the project. This output window opens automatically when a project is generated.

See also

Generating the Project (Page 86)

3.4.11.2 Output window, "Online/Offline comparison" tab

Output window, "Online/Offline comparison" tab

Displays the results of the online-offline comparison of programs and/or interconnections. This output window tab opens automatically when you run an online-offline comparison.

3.4.11.3 Output window, "Utilization" tab

Output window, "Utilization" tab

Displays the results of the utilization check (Page 141) of the configured devices and functions. This output window tab opens automatically when new information arises about such actions.

Here you will find the following information:

- Additional error messages for interconnections with cyclic transfer (Page 155)
- A list of the utilization parameters with actual values and limits. The utilization parameters can be subdivided into the following parameter groups:
  - Device parameters (Page 146)
  - General interconnection-specific parameters (Page 147)
  - Parameters for acyclic remote interconnections (Page 149)
  - Parameters for cyclic remote interconnections (Page 153)

See also

Utilization parameters of the PROFINET devices (Page 145)

Performance parameters of PROFINET devices (Page 143)

3.4.11.4 Diagnostics window

Description

Diagnostic information on process variables and on faults in technological functions, devices and interconnections is displayed on three tabs in the diagnostic window. The three tabs in the diagnostic window are:

- Functions
- Devices
- Variable table - described in a separate section.

To display the diagnostic information on the "Functions" and "Devices" tabs, select the **Online > Monitor** menu command.

See also

Variable table (Page 74)

3.4.11.5 Diagnostics window, "Functions" tab

"Functions" tab

All the malfunctions are displayed in the left-hand window. The right-hand window contains:

- Detailed information on the selected object
- or a reference to the associated faulty device
- or buttons for download or call for the help.

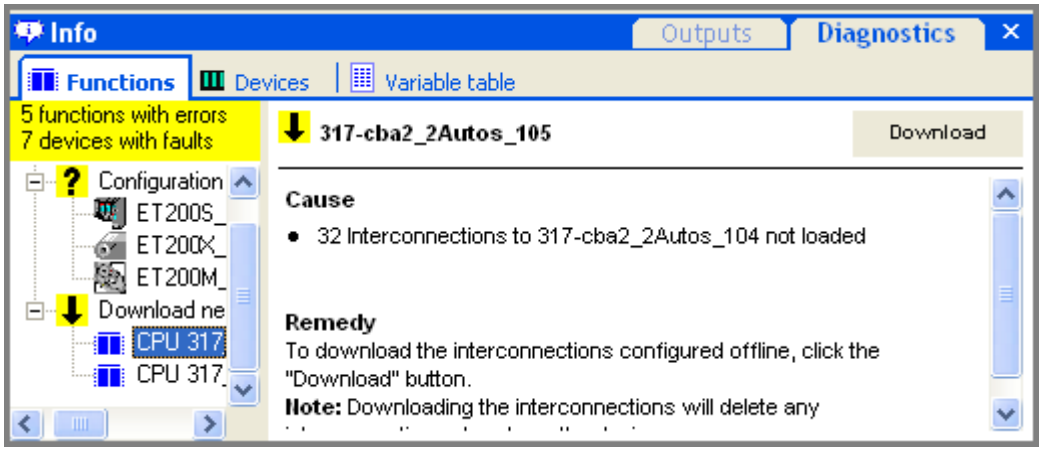


Figure 3-15 Diagnostics window, Functions tab

Actions

You can perform the following actions:

- Trace and analyze errors
- Read troubleshooting information, for example, download required.
- Open the cross references to faulty devices or functions in window on the right side as required.
- On the right window, click a button as required:

Button	Action
Diagnostics	Calls device-specific diagnostics
Download	Downloading the interconnections
Help	Calls the help

Reference to further windows and views

An error reported in the diagnostics window is identified by a diagnostic symbol on the affected object in all views.

Double-click the faulty function on the diagnostics window to display the affected technological function in the chart view and plant view.

Double-click on a faulty device in the diagnostic window to the affected device in the network view.

Example of faults in technological functions

The following diagram illustrates technological functions for which the interconnections will have to be downloaded. The right-hand window shows which interconnections have to be downloaded for the selected function. If you click on the "Download" button, the interconnections are downloaded to the destination system.

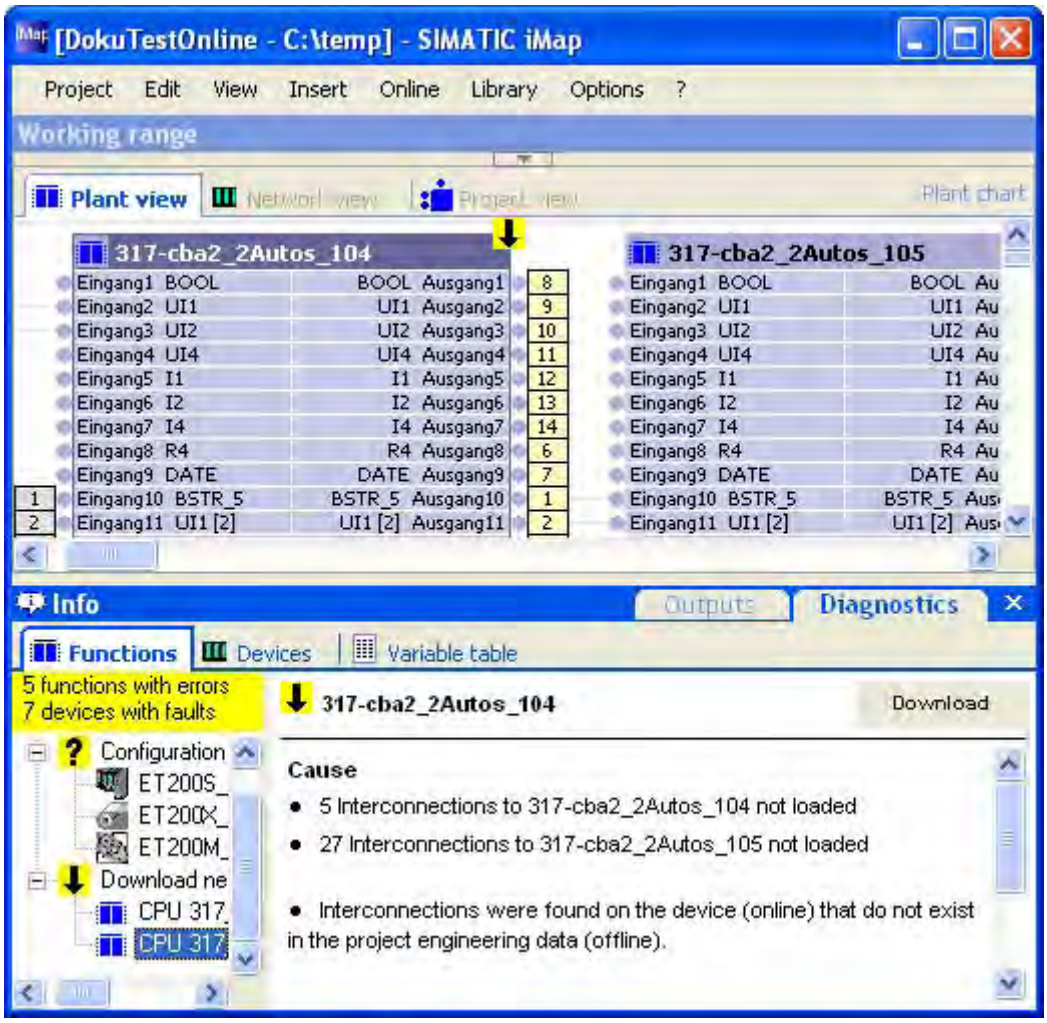


Figure 3-16 Diagnostics window: Example of errors at technological functions

3.4.11.6 Diagnostics window, "Device" tab

"Device" tab

Information on all faulty devices is displayed in the left-hand window. The right-hand window contains:

- Detailed information (including causes and remedies) on the selected object
- or a reference to the associated faulty functions
- or buttons for calling up help or device-specific diagnostics.

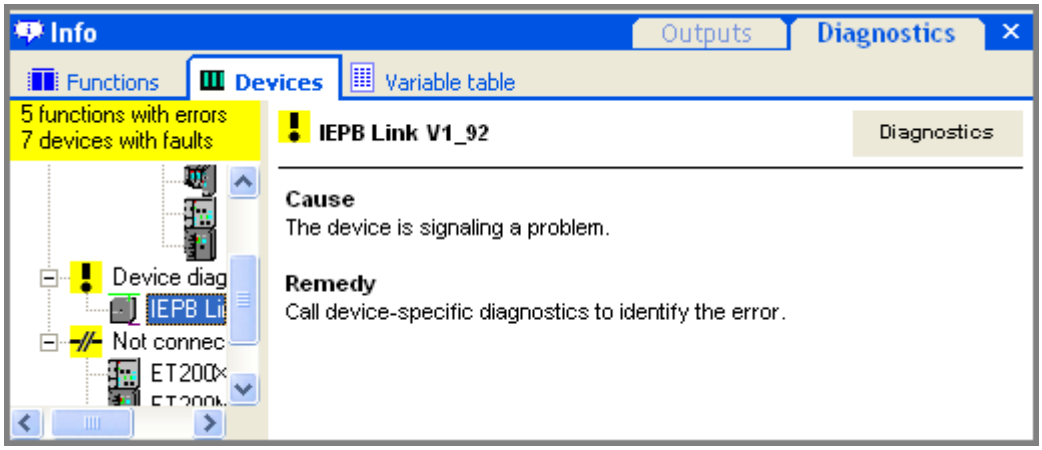


Figure 3-17 Diagnostics window, Devices tab

Actions

You can perform the following actions:

- Trace and analyze errors
- Read troubleshooting information, for example, download required.
- Open the cross references to faulty devices or functions in window on the right side as required.
- On the right window, click a button as required:

Button	Action
Diagnostics	Calls device-specific diagnostics
Download	Downloads the interconnections
Help	Calls the help

Reference to further windows and views

An error reported in the diagnostics window is identified by a diagnostic symbol on the affected object in all views.

Double-click the faulty function on the diagnostics window to display the affected technological function in the chart view and plant view.

A double-click on the faulty device in the diagnostic window displays the affected device in the network view.

3.4.11.7 Variable table

Diagnostics window, "variable table" tab

Description

The variable table is used in SIMATIC iMap for online monitoring and control of variables during the plant testing and commissioning phase. It has its own online mode that can be switched on and off independently of the online monitoring in the plant and network views.

The variable table contains the data for the connectors of the SIMATIC iMap project to be monitored. You can enter the connectors directly or use drag-and-drop to insert them from the plant view into the variable table.

Individual columns in the variable table can be shown / hidden using the **View > Variable table >**... menu command or with the **Columns >**... shortcut menu.

The following diagram shows a variable table in the online view.

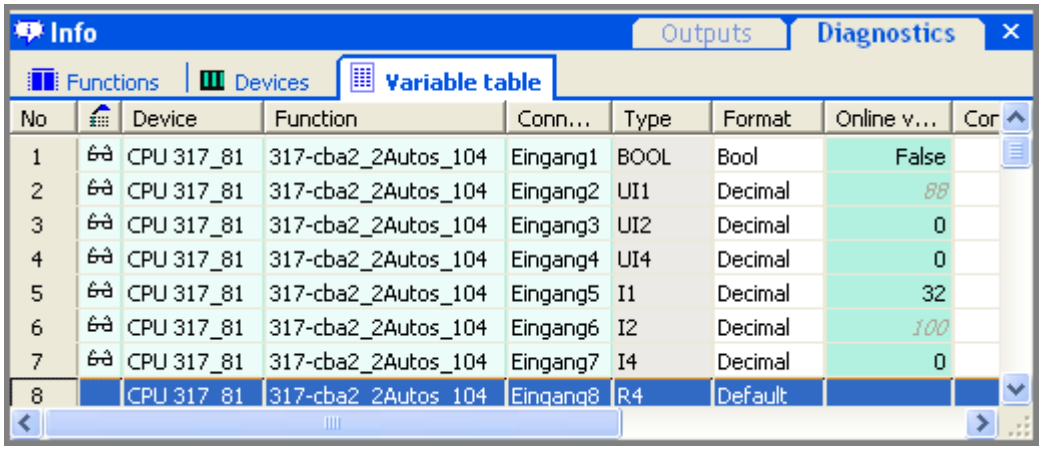


Figure 3-18 Diagnostics window, "Variable table" tab

Actions

You can carry out the following actions in the variable table:

- Adding, copying, deleting and sorting entries
- Changing the display format
- Show and hide columns
- Monitoring and controlling all or just selected variables online
- Editing control values and transferring them to the devices of the plant for testing purposes.
- Importing and exporting data

Reference to other windows

The **Go to > plant view: Function connection** command of the shortcut menu selects the corresponding connection in the plant view.

3.5 Setting up and starting additional tools

Setting up and starting tools

You can configure SIMATIC iMap so that you can start any software tool with a menu command, e.g. in order to edit data from the current project.

To set up a new tool:

1. Select the **Options > Customize** menu command and open the "Tools" tab
2. Click on the "New Entry" button.
3. In the "Name" box, enter the name under which the program is to be called in SIMATIC iMap.
4. In the "Command" box, enter the path of the program or click on the "Browse" button to select the program from the file system. You can select the following:
   - the actual program (e.g. winword.exe) or
   - a file (e.g. <document>.doc) to be opened with this program.
5. Click on "OK" or "Accept" to confirm your input.

Result: The program is added to the list of tools that can be called directly in SIMATIC iMap.

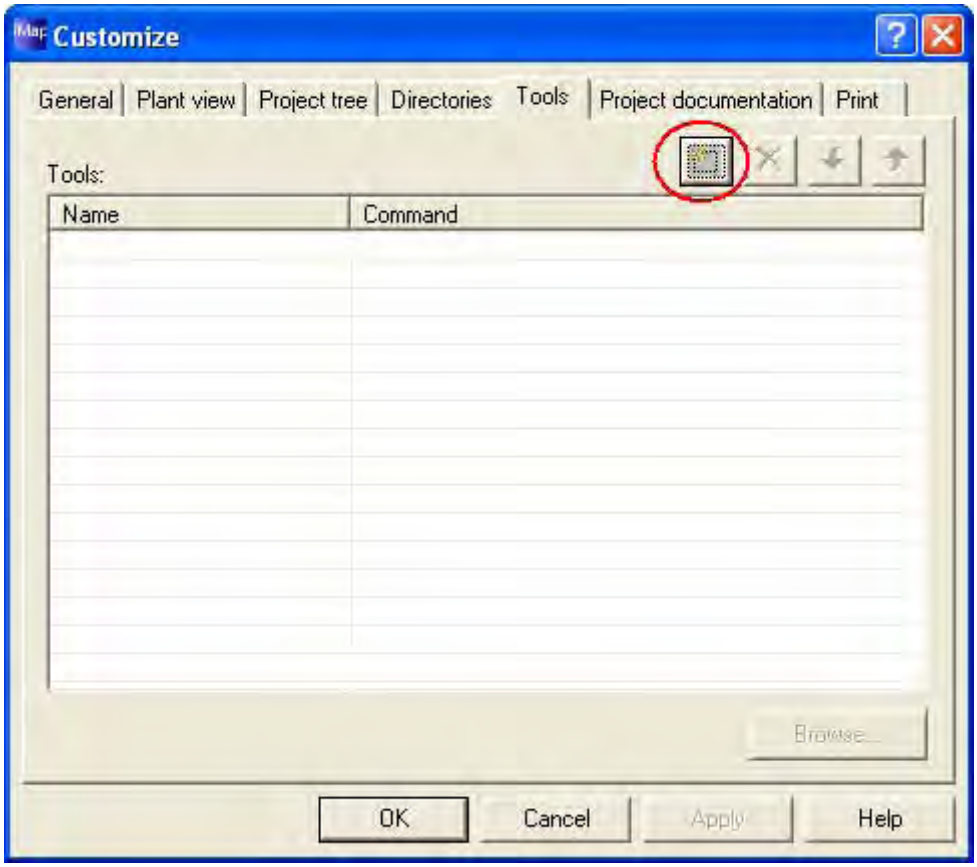


Figure 3-19 Setting up tools

Note

You can use the buttons in the Customize dialog to move or delete entries in the tools list.

To start a tool you have set up:

You can only call tools that are entered under "Tools" in the settings.

To start a tool, select the **Options > Tools >** ... menu command.

Result: The called program is started.

Systems engineering

4

4.1 Basic procedure for configuring the plant

Requirements

The following requirements must be fulfilled before you can configure a plant using SIMATIC iMap:

- SIMATIC iMap must be installed on your PC/programming device.
- The device-specific configuration and programming tool, e.g. STEP 7, is installed on your PC/programming device (optional). Depending on the type of device, this software is needed in order to carry out certain actions, e.g. Generate.
- The necessary PROFINET components must have been created.

Basic procedure

1. Start SIMATIC iMap
2. Create or open a project.
3. The options are as follows, depending on whether the PROFINET components have already been imported into a destination library:
   - If yes, then open the library with the PROFINET components.
   - If not, import the PROFINET components into the project library or into another library.
4. Insert instances of the PROFINET components into the SIMATIC iMap project.
5. Couple devices in the network view.
6. Assign IP and/or PROFIBUS addresses to the devices.
7. Arrange and interconnect technological functions in the plant view.
8. Check the configuration (utilization) of the devices and functions (optional).
9. Generate a SIMATIC iMap project.
10. Document a SIMATIC iMap project (optional).
11. Print a SIMATIC iMap project (optional).

Further optional tasks

Tasks you can perform at any time:

- Modify properties (optional).
- Editing PROFINET components (optional)
- Replace instances (optional).
- Archive a SIMATIC iMap project and library (optional).
- Exporting and importing project descriptions

4.2 Working with projects

4.2.1 Creating a new project

A new SIMATIC iMap project is always opened when you open SIMATIC iMap. You can edit and save this project or open an existing project for editing.

How to create a new SIMATIC iMap project

The options for creating a new SIMATIC iMap project are as follows:

- Restart SIMATIC iMap or
- Select the **Project > New** menu command.

A new SIMATIC iMap project opens in both cases. The associated project library is opened in the library window.

The SIMATIC iMap project is stored in a folder.

NOTICE
The content of a SIMATIC iMap project folder must only be edited with SIMATIC iMap. If you change the project data using Windows Explorer, for example, it may no longer be possible to open the project in SIMATIC iMap.

The actual project folder may be renamed, moved, copied or deleted in Windows Explorer, however.

Note

In SIMATIC iMap, you can only edit one project at a time. If you wish to edit several projects at the same time, then you must start several instances of SIMATIC iMap.

4.2.2 Opening and closing the project

Requirement

A new, empty SIMATIC iMap project is always opened when you open SIMATIC iMap. You can open a different project at any time, provided that this project was saved in SIMATIC iMap.

In SIMATIC iMap, only one project may be open at any given time. When you open a new project, the current project is closed and you are prompted to save any changes you have made in the current project.

Note

A SIMATIC iMap project cannot be open in two SIMATIC iMap applications concurrently.

To open a project in SIMATIC iMap

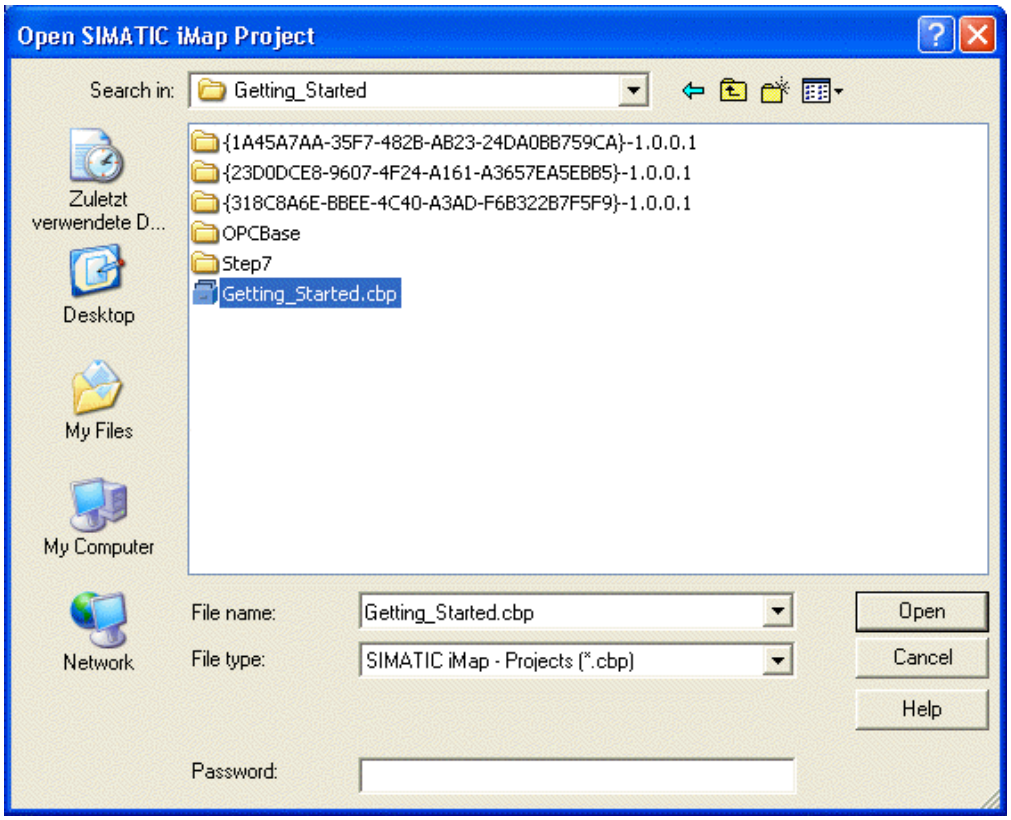


Figure 4-1 Open the SIMATIC iMap project

1. Select the **Project > Open...** menu command.

   A dialog box for browsing the file system for existing projects opens. Look for a project file with the extension .cbp.
2. Select the project folder from the "Search in" box. The box beneath displays only directories and files of the desired file type - SIMATIC iMap project.
3. Select the file name with the extension .cbp.

   The file name is displayed in the "File name" box.
4. If the selected project is password-protected, enter your password in the "Password" box.
5. Click "Open."

Result: The project is opened in SIMATIC iMap.

Tip: The "File name" drop-down list contains the most recently opened SIMATIC iMap projects.

Note

You can also open a project by double clicking a SIMATIC iMap project file (extension .cbp).

To close a project in SIMATIC iMap

To close a project in SIMATIC iMap, you can either:

- Exit SIMATIC iMap,
- Create a new project or
- Open another project.

Each of these options closes the current project. If you have made any changes to the current project or to the project library, you are first prompted to save these changes. A dialog box with the following selection options opens:

- "Yes" to save the changes to the current project before closing
- "No" to close the current project without saving
- "Cancel" to cancel the operation and return to the current project.

Note

Changes that have to be saved with the project include the following:

- Changes to the project library
- Changes to the varaible table
- Changes to the OPC prefix

Projects from the previous versions

The way in which data is stored in the latest version of SIMATIC iMap has changed, and is no longer compatible with the previous versions.

If you want to edit a project that was created in SIMATIC iMap V1.2 or V2.0, you will have to convert the data storage system to the current version. The associated SIMATIC iMap library of version V1.2 must be open to be able to convert the PROFINET components used from the version V1.2.

To open a project in the V1.2 version

1. Start SIMATIC iMap.
2. Use the **Library > Open...** menu command to open the library that was used for the project from the V1.2 version.
3. Open the project using the **Project > Open...** menu command.

Result: The project is converted to the new version of the data storage system, and the PROFINET components used are imported into the project library.

Note

After conversion, the project can no longer be opened with the earlier version of SIMATIC iMap.

Tip:

Save a backup copy of the project you still want to open in an earlier version of SIMATIC iMap before you run it in the current version. With version V1.2 projects you should also copy the library with the necessary PROFINET components.

Tip:

A backup copy of the original project is generated in the folder containing the converted project. The folder is called "V20backup" or "V12backup". If you still want to keep the project open with the earlier version of SIMATIC iMap then use this copy.

4.2.3 Protect project

Effect of the project protection

You can assign a password to your SIMATIC iMap project to protect it against unauthorized access. The password together with the level of protection is defined in the project properties and must be entered when you open the project.

You can choose one of the following levels of protection for a SIMATIC iMap project:

Project protection	Meaning
No protection	No password is required to open and change the project.
Write protection	A password is required to change the project. A protected project will be opened read only if you do not enter the password, i.e. you can not edit the configuration data and properties. When a project is write-protected, all the views have a gray background in SIMATIC iMap.
Read protection	A password is required to open the project. If the correct password is not entered, the project will not open.

How to define the security level of a project

1. Open the project properties using the **Project > Properties** menu command.
2. On the "Project security" box, set the "Change security level" check box
3. Select the "Write protection" or "Read protection" option.
4. Assign a password as required. Type the password into the "New password" box, then repeat it in the "Confirm" box.
5. Confirm your entry with "OK" or "Accept".

How to change the project password

1. Open the project properties using the **Project > Properties** menu command.
2. Make sure you have set the "Change security level" check box at the "Project security" field, and either the "Write protection" or "Read protection" option. If not, select one of those security levels.
3. On the "Project security" box, set the "Change password" check box
4. To change an existing password, enter the old password in the "Old password" box. Then enter the new password in the "New password" box and then repeat it in the "Confirm password" box.
5. Confirm your entry with "OK" or "Accept".

Note

The project security settings are retained in your project backup and restore files.

The project's security settings are not applied to the project description after an export.

To cancel the password protection:

To cancel the password protection for a project:

1. Open the project properties using the **Project > Properties** menu command.
2. On the "Change security level" area in the "Project security" field, set the "No protection" option.
3. Enter the old password in the "Old password" box.
4. Confirm your entry with "OK" or "Accept".

Possible actions on a write-protected SIMATIC iMap project

If a SIMATIC iMap project is write protected, neither the configuration data nor the project properties can be altered. However, the following actions are possible:

- Online and diagnostics functions, e.g. online device analysis, online - offline comparison or monitoring varaible table online
- Downloading Programs and Interconnections
- Check the utilization
- Consistency check
- Re-edit components
- Check the properties
- Documenting and printing a project
- Display and navigation functions

4.2.4 Saving and archiving a project

Data storage of a SIMATIC iMap project

A SIMATIC iMap project is created in the form of a directory tree, and can be stored as an archive file.

If you save it, all the files belonging to the SIMATIC iMap project are stored in a separate folder. You are prompted to enter the path when you save the project for the first time. You can enter any name for the project file. It is automatically assigned the extension cbp. The project file is stored together with other project data in a folder of the same name.

If you archive it, all the project data is stored in an archive file. You can assign a user-specific file name. It is automatically given the extension .arp.

Note

Use the **Options > Customize** menu command to define, on the "Directories", a storage location that will be suggested by default when you open, save or archive projects.

How to save a SIMATIC iMap project

The options for saving a project in SIMATIC iMap are as follows:

- Select the **Project > Save** menu command to save the current project under the same name. The old project is overwritten.
- Select the **Project > Save As...** menu command to save the current project under a different name. The old project remains unchanged. You can enter any path and name for the new project.

If you save a project with a new name, it retains its password protection. The project library is saved together with the project.

To archive the currently opened SIMATIC iMap project

Note

The last stored version of the currently opened project is archived. If there are unsaved changes in the project, you will be prompted to save them first before archiving.

To archive the project that is currently opened, proceed as follows:

1. Select the **Project > Archive > Open project** menu command.

   A dialog box for selecting the storage location opens.
2. In the "Archive iMap project library as" dialog box, select the folder in which the archive file is to be stored.
3. Accept the name suggested in the "File name" box, or enter a different name for the archive file, then click "Save."

Result: The archive file is created and the result is signaled on screen. The project library is archived together with the project.

To archive a stored SIMATIC iMap project

To archive any SIMATIC iMap project, proceed as follows:

1. Ensure that the project is not opened in SIMATIC iMap.
2. Select the **Project > Archive > Stored project** menu command.

   A dialog box for browsing the file system for existing projects opens. Look for a project file with the extension .cbp.
3. Select the project folder from the "Search in" box. The box beneath displays only directories and files of the desired file type - SIMATIC iMap project.
4. Select the file name with the extension .cbp.

   The file name is displayed in the "File name" box.
5. Click "Open."

   A dialog box for selecting the storage location opens.
6. In the "Archive iMap project library as" dialog box, select the folder in which the archive file is to be stored.

7. Accept the name suggested in the "File name" box, or enter a different name for the archive file, then click "Save."

Result: The archive file is created and the result is signaled on screen. The project library is archived together with the project.

Note

The backup file of a project retains its project security.

How to restore a SIMATIC iMap project

Note

You can only retrieve projects that were archived with SIMATIC iMap.

To retrieve a project, proceed as follows:

1. Select the **Project > Retrieve...** menu command.

   This opens a dialog box where you can run a search in the file system for existing archive files.
2. Select an archive file (.arp file). There are two options:
   - Search for the required archive file in the "Search in" field, or
   - Select the most recently archived projects from the "File name" drop-down list.
3. Click "Open."

   A dialog box for selecting the target folder opens.
4. Select the folder to which you wish to save the retrieved project and click "OK".

Result: The project folder is created in the specified destination folder and the result is signaled on screen.

See also

Generating the Project (Page 86)

4.2.5 Generating the Project

4.2.5.1 Generating the Project

Generating projects in SIMATIC iMap

You need to generate a project before you can download its data to the devices of the plant. When you generate the project in SIMATIC iMap, the current project data of all instances of PROFINET components of the SIMATIC iMap project are prepared for a device-specific shadow project to allow a download to the destination devices of the plant.

To generate project data in SIMATIC iMap, you require the manufacturer-specific configuration and programming tool for the configured devices, for,example, STEP 7 for SIMATIC automation devices. A separate generating process is required for each integrated manufacturer-specific configuration and programming tool. The current version of SIMATIC iMap supports the following generation processes:

Menu command	Device type
Project > Generate > Control unit >	Control units of the SIMATIC automation devices
Project > Generate > HMI unit >	HMI unit of the SIMATIC automation devices

Unless expressly stated, the descriptions in the next sections apply to the generation of control units of SIMATIC automation devices. A description of the HMI units can be found under "Special PROFINET component types, PROFINET components with HMI units".

The shadow project

The shadow project contains the device-specific data of the controller units of the project. The shadow project does not contain any HMI units and singleton components (see the chapter "Special PROFINET component types").

The shadow project is created based on the component projects of the project library when the SIMATIC iMap project is initially generated. All changes in the SIMATIC iMap project, such as the IP or PROFIBUS addresses, will be applied to the shadow project when you generate the project.

The shadow project is required for the program download.

Note

The **Project > Save** command does not update the shadow project.

CAUTION

The shadow project may not be modified directly using the manufacturer-specific configuration and programming tool (STEP 7, for example)!

Changes to the shadow project may lead to data inconsistency in the SIMATIC iMap project, and thus prevent a download.

Possible remedies:

- **Regenerate**the SIMATIC iMap project.
- Create new PROFINET components based on the modified shadow project, and replace the old instances.

Select the **Edit > Consistency check > Generate project** command to compare the current shadow project with the corresponding component project(s). The result of the consistency check is shown in the task window.

Actions applied when the project is generated

The following actions in SIMATIC iMap are applied when the project is generated:

- Cut, paste or delete instances and interconnections
- Replacing instances
- Pasting new instances into the project
- Changing instance properties such as names or addresses
- Changes to the device networking, such as connecting and disconnecting PROFIBUS devices.

Note

Any such changes in the project can not be downloaded to the devices of the plant unless you have generated the control units in the project.

View the generating status to determine whether a generation is required. The generation status of the instance of a PROFINET component is displayed in the project view and in the Properties dialog box of the instance. The generation status "generated" means that a download to the corresponding devices of the plant is possible.

Actions not transferred when the project is generated

- Changes made at device-specific data of the shadow project using one of the **Edit > Special...** menu commands. Download those changes to the devices in the plant using the manufacturer-specific configuration and programming tool.
- Changes in the graphic layout, such as the position in the chart or plant views.

Requirement

Before you generate a project, make sure the necessary manufacturer-specific configuration and programming tool, e.g. STEP 7, is installed on the computer.

How to generate changes made in the control units of the project

Select **Project > Generate > Control unit > Changes only** to generate only the project delta data. The messages indicating generation progress and errors are output to the "Generate" tab in the task window.

The shadow project is created based on the component projects of the library (libraries) when you initially execute this command. . The shadow project is updated with the delta data at each further call of this command..

If the generation was successful, the "generated" generation status is assigned to all project components. The program is ready for download. The generation status can be viewed in the project view (green icon), or at the instance properties.

To regenerate the control units of the project

If the generation of a SIMATIC iMap project fails because the shadow project contains corrupted or inconsistent data, for example, you need to create a new shadow project. The new shadow project is generated based on the component projects for the PROFINET components of the library (libraries.)

Select **Project > Generate > Control unit > All new**. If the project is already generated, a message is output to indicate the effects of the command. Acknowledge this message by clicking "Yes" if you want to generate new data.

The messages indicating generation progress and errors are output to the "Generate" tab in the task window.

Result: The shadow project is once again generated based on the PROFINET component projects of the project library. The generated new shadow project does not contain changes made using the manufacturer-specific configuration and programming tool. As an option, a backup copy will be generated of the old shadow project (controller element) to let you trace any changes compared to the new shadow project.

Backup copy of the shadow project

To generate a backup copy of the shadow project (controller element) when you generate project again:

1. Select **Project > properties** to open the "Special" tab.
2. On the "Generate all" input box, set the "Always create backup copy of the controller unit" option, then confirm your setting with "OK" or "Accept."

Result

A backup copy of the shadow project (controller element) will be created in the project folder when you regenerate the project.

Accelerated regeneration for PROFINET devices without proxy functionality

You can optionally specify that the control units of the PROFINET devices without proxy functionality are not copied into the shadow project when the project is regenerated. Proceed as follows:

1. Select **Project > properties** to open the "Special" tab.
2. On the "Regenerate all" box, set the "Accelerated generation for PROFINET devices without proxy functionality" option, then confirm with "OK" or "Accept."

Result

Regeneration of the project is accelerated. The resulting shadow project is smaller and thus requires less storage space.

Note

After a changeover between "normal" generation and accelerated generation, the next generation of the project is always carried out as a regeneration.

Note

The generated control units are required for the download to the target devices and for the execution of device-specific functions (**Edit > Special >** menu command.)

If the "Accelerated generation for PROFINET devices without proxy functionality" option is activated, execution of the **Download** and **Edit > Special >** menu commands can take slightly longer, since temporary STEP 7 projects have to be created.

No consistency check is carried out for the instances of such devices because there is no comparison data in the shadow project.

Canceling generation

it may take a longer time to generate a large-scale project. You can cancel the generation of deltas at any time by clicking "Cancel" on the message box, and continue at a later time. Any data already generated are retained after you cancelled the operation.

At the next call of the **Project > Generate > Control unit > Changes only** command, the system generates only the new, modified and raw data of the project elements.

Generating the HMI unit

The HMI units of the instances are generated using the **Project > Generate > HMI units** command.

For further information, refer to "Special PROFINET component types, PROFINET components with HMI units".

See also

Saving and archiving a project (Page 83)

Generation status (Page 90)

Check consistency of the generated project (Page 91)

Data storage in SIMATIC iMap (Page 92)

4.2.5.2 Generation status

Status of the shadow project

The shadow project is generated in SIMATIC iMap based on the PROFINET component projects of your project.

The generation status of a PROFINET component instance is indicated on the "Instance" tab in the Properties. Select the technological function or device, and then select the **Properties...** shortcut menu.

Generation status	Meaning	Action
Not generated	The shadow project is not yet generated, or it does not yet contain the instance	Generating the project only the deltas all new
Generated	The shadow project is generated and contains the instance. The instance properties and the STEP 7 shadow project are consistent.	No action required
Inconsistent / modified	The instance properties were modified and are now inconsistent with the shadow project.	Generating the project
Generation not possible	The instance properties contain illegal values (ambiguous address, for example) which prevent generation.	Eliminate the error(s), and then once again generate the project

Graphical representation of the generation status

The generation status of an instance is represented graphically in the project view (see "Windows and views, project view").

4.2.5.3 Check consistency of the generated project

Consistency check of the generated project, definition

The consistency check of a generated project comprises a comparison between device-specific data of the shadow project and the data of the original component project. This allows you to identify changes made in the shadow project using the manufacturer-specific configuration and programming tool.

The result of the consistency check is indicated on the "General" tab of the task window.

Items checked

The consistency check of the generated project for SIMATIC automation devices is carried out with the help of STEP 7. In doing so, the program blocks of the station in the shadow project are compared with those of the original component project in the SIMATIC iMap library. The check determines whether program blocks have been added, removed or changed in the shadow project.

Note

If the "Accelerated generation for PROFINET devices without proxy functionality" option is activated, no consistency check is carried out for the instances of such devices, because no data were copied into the shadow project for these devices.

Requirements

- The manufacturer-specific configuration and programming tool (STEP7, for example) is installed on the PG/PC.
- The project is generated, i.e. the generation status of the instances to include in the consistency check is created.

How to check consistency of the generated project

1. Select the instances to be checked from the plant view or network view.
2. Select **Edit > Check consistency > Generated project**.

The system checks consistency of the generated project and outputs the results in the "General" tab of the task window.

4.2.6 Structuring projects

4.2.6.1 Data storage in SIMATIC iMap

The SIMATIC iMap data storage comprises in particular the following types of folder:

- PROFINET components
- SIMATIC iMap libraries
- SIMATIC iMap projects

The section below describes the storage structure of these folders.

Project structure for PROFINET components

Within its life cycle, a PROFINET component may handle various classes of projects, with contents and structures defined in manufacturer-specific configuration and programming tools for the component. We distinguish between the following project classes:

- The **basic project**, for example a STEP 7 project, forms the source for the creation of the PROFINET component using manufacturer-specific configuration and programming tools.
- The **component project** is a copy of the basic project which is assigned to the completed PROFINET component. It is saved to a compressed file in the folder of the PROFINET components in the file system, or to a library. The component project forms the basis for the revision of PROFINET components.

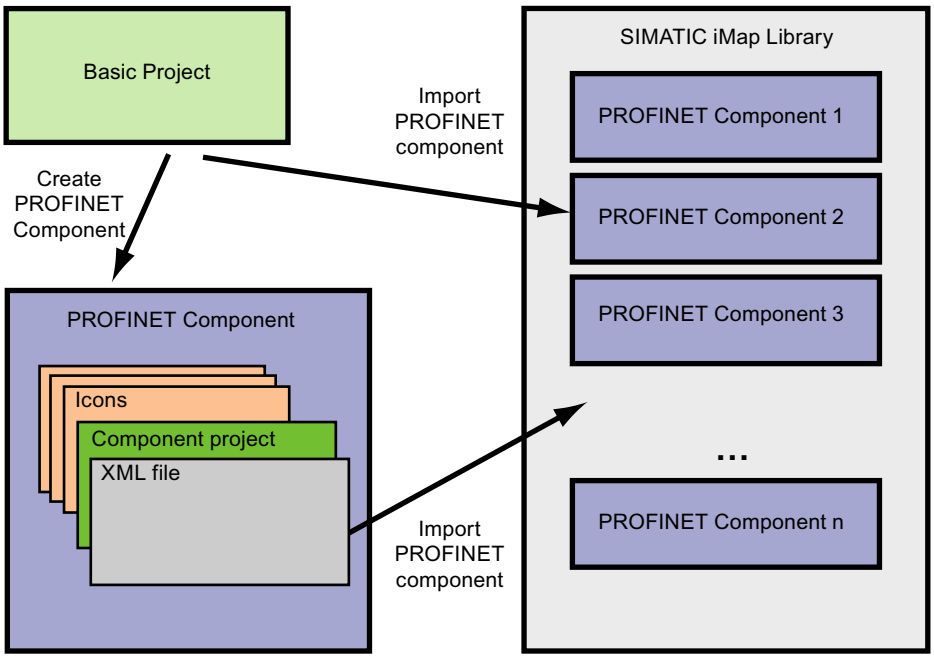


Figure 4-2 Project structure for PROFINET components

Storage structure of PROFINET components

A PROFINET component consists of a folder which contains:

- The XML file (PCD file) which contains the description of the PROFINET component. The system searches for this XML file when importing to a library.
- The icon files
- The compressed component project (copy of the relevant element from the basic project)
- The documentation link file (optional.)

The folder name is derived from the name, the identification (class ID) and the version number of the PROFINET component.

Storage structure of the SIMATIC iMap libraries

A SIMATIC iMap library is created in folder format. The important part is the library file of the same name and file name extension *.cbl which must be specified when the library is opened. A library also contains the PROFINET components folder.

Storage structure of SIMATIC iMap projects

The **SIMATIC iMap project** represents the working project which contains the configured PROFINET component instances and their interconnections for a specific plant.

A SIMATIC iMap project is created as a folder. The important part is the project file of the same name and file name extension *.cbp which must be specified when you open the project. A project folder also contains:

- Configuration data for the inserted instances of the PROFINET components
- the project library
  - visible as a separate folder if the project is open
  - not visible (compressed) if the project is closed.
- one or more shadow projects, created when the SIMATIC iMap project is generated.
- the variable table, if one was created.

The **shadow project** contains the device-specific data of the SIMATIC iMap project. The shadow project is created based on the component projects of the project library when the SIMATIC iMap project is initially generated. The shadow project is required for the program download.

The shadow project is created device-specific or manufacturer-specific. For example, the HMI units of a SIMATIC iMap project form a separate shadow project.

Further object classes and file types

The following object classes and file types are used in SIMATIC iMap:

- Archive files
- Project documentation
- Variable tables
- OPC symbol files
- Online device analyses
- Revised component projects
- Project descriptions

SIMATIC iMap provides default storage locations for all file and folder types used. The descriptions of file types used are available in the appendix.

Default storage paths

Select **Options > Settings** to open the "Directories" tab where you can view the default folders used as storage locations for the file types used in SIMATIC iMap. The system suggests those storage locations before you create, save and select the corresponding file types.

Click "Modify" to change the paths.

These settings apply to all SIMATIC iMap projects.

Archiving in the current project folder

The following objects can be archived in the current project folder:

- Variable tables
- Project documentation
- OPC symbol files
- Online device analyses
- Project descriptions

In order to store specific objects in the current project folder, enter the string "$PRJ\" as the storage location. A subdirectory can be specified optionally.

See also

Special features of systems containing SIMATIC devices (Page 207)

4.2.6.2 Grouping projects

Interconnecting connections with external projects

SIMATIC iMap supports interconnecting of connections to several external projects. This creates interconnections between technological functions located in different projects.

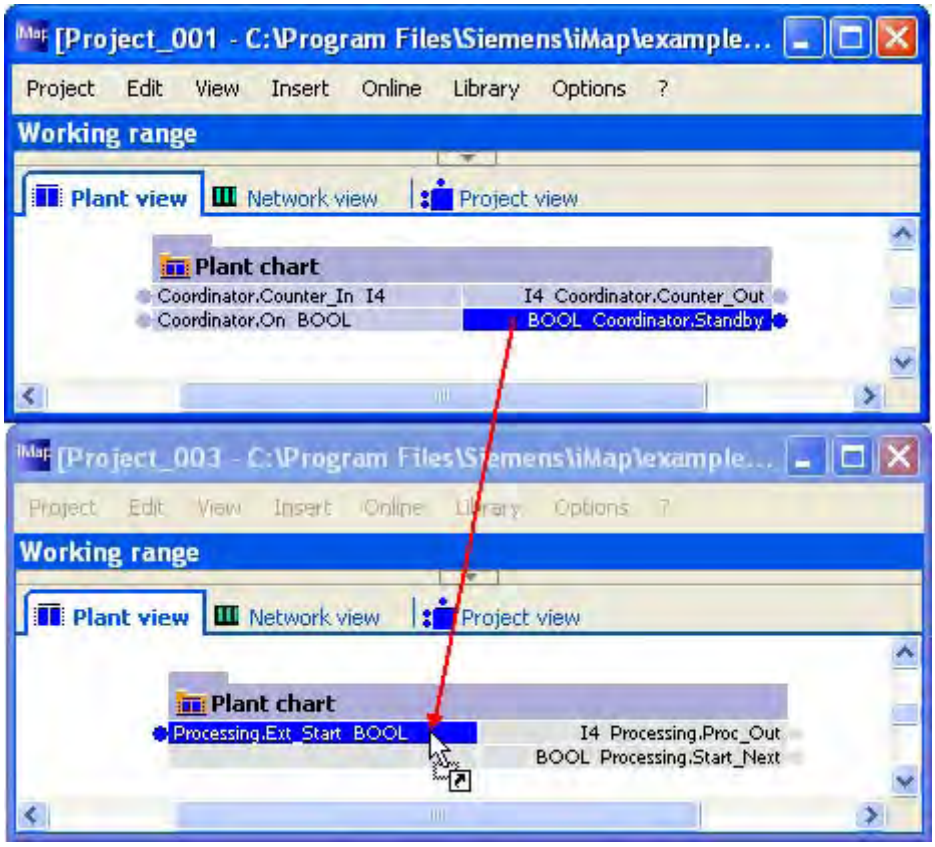


Figure 4-3 Interconnection with external projects

The interconnection source is an output in the source project, and the destination is an input in the destination project. An interconnection between two projects is always configured at the input (receiver) of the destination project.

You have several options of creating interconnections to external projects

- using drag-and-drop
- using menu commands

Note

In the utilization check of the devices, the outgoing interconnections with external projects are not taken into consideration. Only the incoming interconnections of external projects in the destination project are included.

Requirements

- In the source project, the device must have assigned an IP address to the instance to be interconnected with external projects. If the source connection is on a PROFIBUS device, the associated PROFINET device with proxy functionality must have an IP address.
- Only when creating interconnections to external projects using drag-and-drop:

  The connections to be interconnected with external projects must be available in the chart interface of the main chart (plant chart) of the relevant project.

  For each connection to be interconnected: select the connection, and set the "In chart interface" option from the shortcut menu. If the connection is located in a nested chart, repeat this procedure until the connection is contained in the chart interface of the plant chart.

How to create interconnections with external projects using drag-and-drop:

1. Start SIMATIC iMap twice.
2. Open the destination and source projects in separate SIMATIC iMap applications. Arrange the windows on the PC/PG desktop so that both are visible.
3. In plant view, open the chart interface of the plant chart in both projects. Confirm this operation by clicking the "Open chart one level up" icon.
4. In the source project, select the output to be interconnected, hold down the left mouse button and drag an interconnection to the input of the destination project.

   Result: The input is marked interconnected with external projects.
5. Select the device or the technological function which contains the input which is interconnected to external projects.
6. Download the interconnection to the device using the **Download Selected Device > Interconnections only** command.

   Result: This downloads the interconnection, and generates the communication connection to the partner device in the source project. In SIMATIC iMap, you can then monitor online delta values at the connections which are interconnected to external projects in the source and destination project.

How to create interconnections with external projects using menu commands

1. In SIMATIC iMap, open the destination project which contains the input you want to interconnect with an external project.
2. From the plant view, select the input to be interconnected with an external project, or select **External interconnection** from the shortcut menu.
3. On the "Properties - External interconnection" dialog box, enter the following data from the source project in the "From" input box (see the example below):
   - the IP address,
   - the name of the PROFINET device,
   - the name of the technological function,
   - the name of the source output for the interconnection
4. Define the transfer parameters for the interconnection in the "Transfer parameters" input box. You can either accept the defaults or edit the parameters.
5. In the "Substitution value" input box, configure a substitution value for the interconnection.
6. Click "OK" or "Apply"

   Result: The input will be assigned the interconnection data, and the connection is added to the chart interface of the plant chart and marked as external interconnection.
7. Select the device or the technological function that contains the input which is interconnected to external projects.
8. Download the interconnection to the device using the **Download Selected Device > Interconnections only** command.

   Result: This downloads the interconnection, and generates the communication connection to the partner device in the source project. In SIMATIC iMap, you can then monitor online delta values at the connections which are interconnected to external projects in the source and destination project.

Example: Interconnection with external projects

The diagram below shows the data of the connection in the source project that you must enter using the **Edit > Interconnect externally** menu command when you create the interconnection to external projects.

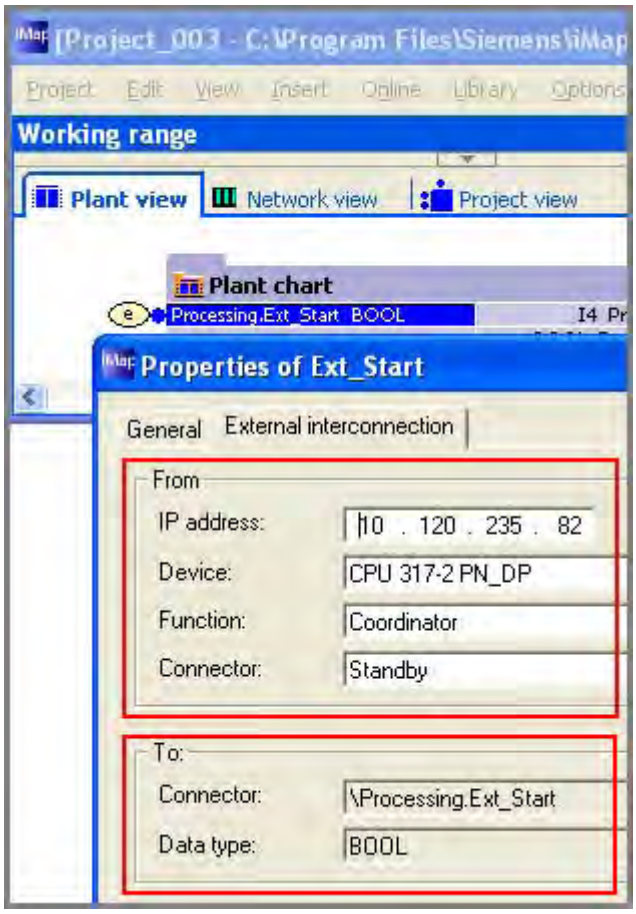


Figure 4-4 Configuring an interconnection with external projects

See also

Library types (Page 102)

4.2.7 Project logging

Content of the project documentation

You can create a documentation containing the following information on a SIMATIC iMap project:

- General project data such as the name, path and creation date
- All the technological functions and nested charts of the plant chart, including their interconnections
- All PROFINET and PROFIBUS devices of the network chart
- The PROFINET components used as library elements, including their instances (devices and functions), in the project
- Optional - descriptions of the interconnectable and non-interconnectable connections of the technological interfaces
- Optional - graphical representations of all charts (network chart, plant chart, and nested charts)

How to create the project documentation

1. Select the **Project > Documentation** command.
2. On the "Create Project Documentation" dialog box, set the options for the information to be transferred to the documentation.
3. If necessary, click "Modify" to change the path of the project documentation.
4. Click "OK."

Result: The most current version of the project is documented. The project documentation is stored as a collection of HTML files together with the associated graphics files (icons, etc.) in the folder.

The project documentation is structured as an online document, rather than as a template for printing. Use the menu command **Project > Print** to print the project data.

Note

The project documentation is recreated whenever you call the **Project > Documentation** menu command.

You can display stored project documentation versions by opening the HTML file directly in an HTML browser.

4.2.8 Print Project

General print settings

Select **Options > Settings**, then select the "Print" tab to define the settings for printing all views.

- Views to print
- Zoom ratio

Those settings apply to all SIMATIC iMap projects. You can define separate settings for each print job (**Project > Print >All views**, "Settings tab".)

To set up the page for printing:

Select the **Project > Page Setup** menu command to make the following settings for printing the current window:

- Paper size and source
- Orientation: Portrait or landscape format
- Width of the page margins

To set up the header and footer

To set up the headers and footers of the hardcopy:

1. Select the **Project > Headers and Footers** menu command.

   A dialog box for setting the header and footer opens.
2. Enter the content of your header and footer. You can edit the "Left", "Middle" and "Right" input boxes. The field buttons can be used to automatically insert field functions, such as the project name or page.
3. Specify the font and point size, if necessary.
4. You can specify the type of separating lines to be inserted between adjacent pages and for the lines in the header and footer.
5. Click on "OK" to accept the settings.

To print the project:

- Select **Project > Print > Active view** to outputs a selected view of the work area in the current project to the printer. The active window is printed with the current zoom factor.
- Select **Project > Print > All views** to print all views of the work area in the current project. This outputs the plant view to the printer, including all nested charts Adapt the current zoom ratios on the "Settings" tab as required.

Large projects are printed on several pages.

Tip: Showing page margins

Select **View > Chart view/Plant view/Network view/Project view > page margins**, or **Options > Settings >** "Print" tab to output the page margins in the selected view. This provides a preview of the printed area.

4.2.9 Exporting and importing projects

Data exchange between SIMATIC iMap and other applications

SIMATIC iMap provides import and export functions for exchanging configuration data between SIMATIC iMap and other configuration tools. The data are exchanged using a project description file in XML format.

The export function saves all files belonging to the SIMATIC iMap project to a separate folder. You can enter a user-specific storage path and name for the project description file. The export file is automatically assigned the extension .cbi.

Note

Select **Options > Customize**. In the "Directories" tab, you can accept the default storage location proposed by the export and import function.

How to export a SIMATIC iMap project:

1. Open the SIMATIC iMap project.
2. Select **Project > Export**.
3. In the "SIMATIC iMap project description export to" dialog, define the path and name of the project description file.

   Search for the required folder in the "Find in" input box as required.
4. Click "Save".

Result

The folder with the project data and project description file will be created.

Note

The project security setting is not applied to the exported project description.

How to import a SIMATIC iMap project:

1. Open the required SIMATIC iMap project as the basis for an import.
2. Select **Project > Import**.

   This opens a dialog box where you can search the file system for existing project descriptions in the exchange format. Search for a project description file with the extension *.cbi.
3. Select the export folder from the "Find in" box. The search result box below shows only the folders and files of the project description.file type.
4. Select the file name with the extension .cbi.

   The file name is displayed in the "File name" box.

   Tip: The "File name" drop-down list contains the most recently opened SIMATIC iMap project descriptions
5. Click the "Open" button.

Result

The current instances and interconnections are deleted from the project. The configuration data of the imported project are inserted in the current project, including all properties and interconnections. The PROFINET components will be inserted into the project library.

Note

The generation status of imported instances is based on data of the current project, and is retained in the import file, provided the instances of the imported project correspond with those of the current project. When SIMATIC iMap projects were edited in other configuration tools, this feature is useful to minimize computing time required for generation before you download the imported configuration data to the destination devices of the plant

4.3 Working with libraries

4.3.1 Library types

Project libraries and global libraries

There are two types of library in SIMATIC iMap:

- Project library which is contained in a SIMATIC iMap project and is opened, closed, archived and retrieved automatically with the project. The project library contains all the PROFINET components the instances of which are contained in the project. The information needed to generate the project is thus available.
- (Global) library that can be opened, closed, archived and retrieved using menu commands. The global library contains PROFINET components that can be used in several projects.

In the following descriptions, the global library is simply called the "library".

When a PROFINET component is inserted into the project from a global library, it is automatically inserted into the project library as well.

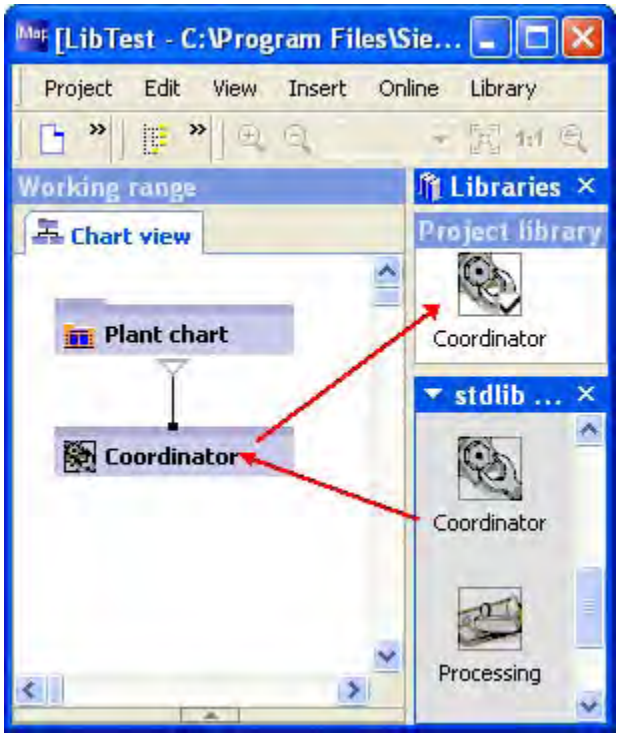


Figure 4-5 Example: Project library and global libraries

Comparison between project and global libraries

Property/Action	with the project library	with global libraries
Create	automatically with the project	independently of the project, using the **Library > New...** menu command
Name	Project library	any
Open / Close	automatically with the project	separately from the project, using the **Open library...** or **Close library** menu command
Import PROFINET Components	• automatically when the PROFINET component is inserted into the project from a global library or • using the **Library > Import components** menu command	using the **Library > Import components** menu command
Number of open libraries	exactly one	any
Copy PROFINET component	any	any
Delete PROFINET component	only possible if there is no instance of the PROFINET component in the project	any
Archive / Retrieve	automatically with the project	using the **Library > Archive...** or **Library > Retrieve...** menu command

4.3.2 Create new library

Data storage of SIMATIC iMap libraries

In the SIMATIC iMap library window, you can open, close or create any number of shared libraries in any project you are editing.

Shared libraries can only be created, opened, closed, backed up and restored using the menu commands.

The libraries are created as folders in SIMATIC iMap. When you create a new library, the system generates a new library file with the extension .cbl. You can assign this file a user-specific name. The file is stored in a folder of the same name. You can select a user-specific path.

You can also archive an existing library. In this case, the entire content of the library is saved in an archive file with the extension .arl. You can assign a user-specific path and name to the archive file.

How to create a new library:

1. In SIMATIC iMap, select the **Library > New...** command.

   This opens a dialog box for searching the file system.
2. Select the folder in which the library is to be created from the "Search in" box.
3. Enter the name of the library in the "File name" input box. The name is automatically assigned the extension .cbl.
4. Click "Save".

Result: The shared library is created and opened.

See also

Library types (Page 102)

4.3.3 Opening and closing libraries

Requirement

The library must have been created in SIMATIC iMap.

How to open an existing library

1. In SIMATIC iMap, select the **Library > Open...** command.

   This opens a dialog box where you can run a search in the file system for existing libraries.
2. Select the library folder from the "Search in" box. The search result box below shows only the folders and files of the SIMATIC iMap library file type.
3. Select the file name with the extension .cbl.

   The file name is displayed in the "File name" box.
4. Click "Open."

Result: The library is opened in the SIMATIC iMap library window.

Tip: The "File name" drop-down list contains the most recently opened SIMATIC iMap libraries.

How to close a library

1. Click in the library you want to close.
2. You can then either:
   - Click the cross (X) on the top right-hand corner of the library, or
   - Select **Library > Close**, or
   - Select **Close library** from the shortcut menu.

Libraries from earlier versions

A library created on an earlier version of SIMATIC iMap is automatically converted to the data storage system of the current version when you open it.

Note

A converted version V1.2 library can no longer be opened in SIMATIC iMap V1.2.

Tip:

Save a backup copy of the project you still want to open in the earlier version V1.2 of SIMATIC iMap before you run it in the current version.

See also

Data storage in SIMATIC iMap (Page 92)

Library types (Page 102)

4.3.4 Importing PROFINET components

PROFINET components in libraries

A PROFINET component must be located in a library before it can be inserted into a SIMATIC iMap project. Instances of the PROFINET component can then be inserted from this library into the project.

When you create a PROFINET component, you can define whether it should be stored in the file system or imported into an existing global library. If a PROFINET component was created in the file system, then it can subsequently be imported into a library in SIMATIC iMap.

Unique identification of PROFINET components

PROFINET components are uniquely identified by the identification (ID) and the version number. Both the ID and the version number are displayed in the "Properties" dialog for the PROFINET component.

Note

PROFINET components cannot be overwritten by importing into a library. If the library already contains a PROFINET component with the same version number and identification (ID), then the selected component will not be imported.

Requirement

The PROFINET component must have been created using the vendor-specific configuration and programming tool, e.g. STEP 7, and must have been stored in the file system.

To import a PROFINET component into a library:

1. Click on the library into which you wish to import the PROFINET component.
2. Select the **Library > Import PROFINET components** menu command.

   A dialog box for browsing the file system for existing PROFINET components opens. The system searches for the associated XML files.
3. Select an XML file.

   Tip: Click on the down arrow in the "File name" box to display a list of the most recently opened XML files.
4. Click on "Open" to import the selected PROFINET component.

Result: The selected PROFINET component is imported and the component's icon appears in the library.

4.3.5 Administering PROFINET components in libraries

Processing possibilities in the library

You can edit PROFINET components contained in one or more libraries in the following ways:

- Move from one library to another
- Cut
- Copy
- Paste cut or copied PROFINET components

To move a PROFINET component:

You can move a PROFINET component from one library to another:

- Using drag & drop
- By cutting and pasting

To delete a PROFINET component

You can delete a PROFINET component from a library:

- Using the "Delete" key
- Using the **Edit > Delete** menu command.

PROFINET components can only be deleted from the project library if they are not being used in the project.

Copying, cutting and pasting PROFINET components

You can use the following menu commands:

- **Edit > Copy** - Copies the selected PROFINET component to the clipboard.
- **Edit > Cut** - Cuts the selected PROFINET component and places it on the clipboard.
- **Edit > Paste** - Inserts the clipboard contents.

The commands are also available in the pop-up menu, depending on which window is active.

See also

Library types (Page 102)

4.3.6 Archiving and retrieving libraries

The next section only deals with shared libraries. The project library is always automatically archived and restored together with the project.

Data storage of shared SIMATIC iMap libraries

A shared SIMATIC iMap library is created in the form of a directory tree, and can be stored as an archive file.

When you archive a shared library, all PROFINET component data will be backed up to an archive file. You can assign a user-specific file name. It is automatically assigned the extension .arl.

Note

Select **Options > Customize**, then select the "Directories" tab to accept the default storage location for shared libraries when you create, open or archive shared libraries.

How to archive a shared library

1. Select the **Library > Archive...** command.

   This opens a dialog box where you can run a search in the file system for existing libraries. Search for a file with the extension .cbl.
2. Select the library folder from the "Search in" box. The search result box below shows only the folders and files of the SIMATIC iMap library file type.
3. Select the file name with the extension .cbl.

   The file name is displayed in the "File name" box.
4. Click "Open."

   A dialog box for selecting the storage location opens.
5. On the "Archive iMap library as..." dialog box, select the folder for the archive file.
6. Accept the name suggested in the "File name" box, or enter a different name for the archive file, then click "Save."

Result: The archive file is created and the result is output to the screen.

How to retrieve a library

Note

You can only retrieve libraries that were archived with SIMATIC iMap.

To retrieve a library, proceed as follows:

1. Select the **Library > Retrieve...** menu command.

   This opens a dialog box where you can run a search in the file system for existing archive files.

2. Select an archive (.arl file). There are two options:
   - Search for the required archive file in the "Search in" field, or
   - Select a file from the list of most recently archived libraries from the "File name" field. (Click on the down arrow in the "File name" box to display a list of the most recently archived libraries.)

3. Click "Open" to select the archive file.

   A dialog box for selecting the target folder opens.

4. Select the folder to which you wish to save the retrieved library and click on "OK".

Result: The library folder is created in the specified target folder and the result is signaled on screen.

See also

Library types (Page 102)

4.4 Working with instances of PROFINET components

4.4.1 Structuring plants

4.4.1.1 Inserting instances of the PROFINET components in a SIMATIC iMap project

Instances of a PROFINET component

A PROFINET component forms a **class**, i.e. a template for one or several **instances**, and describes the internal structure of those instances. The insertion of a PROFINET component from a library in a SIMATIC iMap project generates an instance of the PROFINET component in the project, i.e. an application of this component class. Each instance is assigned additional properties, for example, a name and address. One or more instances of a PROFINET component may be inserted into a project.

The association of all instances to the original PROFINET component is derived from the instantiation, and can be checked in the instance properties by defining the ID and version number of the corresponding component.

Options of inserting an instance in the SIMATIC iMap project

You can insert the instance of a component in one of the following windows:

- Chart view
- Plant view
- Network view
- Project view
- Project tree (plant tree and network tree).

In all cases the entire instance is inserted, i.e. both the technological function (if available) and the associated device.

You can insert instances of components without technological functions in one of the following windows:

- Network view
- Project view
- Network tree

Requirements

- The PROFINET components that you want to insert into your project must be contained in a library in SIMATIC iMap.
- The chart view of the project is open.

How to insert the instance of the PROFINET component into the project:

1. Select the PROFINET component from the library.
2. Insert it in a chart in the chart view. There are several options:
   - Drag-and-drop
   - **Copy** and **Paste** menu commands

Result

The technological function of the component, if it contains any, appears in the chart view, in the plant view, in the project view and in the plant tree of the project tree. The associated device appears in the network view, in the project view and in the network tree of the project tree. The diagram below shows the presentation of a component instance in SIMATIC iMap.

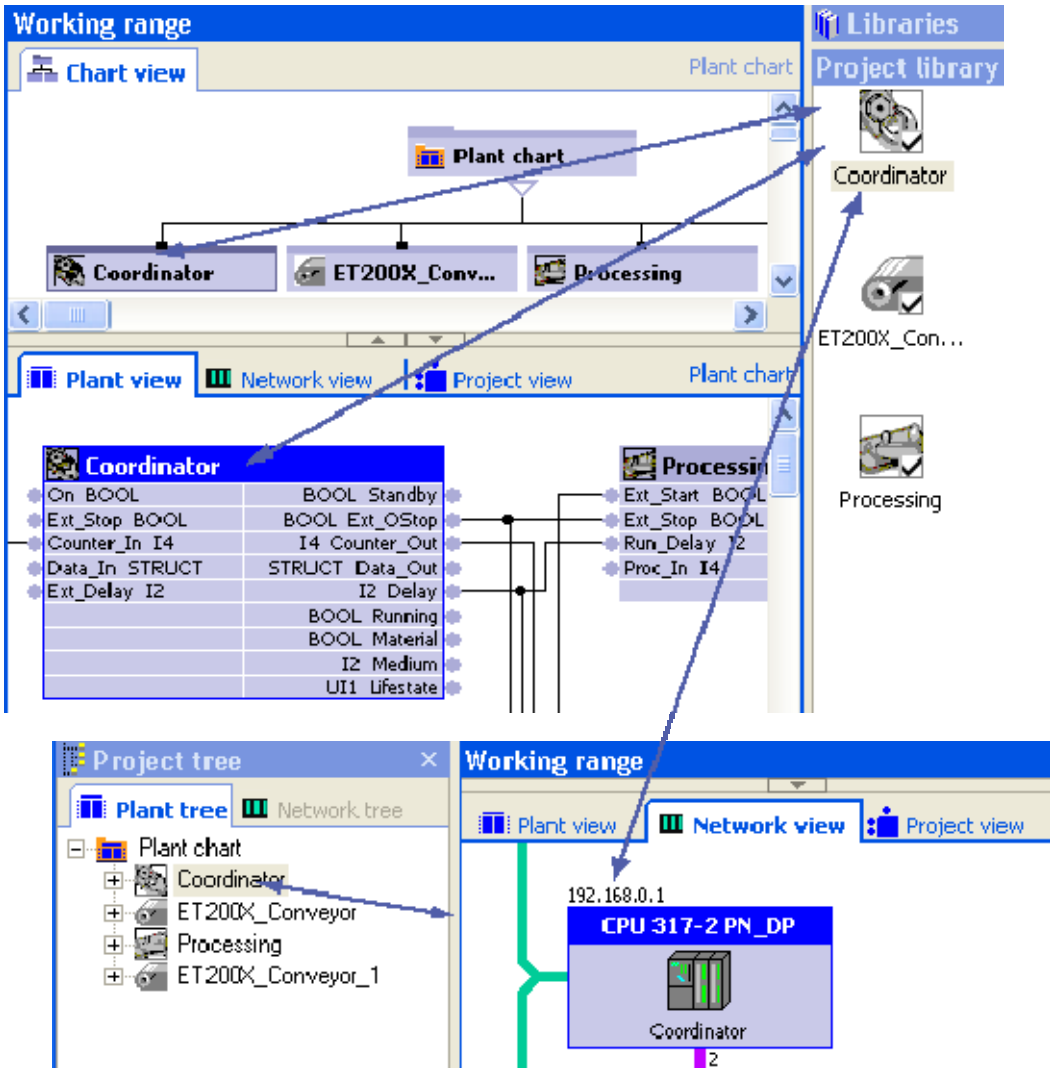


Figure 4-6 Instance of a PROFINET component in the SIMATIC iMap project

The association between PROFINET components and their instances is represented in the project view (see diagram below).

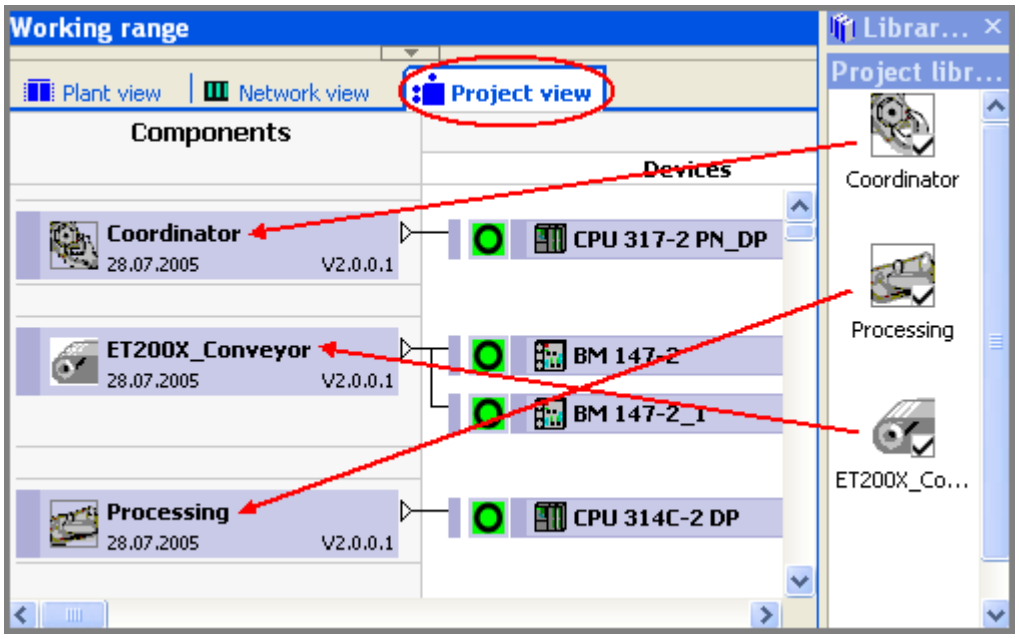


Figure 4-7 PROFINET components and their instances in the project view

Representation of technological functions

The representation of instances of the technological functions differs based on the window in which they have been inserted. The instance of a technological function is only visible in the chart view, plant view and plant tree of the project tree if it is assigned to a specific chart in the chart hierarchy, for example, the plant chart.

Functions inserted in the network view or network tree of the project tree can not be assigned to a chart. Function instances not assigned to any charts are identified by the "Not in use" attribute, and are only visible in the project view. Unused functions can be integrated in the plant hierarchy at a later time by means of drag-and-drop.

Tip

Always insert instances of the PROFINET components in the chart view, the plant view or in the plant tree of the project tree. That way you immediately arrange them in the plan hierarchy and they are then visible in all windows.

See also

Interconnecting Technological Functions (Page 123)

Connecting devices in the network view (Page 115)

Importing PROFINET components (Page 106)

4.4.1.2 Creating nested charts

subordinate charts

Nested charts are used to create a hierarchical structure for your plant, just like a directory tree in the file system.

Nested charts are displayed differently in the individual windows of SIMATIC iMap:

- In the chart view and in the plant tree of the project tree, a chart is shown as a folder that can include the functions and other nested charts. The contents can be shown or hidden with the help of the symbols (+, -, arrow).
- In the plant view, a nested chart is represented as technological function with a chart interface for creating interconnections. The chart interface contains the inputs and outputs of the technological functions contained in the nested chart, which can be interconnected extend beyond the chart limits.

To create a nested chart

1. Open the chart view or the plant view of the project.
2. if the chart view is active, select a chart such as the plant chart.
3. Select the **Insert > New chart** menu command.

   The new chart is inserted and displayed in the chart view, in the plant view as well as in the plant tree of the project tree.
4. Name the nested chart
   - using the editable name field in the plant view, or
   - using the "Properties" dialog
5. Open the parent chart by double-clicking it (in the plant view), or by selecting the **Open chart** command from the shortcut menu.
6. Insert the instances of the desired PROFINET components from the library and interconnect them.

When you return to the parent chart, the plant view represents the nested chart as a technological function with the defined chart interface.

To move technological functions to a new chart:

To create a new nested chart based on several technological functions:

1. Select the technological functions.
2. You have several options: Select:
   - **Edit > Move to new chart**, or
   - the "Insert in new chart" toolbar icon, or
   - the **Move to new chart** command from the shortcut menu.

Result: A new nested chart is created, and the selected technological functions are moved to this chart. Any existing interconnections between charts are automatically inserted into the chart interface.

Working with nested charts

You can work with nested charts just as though they were technological functions, i.e. they can be interconnected, moved, deleted, cut and copied. Make allowances for their special features when using multifunction components (see "Using multifunction components in a SIMATIC iMap project")

The content and connections of a nested chart can be modified as required.

It is not possible to download a selected nested chart to all devices. To carry out a specific download, you must select individual objects. If you download to all devices in the plant, those devices whose functions are contained in the nested chart are included in the download.

To assign connections to the chart interface:

In order to interconnect functions beyond the chart limits, you must assign the desired connections to the chart interface.

Proceed as follows for each connection that should be included in the chart interface:

Select the connection, and activate the option **In chart interface** from the shortcut menu. If the connection is already contained in the chart interface, this is indicated by a tick in the shortcut menu.

Result

The connection is displayed in the chart interface and can be interconnected with functions outside of the chart.

Tip: Navigation aid

Select a connection of a nested chart, then select **Go to > Plant view: Function connection**, in order to reach the associated connection of the technological function.

4.4.1.3 Structuring functions in the plan hierarchy

Assigning functions to the chart hierarchy

The chart hierarchy of the SIMATIC iMap project consists of charts and functions of the instances, and is visualized in the chart view and plant view of the project tree.

The instance of a technological function is only visible in the chart view, plant view and plant tree of the project tree if it is assigned to a specific chart in the chart hierarchy, for example, the plant chart. Function instances not assigned to any charts are identified by the "Not in use" attribute, and are only visible in the project view.

How to assign unused functions to a chart

1. Open the project view. This view shows the function of instances which are not assigned to any chart (not in use.)
2. Select the required functions, then drag-and-drop these to a chart in the chart view, plant view or plant tree.

Result: The functions are marked with the "in use" attribute and are only visible in the chart view, plant view or plant tree.

How to remove a function from the chart hierarchy

Select the required function from the chart view, plant view or plant tree, then select **Remove from chart hierarchy** from the shortcut menu.

Result: The function is only visible in the project view, and is assigned the "not in use" attribute.

4.4.2 Coupling devices and assigning addresses

4.4.2.1 Connecting devices in the network view

Arrangement of the devices in the network view

The devices in the network view are always arranged according to the following rules:

- PROFINET devices with Ethernet connection are automatically connected to the vertical Ethernet bus.
- PROFIBUS devices are connected to the PROFIBUS of the DP master by means of drag-and-drop.

Changing the networking

You can make the following changes to the networking:

- Coupling a free-standing PROFIBUS device to a PROFINET device with proxy functionality.
- Moving and copying the PROFIBUS devices to the same or another PROFIBUS. In this case, remember that the PROFIBUS addresses on a PROFIBUS must not be assigned more than once.
- Moving and copying PROFINET devices as required on the vertical or horizontal Ethernet bus. PROFINET devices with proxy functionality can only be coupled to the vertical Ethernet bus. PROFINET devices without proxy functionality may be coupled and moved both on the vertical Ethernet and on the horizontal Ethernet nodes.

To insert an Ethernet node:

Select **Insert > New Ethernet branch** to create a new horizontal Ethernet branch in the network view. Several PROFINET devices without proxy functionality may be coupled to it (see diagram below).

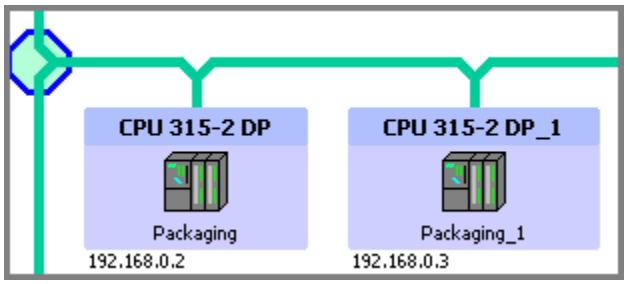


Figure 4-8 Ethernet node in the network view

Explicit positioning of devices

You can drag-and-drop devices to specific positions on the network view. The possible insertion positions are indicated in color.

Positioning devices automatically

Devices you insert in the chart view, instead of placing these by drag-and-drop to specific positions on the network view/tree, are placed automatically:

- PROFINET devices are automatically connected to the vertical Ethernet bus.
- New PROFIBUS devices (DP slaves) will not be connected (in the top section of the network view, as shown in the diagram below), and must be placed at a later time.

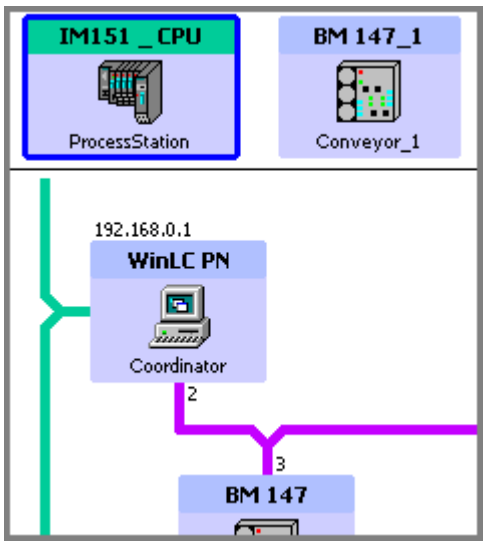


Figure 4-9 Non-connected PROFIBUS devices

Tip: Check consistency of the runtime versions

Select **Edit > Check consistency > Runtime versions** to check whether the PROFINET devices with proxy functionality and the corresponding PROFIBUS devices are compatible with the PROFINET runtime versions.

See also

Check consistency of the runtime versions (Page 117)

Performance parameters of PROFINET devices (Page 143)

Assigning addresses (Page 120)

Utilization test (Page 141)

4.4.2.2 Check consistency of the runtime versions

PROFINET runtime version

The PROFINET runtime version identifies the version of PROFINET functionality in the firmware of the PROFINET device.

The PROFINET runtime version of a PROFINET device with proxy functionality is of particular significance to the connected PROFIBUS devices. The proxy device must support specific functions such as connections of the data type STRUCT or multifunction components to allow the use of this functionality by the connected PROFIBUS devices.

Items checked

The system checks whether the PROFINET devices with proxy functionality and the connected PROFIBUS devices are compatible with the PROFINET runtime versions.

How to check consistency of the runtime versions

Select **Edit > Check Consistency > Runtime versions**.

Result: The system checks consistency of the runtime version and outputs the results in the "General" tab of the task window.

4.4.2.3 Addresses of PROFINET devices

Address types

PROFINET devices may have the following addresses, depending on the bus connections used:

Bus connection	Address
Ethernet	IP address of PROFINET devices
PROFIBUS	One or several PROFIBUS addresses for PROFINET devices with proxy functionality
Internal PROFINET IO system	IP addresses for PN IO controllers and PN IO devices

SIMATIC iMap does not visualize internal PROFINET IO systems. You can configure the names and IP addresses of the PN IO controller and PN IO devices at the instance properties.

IP address and subnet mask

The IP address and the subnet mask each consist of four decimal numbers with a range of values from 0 to 255. The decimal numbers are each separated by a dot.

Example:

IP address	192.168.0.20
Subnet mask	255.255.255.0

The IP address consists of

- The address of the (sub)net
- The address of the node (generally called the host or network node)

The subnet mask separates these two addresses. It determines which part of the IP address the network addresses and which part of the IP address is addressed by the node.

In binary format, the 4 decimal numbers of the subnet mask must contain a continuous sequence of 1s from the left and a continuous sequence of 0s from the right. The bits set for the subnet mask determine the network part of the IP address.

As a rule:

- The network address is obtained by an AND combination of IP address and subnet mask.
- The node address is obtained by an AND-NOT combination of IP address and subnet mask.

Relationship between the IP address and the default subnet mask

There is a convention concerning the assignment of IP address areas and the "default subnet masks". The first decimal number (from the left) of the IP address determines the structure of the default subnet mask with regard to the number of "1" values (binary) as follows:

IP address	IP address (bin.)	Address class	Default subnet mask
1.0.0.0 to 126.255.255.255	0xxxxxxx.xxxxxxxx....	A	255.0.0.0
128.0.0.0 to 191.255. 255.255	10xxxxxx.xxxxxxxx...	B	255.255.0.0
192.0.0.0 to 223.255.255.255	110xxxxx.xxxxxxxx...	C	255.255.255.0

Note

Only class A, B or C IP addresses are permitted.

Example: IP address and subnet mask

Addresses	Example
IP address	141.30.0.5
Subnet mask	255.255.0.0
Subnet	141.30
Host	0.5

Decimal and binary representation of the subnet mask in the above example:

255.255.0.0 = 11111111.11111111.00000000.00000000

Significance: The first 2 bytes of the IP address determine the subnet - i.e. 141.30. The last two bytes address the node, i.e. 5.

Network node

You will need a network node (router) if you want the device to be able to communicate with other devices outside its own subnet. In this case, you will have to enter the router address for each node on the subnet. The structure of your plant will determine whether you use a network node or not. The address is specified by the network administrator or plant operator.

The IP address of a node on the subnet and the address of the network node (router) must only differ at the points at which the subnet mask is set to "0".

PROFIBUS address

The PROFIBUS address is entered as a decimal number with the value range from 1 to 125. The current value range depends on the respective module.

PROFINET devices with several PROFIBUS connections are assigned a PROFIBUS address on each DP master system.

4.4.2.4 Assigning addresses

Addresses of PROFINET and PROFIBUS devices

The devices are assigned their IP and/or PROFIBUS addresses in the “Properties“ dialog boxes, or directly at the objects in the network view. IP addresses and subnet masks must be assigned in order to be able to establish online connections with devices of the plant.

Note

The IP address and subnet mask assigned in SIMATIC iMap to a PROFINET device must match the setting at the device of the plant, for the device could otherwise not be accessed online in SIMATIC iMap.

When use a network node: The IP address of the device and the IP address of the network node must belong to the same subnet.

Requirement

The IP addresses and associated subnet masks have to be assigned to the devices of the plant using manufacturer-specific configuration tools. They are generally defined by the network administrator.

Assigning addresses using the properties dialog box

1. Select the desired device or the associated function in one of the windows.
2. Open the object properties
   - using the **Properties** shortcut menu or
   - using the **Edit > Properties** menu command.
3. Enter the addresses required for the device type on the Addresses" tab.
   - IP address and subnet mask:

     Enter the IP address and subnet mask to be assigned to the device at the node (e.g. via the manufacturer-specific configuration and programming tool).
   - PROFIBUS address:

     Enter the PROFIBUS address to be assigned to the device, e.g. using the DIP switches. The default is the PROFIBUS address defined when the PROFINET component was created. If this is already in use, then the lowest free address on the PROFIBUS becomes the default.

     At PROFINET devices with proxy functionality and several PROFIBUS connections, you can enter one PROFIBUS address for each DP master system.
4. When using a network node set the "Network node, use router" option and enter the IP address of the router in the “Address“ input box.
5. Confirm your input by clicking on the
   - "OK" button to accept the input and close the dialog box
   - "Accept" button to accept the input and leave the dialog box open.

Result: The assigned addresses are displayed on the device in the network view.

How to edit the addresses directly at the object in the network view

- To edit the IP address of a PROFINET device, select the relevant device, and then click the IP address. This opens the display field for editing, and you can enter the required address.
- To edit the PROFIBUS address of a PROFINET device, select the relevant device, and then click the address. This opens a list where you can select the new PROFIBUS address.

See also

Addresses of PROFINET devices (Page 118)

4.4.2.5 Configuring PROFINET IO properties

What are internal PROFINET IO systems?

Internal PROFINET IO systems may be integrated in PROFINET components, for example, if the PROFINET device is also a PROFINET IO controller.

SIMATIC iMap does not visualize internal PROFINET IO systems and the corresponding IO devices. However, you can edit these objects in the instance properties dialog, and then use SIMATIC iMap to download your configuration data to the devices.

Fundamental procedure when configuring an internal PROFINET IO system

1. Assigning PROFINET IO system names in SIMATIC iMap.
2. Assigning IP addresses of the PROFINET IO devices in SIMATIC iMap.
3. Assigning device names to the target devices of the PROFINET IO system.
4. Generating projects in SIMATIC iMap (see chapter "Generating the project").
5. Downloading configuration data from SIMATIC iMap into the target device.

Device name within the internal PROFINET IO system

The names of the devices in the internal PROFINET IO system comprise the following:

<device name>.< PROFINET IO system name>

The device name is defined using the manufacturer-specific configuration tool (STEP 7, for example), and can not be edited in SIMATIC iMap. You can automatically or manually assign the PROFINET IO system names in SIMATIC iMap.

Assigning PROFINET IO system names in SIMATIC iMap.

1. Select the device of instance function of which you want to edit the internal PROFINET IO system, then select **Properties...** from the pop-up menu.
2. Open the "Internal IE devices" tab.
3. In order to be able to automatically assign the PROFINET IO system names, activate the option "Assign name automatically".

   Result: The system name is generated based on the IP address of the PROFINET IO controller, and appended to the device name. This gives the PROFINET IO devices clear names throughout the system.
4. To enter the system name manually, reset the "Assign name automatically" option, and then type in the required name in the "PROFINET IO system name" input box.

   Result: The system name is appended to the device name.

Note

You must ensure that the devices in the internal PROFINET IO system receive clear names throughout the system.

Assigning IP addresses of the PROFINET IO devices in SIMATIC iMap.

The PROFINET IO controller is automatically assigned the IP address of the instance. Assign the IP addresses to PROFINET IO devices manually or automatically.

1. Select the device of instance function of which you want to edit the internal PROFINET IO system, then select **Properties...** from the shortcut menu.
2. Open the "Internal IE devices" tab.
3. To assign the IP addresses automatically to all PROFINET IO devices, click "Assign new addresses automatically."

   Result: The PROFINET IO devices are assigned IP addresses that are derived from the IP address of the PROFINET IO controller. The last digit will be incremented by the count of 1. You can edit those IP addresses at any time.
4. To manually assign an IP address to a PROFINET IO device, enter the relevant address directly in the corresponding "IP address" input box.

Assigning device names to the target devices of the PROFINET IO system.

You can assign clear names to the PROFINET IO devices directly from SIMATIC iMap:

1. Ensure that the generate status of the instance in SIMATIC iMap is "generated". If necessary, generate the project.
2. In the network view or project view, select the device of the instance and choose **Special > Assign device names** from the pop-up menu.
3. The shadow project is opened in the manufacturer-specific configuration tool, e.g. STEP 7.
4. Assign the PROFINET IO devices the device names that have been configured in SIMATIC iMap.

Downloading configuration data from SIMATIC iMap into the target device

When the program is downloaded, the configuration data of the PROFINET IO system (the IP addresses of the PROFINET IO devices) is downloaded from SIMATIC iMap into the PROFINET IO controller and then automatically assigned to the PROFINET IO devices (refer to chapter "Downloading programs").

4.4.3 Interconnecting functions

4.4.3.1 Interconnecting Technological Functions

Interconnection - Definition

An interconnection is represented by a line which connects the input of a technological function with the output of another technological function.

Interconnection rules

- An interconnection can only be set up between an output and an input. An output can be interconnected with several inputs, whereas an input can only be interconnected with one output.
- The two connections of an interconnection must be of the same data type, for example, both of the type I2 or R4.

  Connections with composite data types must be of the same type, i.e. arrays and structures must be of the same syntax.

Requirement

The technological functions to be interconnected are inserted in the project.

How to interconnect the instances of technological functions:

1. Open the plant view.
2. Click a connection. The connection changes color, and the shape of the cursor also changes.
3. There are two options:
   - Hold down the mouse button and drag the connection to the destination connection, or
   - click the mating connection of the interconnection.

With this procedure, those connections that are suitable for the data type of the technological functions are always highlighted in color.

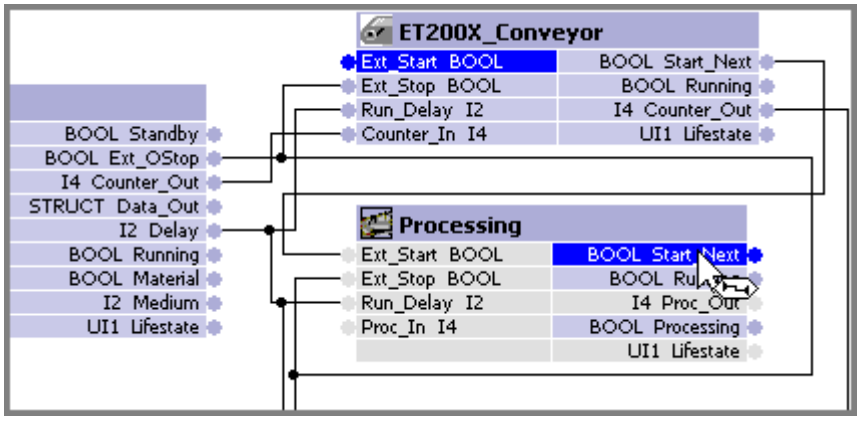


Figure 4-10 Interconnecting technological functions

The interconnection appears between the two connections as a line or in the form of continuation connections (see below "Displaying the interconnection lines").

Tip: Multiple interconnections

Used to connect several inputs to one output:

- Hold down the CTRL key and select the required inputs.
- Release the CTRL key and select the output to be interconnected.

Result: All the selected inputs are interconnected to this output.

See also

Moving interconnections (Page 134)

Interconnection with constant values (Page 129)

Setting the transfer properties of interconnections (Page 137)

4.4.3.2 Working with interconnections

General rules for handling interconnections

The deletion of the instance of a technological function includes all its associated interconnections.

Moving a technological function also alters the path of the associated interconnections.

If the the line path can not be calculated, for example due to lack of space, only the two ends of the interconnection, known as continuation connectors, are visualized. Continuation connectors with identical numbers represent an interconnection.

The line color of a selected interconnection changes. You can delete a selected interconnection, or view and edit its properties.

Visualization of interconnection lines

Select the **View > Plant view > Display Interconnection Lines** command to show or hide the interconnection lines.

In order to improve efficiency when working in the plant view, you can disable the interconnection lines temporarily by clearing the check mark at the menu command. The result is, only the end points of the interconnections are visualized as continuation connectors. This visualization mode reduces load on computer resources required for the dynamic calculation of lines, and thus allows you to quickly move and interconnect technological functions.

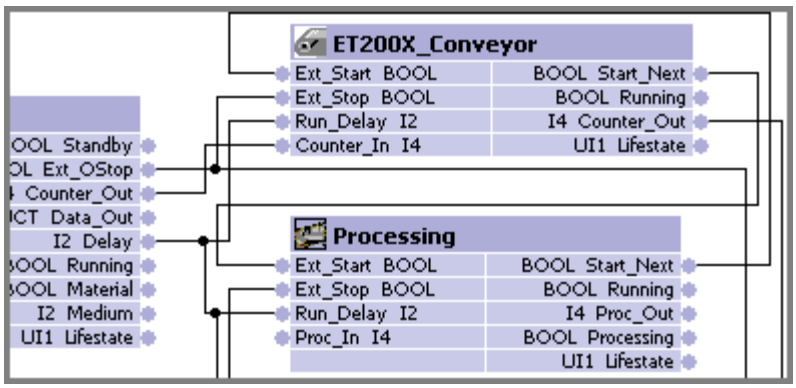


Figure 4-11 Visualization of interconnection lines

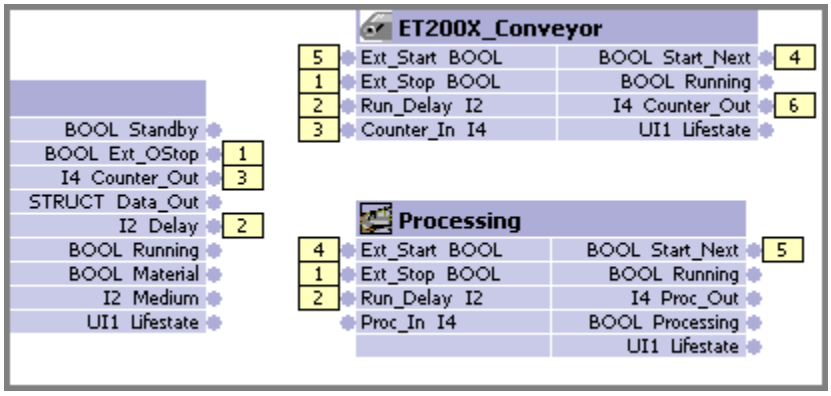


Figure 4-12 Visualization of continuation connectors

Recalculation of interconnection lines

Select the **View > Plant view > Recalculate interconnection lines** , or press the F5 function key to recalculate the interconnection lines and to optimize their visualization.

Highlighting interconnections

- Select the interconnections you want to highlight in the plant view, then select **Highlight interconnections** from the shortcut menu.
- To highlight interconnections with specific transfer properties in the plant view, select the functions and charts, then select **Edit > Plant view > Highlight interconnections >**, and finally select the required property. Options:

Property	Description
> Selected	Highlights all selected interconnections
> Cyclic > All transfer rates /fast /medium /slow	Highlights all cyclic interconnections with the corresponding transfer rates of selected functions and charts
> Acyclic > All scan rates /fast /medium /slow	Highlights all cyclic interconnections with the corresponding scan rate of selected functions and charts

Result: In both versions, the selected interconnections are indicated in the plant view by a thicker line, or continuation connectors and bold numbers.

Selecting interconnections

To select interconnections with specific properties in the plant view, select the functions and charts, then select **Edit > Plant view > Select interconnections >**, and finally select the required property. Options:

Property	Description
> All	Includes all interconnections of selected functions and charts
> Cyclic > All transfer rates /fast /medium /slow	Includes all cyclic interconnections with the corresponding transfer rates of selected functions and charts
> Acyclic > All scan rates /fast /medium /slow	Includes all acyclic interconnections with the corresponding scan rate of selected functions and charts
> Highlighted	Includes all highlighted interconnections of selected functions and charts

Result: The required interconnections are highlighted (transformation of the line colors or continuation connectors), and thus prepared for further editing, for example, deleting or moving.

4.4.3.3 Hiding and showing connectors

Visible and hidden connections

Connections which are not interconnected, and connections interconnected with constant values, can be visualized (made visible) or hidden (concealed) in the plant view. By hiding the connections you do not require you can simplify the representation of functions in the plant view and interconnecting.

Options of of hiding connections:

- Identify selected connections for hiding. Options:
  - Identification by function
  - Identification in the "Properties" dialog of the instance or of the individual connection

    The marked connections are represented in the plant view in white font. You can hide the connections at a later time.
- Hiding and showing the identified connections of a function. Options:
  - Hiding and showing the function
  - Set the hide and show option in the "Properties" dialog box of the instance

How to identify the connections for hiding directly at the function:

1. Open the plant view
2. Select the relevant connections of a function, then select the **Hide option** option from the shortcut menu

Result: The selected connections are shown in white font, and can be hidden at any time.

Tip

The **Edit > Plant view > Select connections >** menu command can be used to select the desired connections (see below)

How to identify the connections for hiding in the "Properties" dialog box of the instance

1. Select the function or the device of the instance, and then select **Properties...** from the context menu.
2. Activate the "Can be hidden" option and confirm by clicking the "OK" or "Accept" button.

   Result: When the dialog box is closed the connection is shown in white font and can be hidden at any time.

How to hide and show connections directly at the function:

1. Open the plant view.
2. Select a function where the connections are identified for hiding.
3. Select the shortcut menu **Hide connections**

Result: The connections identified for hiding are hidden.

How to hide and show connections in the "Properties" dialog:

1. Select the function or the device of the instance, and then select **Properties...** from the context menu.
2. On the "Properties" dialog box, select the "Connections" tab.
3. Select any connections required from the IO list, or reset the identifier ("Set hide option for selected connections" check box.)
4. Set the "Hide connections with hide option in the plant view" check box.
5. Click "OK" or "Apply"

   Result: The marked connections will be hidden when you close the dialog box.

Selecting connections

To select connections with specific properties in the plant view, select the functions and charts, then select **Edit > Plant view > Select connections >**, and finally select the required property. The following possibilities are available to you:

Property	Description
> All	Includes all interconnections of the selected functions and charts in the selection
>Not interconnected	Includes all connections that are not connected of the selected functions and charts in the selection
> Interconnected	Includes all the interconnected connections of the selected functions and charts in the selection

Result: The required connections are highlighted (the connection colors change) and thus prepared for further editing, for example, hiding.

4.4.3.4 Interconnection with constant values

Constant values at technological inputs

Some technological functions require a constant value to be applied at an input, in order to test the function, for example. This value can be set using SIMATIC iMap.

Rules

In SIMATIC iMap, only inputs can be interconnected with constant values. This is not possible with outputs.

Requirement

The input may not be interconnected otherwise. If this is the case, the existing interconnection must first be deleted.

To interconnect an input with a constant value

1. Select the input so that the mouse pointer with the interconnection icon appears.
2. Select **Interconnect Constants** from the shortcut menu.
3. Enter the desired value in the "Interconnection with Constant Value" dialog box and click on the "OK" or "Accept" button.

The input is identified by a constant icon, and the value of the constant is displayed at the input.

Example

The selected input is interconnected with the value 30.

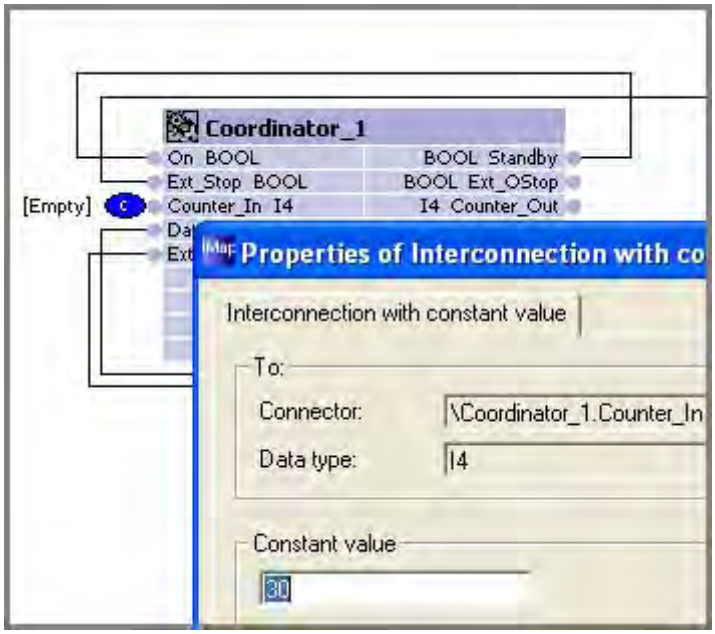


Figure 4-13 Interconnection with a constant value

How to modify the interconnection with a constant value

1. Select the constant icon of the input.
2. Open the interconnection properties.
3. Enter the required value in the Constant Value" input box of the "Interconnection with Constant Value" dialog box.
4. Click on the "OK" or "Apply" button.

The changed value is displayed at the input.

Constant values for composite data types

With composite data types such as arrays or structures you can enter constant values for each individual element.

With arrays, you can also enter the same constant value for all the elements in the array. To do this, enter the required value in the "Constant value" input box and click on the "for all array elements" button.

Example: Constant values for a connection of the type STRUCT

The following diagram shows how to enter a constant value for a structure element of the type UI1 (byte):

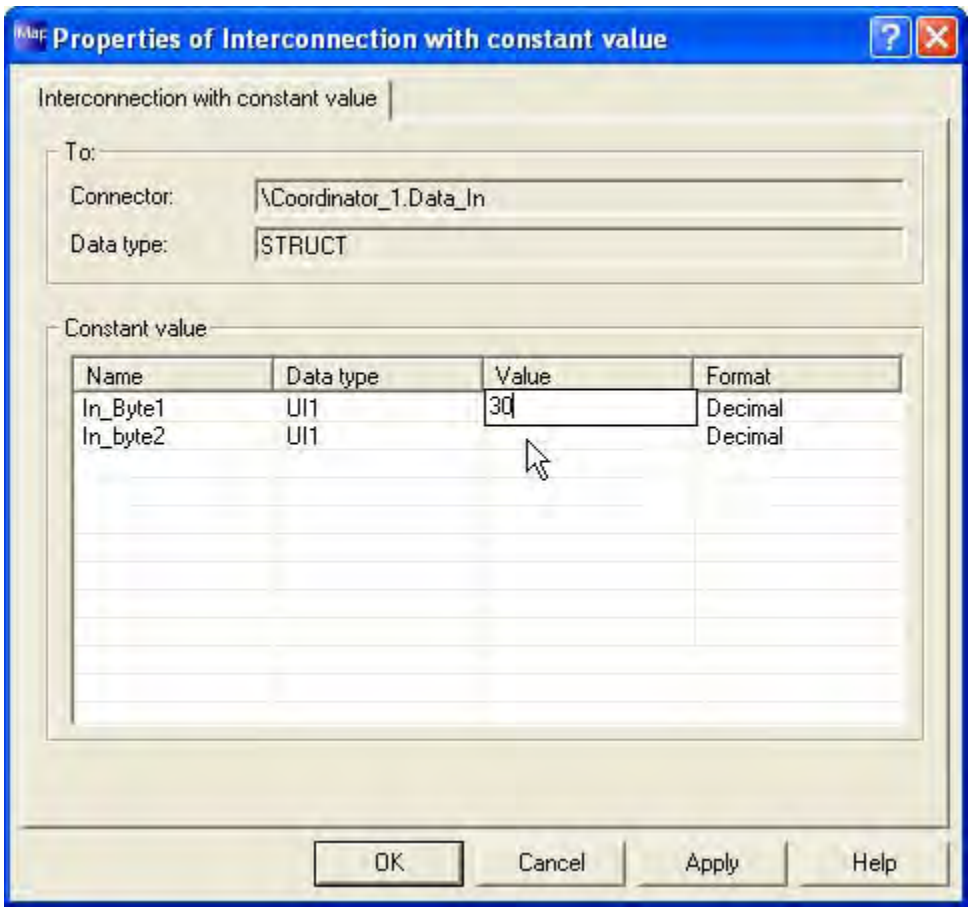


Figure 4-14 Interconnecting with constant values for a connection of the data type STRUCT

How to delete an interconnection with a constant value:

1. Select the constant icon of the input.
2. Select the **Delete Interconnection** command from the shortcut menu.

The constant icon disappears. The input can be interconnected again.

4.4.3.5 Configuring substitute values

Substitute values

If a fault occurs on a device such that the values that are sent via its interconnections are no longer valid, then the recipient switches to substitute values.

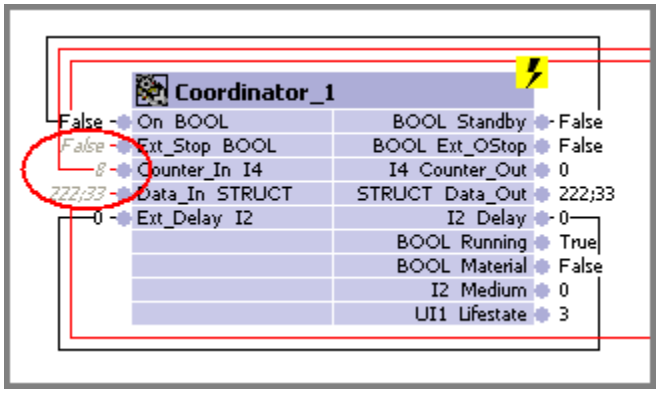


Figure 4-15 Example - Substitute values

In SIMATIC iMap, there is a default substitute value for every interconnection. This may be the last known value or a user-defined value.

Note

Substitute values can only be configured for interconnections between PROFINET devices.

If a PROFIBUS device is involved, then only substitute value 0 may be used.
Exception: The "1.1.2000" is always used as the substitute value for connections of the type DATE.

How to change the default substitute value of an interconnection

1. Select the interconnection from the plant view.
2. Select **Properties** from the pop-up menu.
3. In the "Properties" dialog box, activate the required option in the "Substitute value" box. If you wish to activate a specified value as the substitute value, then enter the required value.
4. Click on the "OK" or "Accept" button to confirm the changes.

5. Select the function with the affected input (on the recipient side) and select **Download Selected Device > Interconnections only** from the context menu to download the newly configured interconnection to the associated device.

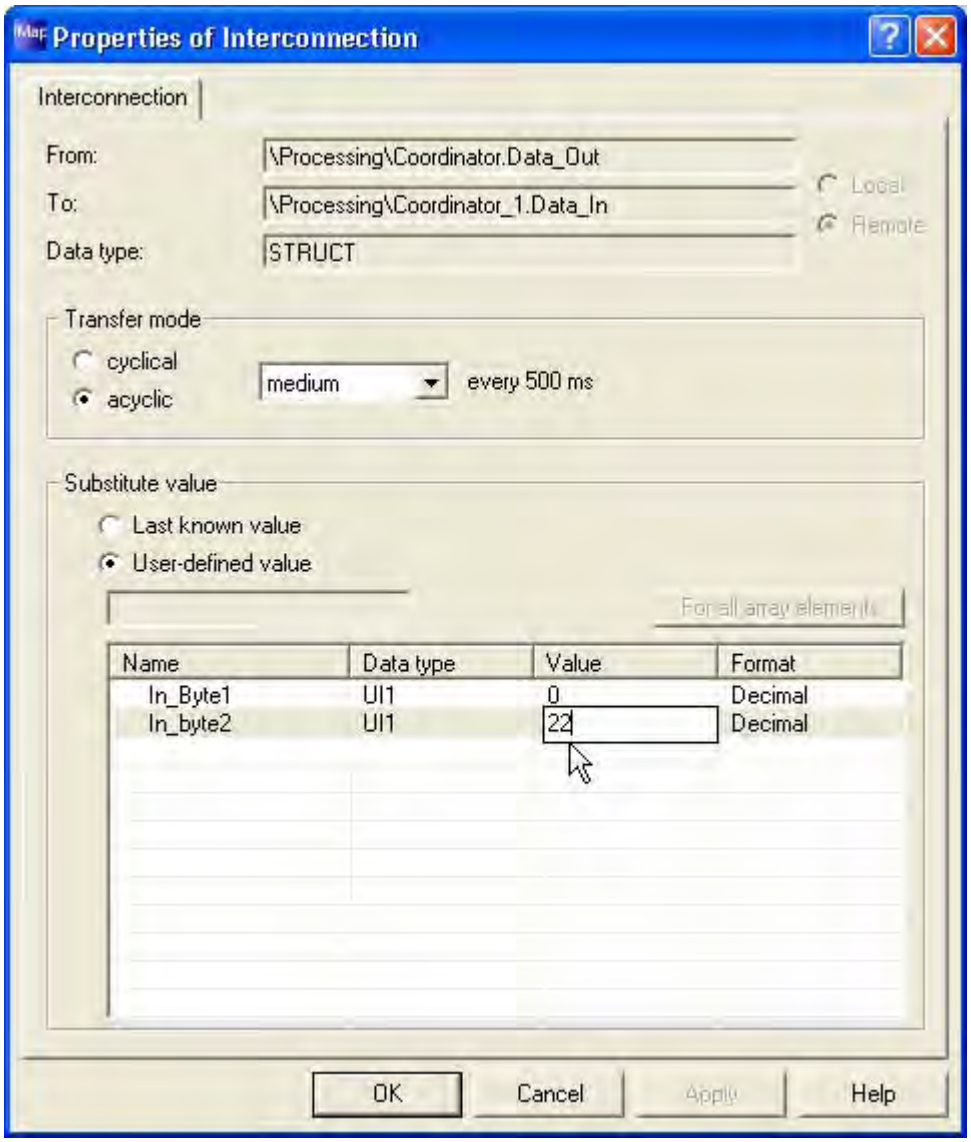


Figure 4-16 Example - Changing substitute values

Result: The change takes effect immediately. If there is already a fault on the device, you can monitor the modified substitute value online.

Substitute values for composite data types

With composite data types such as arrays or structures you can enter a user-defined substitute value for each individual element.

With arrays, you can also enter the same user-defined substitute value for all the elements in the array. To do this, enter the required value in the "User-defined value" box and click on the "for all array elements" button.

4.4.3.6 Moving interconnections

In SIMATIC iMap, the end point of an interconnection can be moved onto a connection of another technological function.

Rules for moving interconnections

The target connection to which the end point of an interconnection is to be moved must fulfill a number of conditions. These conditions depend on the number of end points to be moved.

- Some or all of the end points of the interconnections of a technological function can only be moved onto connections of the same type (input or output), same name and same data type of another technological function.
- There are two ways to move the interconnection at an individual end point:
  - to a connection of the same type (input or output), data type, and technological function (the latter does not require identical connection names), or
  - to a different technological function. In this case, the technological function at the destination must contain a connection of the same type (input or output), name and data type.
- If the end point is an input, it can only be moved to an **unconnected** input. An output can be moved to an interconnected output.
- Interconnections cannot be moved beyond chart limits. The source and destination must be located in the same chart.
- The configured substitution values are applied to the interconnections.
- Interconnections with configured substitution values can not be moved from a PROFINET device to a PROFIBUS device, if those values are unequal to default values.

How to move several interconnections:

1. Select:
   - the entire technological function to move all interconnections, or
   - to move only the connections of the interconnections.
2. Select the **Move Interconnections** command from the shortcut menu. The technological functions at the destination of the selected interconnections are highlighted in color when the mouse pointer moves over these objects.
3. Click the technological function at the destination of your interconnections.
4. Confirm the prompt with "Yes" to move the interconnection.

   Result: the interconnections are moved to suitable connections in the new technological function.

Interconnections without suitable destinations will not be moved, and remain at their original technological function.

How to move a single interconnection

1. Select the connection of the interconnection to move.
2. Select the **Move Interconnections** command from the shortcut menu. The possible destinations of the interconnection, i.e. the connections or technological functions, will be highlighted in color when you move the mouse pointer over these objects.
3. Click the destination connection for the interconnection.

   Result: the end point of the interconnection is moved to the destination connection.

4.4.3.7 Transfer properties

Interconnections with local communication partners

Interconnections with local communication partners are:

- Interconnections between two PROFIBUS devices on the same PROFIBUS
- Interconnections between a PROFIBUS device and the corresponding PROFINET device with proxy functionality
- Internal device interconnections

Interconnections with remote communication partners

Interconnections with remote communication partners are routed across Industrial Ethernet.

Features of PROFINET communication

In SIMATIC iMap, the following PROFINET communication properties can be assigned to interconnections:

- Transfer mode
- Transfer rate and scan rate (Quality of Service)

Transfer mode

PROFINET communication on Industrial Ethernet supports the following transfer modes:

- Cyclic transfer of time-sensitive process data

  Data are transferred cyclicly; changed values will be ignored.

- Acyclic transfer, for example, of engineering data and of data which are not time-sensitive.

  The data are scanned cyclicly, i.e. checked for changes. The data are only transferred if changed.

  The data are scanned on the transmitter side of the interconnection (output of a technological function.)

The supported transfer modes represent device properties. They can be derived from the properties of the relevant PROFINET component.

Note

Always transfer time-sensitive process data in cyclic mode.

Quality of Service (QoS)

A QoS is defined for both transfer modes:

- Transfer rate (cyclic):

  In cyclic transfer mode, the transfer rate represents the interval between two successive transfers of a parameter, for example, 32 ms.

- Scan rate (acyclic):

  In acyclic transfer mode, the scan rate represents the interval between two successive checks for changes in data on provider side, for example, 200 ms. The scan interval is usually equivalent to the maximum time expiring prior to the transfer of deltas.

  This time may be exceeded as a result of overload or communication errors. If errors persist, a substitution value is applied on receiver (consumer) side after 20 x <scan interval>.

Scan rate and transfer rate values

Three rate levels are defined for both transfer modes:

- fast - high rate
- medium - medium rate
- slow – low rate

A transfer value can be set centrally for each rate level:

- Between 1 ms and 512 ms (cyclic)
- Between 1 ms and 1000 ms (acyclic)

Project settings

Properties of the SIMATIC iMap project (**Project > properties**, "Interconnections" tab) users can set:

- Default transfer properties for new interconnections. – Apply to all new interconnections
- Time values for the rate levels. – Apply to all instances of the SIMATIC iMap project.

Example

The diagram below shows the transfer properties settings of the project as an example:

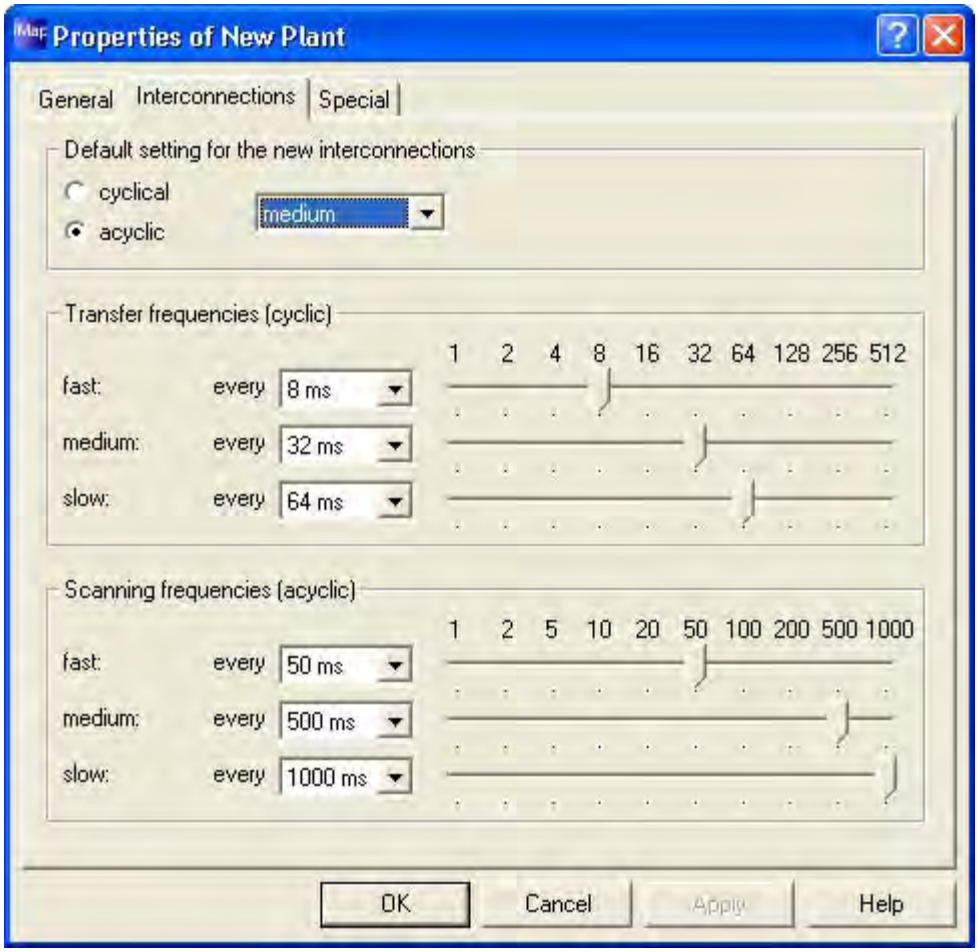


Figure 4-17 Transfer properties of the project

All subsequently created interconnections will have these preassigned properties assigned to them.

4.4.3.8 Setting the transfer properties of interconnections

Central settings and individual adaptations

Every interconnection has a transfer mode and a transfer value assigned to it in SIMATIC iMap. The following is defined centrally in the project settings:

- The default setting for new interconnections.
- The precise transfer values for the frequency levels "fast", "medium" and "slow" in milliseconds for all interconnections.

You can change the transfer mode and the frequency level "fast", "medium" or "slow" in the properties of the individual interconnections.

Note

The transfer properties (transfer mode, transfer frequency and scanning frequency) are only of relevance for interconnections to remote communication partners via Industrial Ethernet.

During a download, interconnections are checked, however, regardless of whether they are remote interconnections or not. The transfer properties must therefore still be specified at the configuration stage for internal device interconnections and interconnections within a proxy system.

Note

Interconnections with cyclical transfer only work between communication partners that are on the same subnet.

How to define the transfer properties for the interconnections of the entire project

1. Select the **Project > Properties** menu command.
2. Open the "Interconnections" tab.
3. In the "Default setting for the new interconnections" box, select:
   - the transfer mode "acyclical" or "cyclical" and
   - the frequency level "fast", "medium" or "slow".

   These settings will apply to all subsequently created interconnections.
4. In the "Transfer frequency (cyclical)" box, select the transfer values for the three frequency levels. There are two options:
   - Select the required value from the drop-down list or
   - drag the pointer onto the required value.
5. In the "Scanning frequency (acyclical)" box, select the transfer values for the three frequency levels (as in step 4).
6. Click on the "OK" or "Accept" button to confirm your input.

The settings in step 4 and 5 apply to all the interconnections in the project with the corresponding transfer mode and frequency level. These values are retained in SIMATIC iMap until they are changed again.

You can change the transfer properties of individual interconnections via the interconnection properties.

Tip: The transfer properties of a highlighted interconnection are also displayed as a tooltip.

To change the transfer properties of an interconnection

1. Select the interconnection in the plant view and select the **Edit > Properties** menu command.
2. In the "Properties" dialog box select:
   - the transfer mode "acyclical" or "cyclical" and/or
   - the frequency level "fast", "medium" or "slow". The precise transfer value in milliseconds for this transfer mode and frequency level can be taken from the project settings.
3. Click "OK" or "Accept" to confirm.

Example: Transfer properties for the entire project

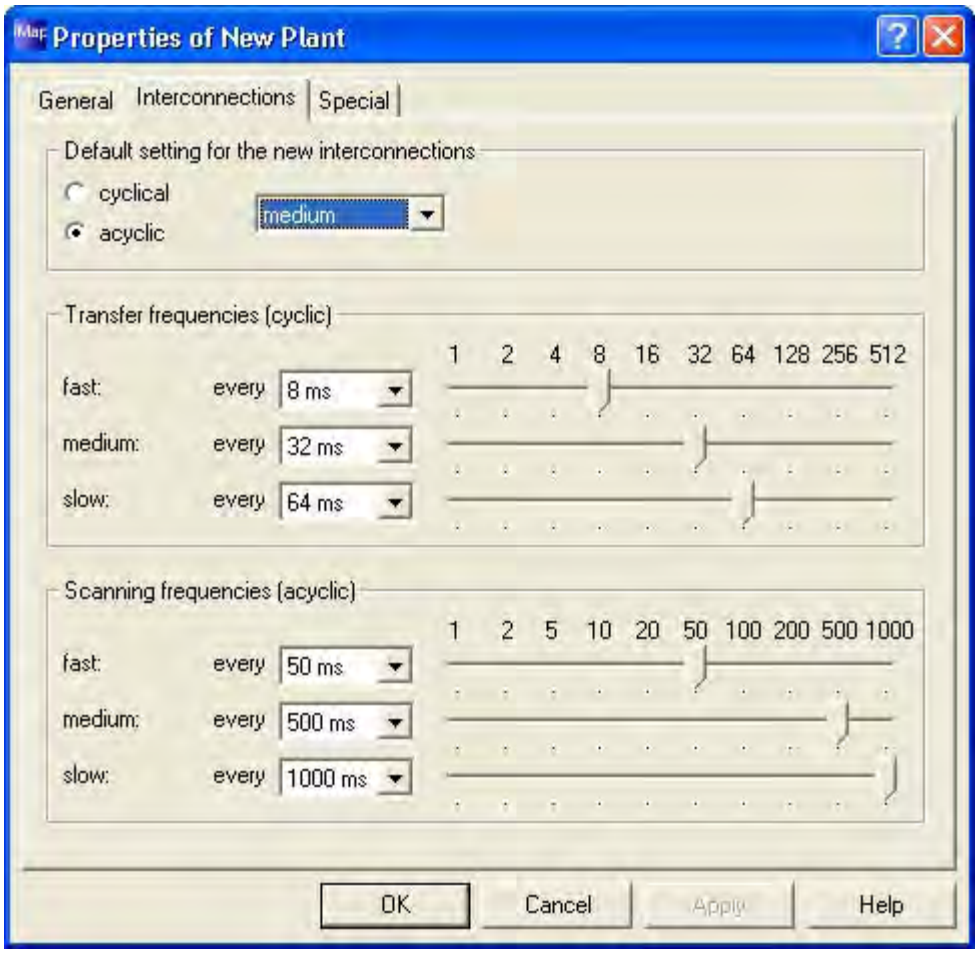


Figure 4-18 Transfer properties for the entire project

Example: Transfer properties of an interconnection

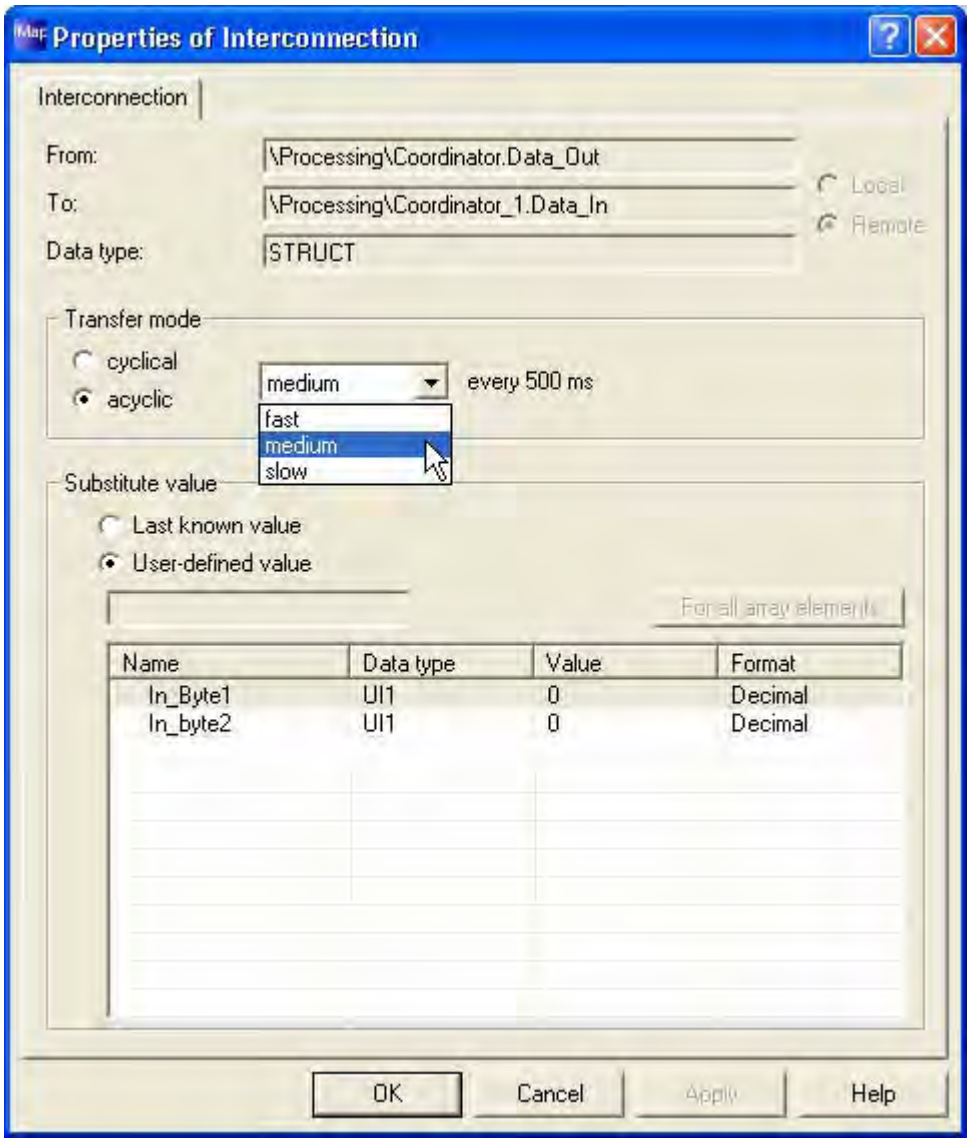


Figure 4-19 Transfer properties of an interconnection

See also

Interconnecting Technological Functions (Page 123)

Transfer properties (Page 135)

4.4.4 Checking the utilization of the devices

4.4.4.1 Utilization test

Application

PROFINET devices with runtime version V2.0.0.0 or higher dispose of performance parameters (Page 143) that describe the PROFINET communication properties of the devices.

The performance parameters allow users to the test working load on devices in the configuration phase in SIMATIC iMap. The results show at an early stage whether the devices are capable of meeting requirements of your SIMATIC iMap project without causing any runtime errors in the plant as a result of overload.

In the configuration phase, you can debug the system before you generate the project if this check returns values which are incompatible with performance parameters.

Items checked

Items checked in the configuration phase:

- Violation of any performance parameters at the devices, for example, the maximum number or transfer values of interconnections.
- Support of configured transfer properties of the interconnection (cyclic transfer, for example) at the device.
- Only for PROFIBUS devices: Compatibility of the PROFIBUS device and of the corresponding PROFINET device with proxy functionality, with the PROFINET runtime version.

The performance parameters are available in the "Device" tab of the PROFINET component properties. Select the PROFINET component from the library window then select **Properties** from the context menu.

Rules

You can only test PROFINET devices.

At PROFINET devices with proxy functionality, the utilization check relates to the entire proxy system, which consists of the actual device and any connected PROFIBUS devices.

How to test the working load on PROFINET devices

1. Select the PROFINET devices to test from the network view.
2. Select the **Test utilization** command from the context menu.

   Result: The test is carried out, and the results are output to the output window, "Utilization (Page 145)" tab.
3. If the test returns overload: Debug the configuration data of the devices and the interconnections, or modify the networking of the devices.

Note

In the utilization check of the devices, the outgoing interconnections with external projects are not taken into consideration. Only the incoming interconnections of external projects in the destination project are included.

Tip: Detailed information

To view detailed results, select the "Utilization" tab of the task window and then click the "+" symbols.

Result: All the performance parameters are listed including current and limit (Page 143) values (actual/typical/max. or actual/typical/min.)

Tip: Locating the objects

If the utilization test discloses any violation of limit values, the relevant object will be identified by a warning icon in the "Reference object" column. Double-click the reference object to select the relevant object to check and correct its properties right away

Tip: Test the online utilization

The **Online > Online device analysis** command returns the online data of a specific PROFINET device, including a comparison between online configuration data and performance parameters (see "Online device analysis (Page 199)".)

See also

Parameters of limit values (Page 143)

Online device analysis (Page 199)

Connecting devices in the network view (Page 115)

Transfer properties (Page 135)

Setting the transfer properties of interconnections (Page 137)

Performance parameters of PROFINET devices (Page 143)

Utilization parameters of the PROFINET devices (Page 145)

4.4.4.2 Parameters of limit values

Typical and absolute limits

There two different types of limits at the parameters of the PROFINET devices.

- Typical limits

  On the basis of these values it is possible to determine whether excessive demands would be placed on a device. If the configuration remains below or, respectively, above the typical limit at each individual parameter, it is ensured that the plant will definitely run stable and free of errors. However the reverse is not true: If one or even several typical limits are exceeded, the plant may still functions stably and error-free. But this cannot be guarantee in every case.

- Absolute limits

  The maximum or minimum limits may not be exceeded or underpassed respectively under any circumstances. If only one parameter lies above the maximum limit, the device cannot fulfill the configured requirements. In this case, the configuration cannot be downloaded to the target device

Note

The differentiation between typical and maximum limits is only supported for devices of PROFINET Runtime Version V2.3 and higher.

Displaying the limit values

The typical and maximum limits are displayed as follows:

- Both the typical and the absolute limits are displayed if available in the properties of the PROFINET component (performance parameters (Page 143)).
- In the utilization check (Page 141) of the current configuration (utilization parameters (Page 145)) the actual values, the typical and the maximum limits are displayed in as far as available.
- The maximum/minimum limits and the online actual values of a device are displayed at the online device analysis (Page 199).

4.4.4.3 Performance parameters of PROFINET devices

Performance parameters of PROFINET devices

PROFINET devices with PROFINET runtime version 2.0 or higher are assigned specific performance parameters which are vital to PROFINET communication. From PROFINET Runtime Version 2.3 and higher both the typical and the maximum limits (Page 143) are displayed, if available.

These performance parameters are available in the "Performance parameters" tab under the PROFINET component properties. Select the PROFINET component from the library window, then select **Properties** from the context menu.

PROFINET performance parameters

Parameter	Description
General limits*)	
Number of remote interconnection partners	Maximum number of communication partners (devices) via industrial Ethernet.
Number of functions (proxy)	Maximum number of technological functions. For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.
Total of all connections (proxy)	Maximum number of connections for the technological functions. For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.
Number of PROFIBUS devices (proxy)	Maximum number of PROFIBUS devices connected to the PROFINET device with proxy functionality.
Total data length of all incoming connections (proxy)	Maximum total data length of all incoming connections in bytes.
Total data length of all outgoing connections (proxy)	Maximum total data length of all outgoing connections in bytes.**)
Number of local interconnections	Maximum number of interconnections: • between PROFIBUS devices on the same PROFIBUS • between the PROFIBUS device and the corresponding PROFINET device with proxy functionality • on the same device (internal)
Total data length of all local connections (proxy)	Maximum total data length of all internal and PROFIBUS interconnections in bytes.
Data length per connection	Maximum total data length per connection in bytes.
Remote interconnections with acyclic transfer*)	
Scan rate - minimum scan interval	Minimum time interval of the scan rate in milliseconds.
Number of incoming interconnections	Maximum number of interconnected inputs.
Number of outgoing interconnections	Maximum number of interconnected outputs.**)
Total data length of all incoming interconnections	Maximum total data length of all incoming connections in bytes.
Total data length of all outgoing interconnections	Maximum total data length of all outgoing connections in bytes.**)
Remote interconnections with cyclic transfer*)	
Transfer rate - minimum transfer rate	Minimum time interval of the transfer rate in milliseconds.
Number of incoming interconnections	Maximum number of interconnected inputs.
Number of outgoing interconnections	Maximum number of interconnected outputs.**)
Total data length of all incoming interconnections	Maximum total data length of all incoming connections in bytes.
Total data length of all outgoing interconnections	Maximum total data length of all outgoing connections in bytes.**)
Data length per connection	Maximum total data length per connection in bytes.

*) Applicable to PROFINET devices with proxy functionality: including the connected PROFIBUS devices (see the rule below.)

**) Outputs with multiple interconnections with remote partners are counted accordingly.

Rule

The performance parameters of PROFINET devices with proxy functionality apply to the entire proxy system, which consists of the actual device and the connected PROFIBUS devices.

See also

Utilization test (Page 141)

Transfer properties (Page 135)

4.4.4.4 Utilization parameters of the PROFINET devices

Options of scanning utilization parameters

In the case of the utilization check (Page 141), all the parameters with their current values and limits are listed in the information window. Exceeded and undershot utilization parameters are identified by a warning symbol in the information window. The quantitative deviations can be seen from the Actual/Max and Actual/Min values.

Note

For devices from PROFINET Runtime Version V2.3 and higher a difference is made between typical and maximum limits (Page 143) if available.

Validity of the utilization parameters

The parameters listed below apply to:

- a PROFINET device without proxy functionality or
- the entire proxy system of a PROFINET device with proxy functionality.

Descriptions of the utilization parameters

The utilization parameters can be subdivided into the following parameter groups:

- Device parameters (Page 146)
- General interconnection-specific parameters (Page 147)
- Parameters for acyclic remote interconnections (Page 149)
- Parameters for cyclic remote interconnections (Page 153)

The "Remedy" column contains possible remedies in the event that utilization parameter limits are exceeded or undershot.

<Actual> represents a current actual value, while <Min> and <Max> are limit values.

Note

In the utilization check of the devices, the outgoing interconnections with external projects are not taken into consideration. Only the incoming interconnections of external projects in the destination project are included.

Note

With the utilization check of the devices the interconnections with uncoupled PROFIBUS devices are taken into consideration as remote interconnections.

See also

Error messages for interconnections with cyclic transfer (Page 155)

Setting the transfer properties of interconnections (Page 137)

Transfer properties (Page 135)

4.4.4.5 Device parameters

Utilization parameters: Device parameters

These utilization parameters apply to the entire proxy system of the PROFINET device with proxy functionality.

Parameter	Meaning	Remedy
Number of coupled PROFIBUS devices	Number of PROFIBUS devices that are coupled to the PROFINET device with proxy functionality. This includes DP slaves on the local PROFIBUS.	Reduce the number of coupled PROFIBUS devices.
The number of functions on DP master and DP slaves	Number of technological functions. For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices	Reduce the number of functions.
Total of all connections of DP master and DP slaves	Total number of connections for the technological function(s). For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	Reduce the number of coupled PROFIBUS devices.
Maximum data length for arrays and structures for DP master and DP slaves	Total data length for arrays and structures in bytes (see "Connection data types"). For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices. Possible cause: The data length of at least one connection of a coupled PROFIBUS device is too long for this master	Couple the PROFIBUS device to another PROFINET device with proxy functionality.

Parameter	Meaning	Remedy
Total data length of all inputs of DP master and DP slaves	Total data length of all inputs of the technological function(s) in bytes (see "Connection data types"). For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	Reduce the number of coupled PROFIBUS devices.
Total data length of all outputs of DP master and DP slaves	Total data length of all outputs of the technological function(s) in bytes (see "Connection data types"). For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	
Memory requirement for type descriptions of all connections of DP master and DP slaves	This parameter comprises the memory required for the description of the data types of all connections. This memory is required in addition to the working data (sum of the data lengths of all inputs and outputs).	

See also

Utilization parameters of the PROFINET devices (Page 145)

4.4.4.6 General interconnection-specific parameters

Utilization parameters: General interconnection-specific parameters

These parameters are independent of the transfer mode.

Parameter	Meaning	Remedy
Number of internal device and PROFIBUS interconnections for master and slaves	Number of interconnections: • between PROFIBUS devices on the same PROFIBUS • between PROFIBUS devices and the associated PROFINET device with proxy functionality • on the same device (internal)	If necessary, reduce the number of internal device interconnections and PROFIBUS interconnections.
Number of internal device and PROFIBUS interconnections for master and slaves	Total data length in bytes for all connections with the following interconnections: • between PROFIBUS devices on the same PROFIBUS • between PROFIBUS devices and the associated PROFINET device with proxy functionality • on the same device (internal)	

Parameter	Meaning	Remedy
Number of interconnections with constants of master and slaves	Number of interconnections with constants. For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	Reduce the number of interconnections with constants.
Total data length of all interconnections with constants of DP master and DP slaves	Total data lengths of all interconnections with constants. For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	
Number of remote interconnection partners of DP master and DP slaves	Number of remote communication partners (via Industrial Ethernet).	Reduce the number of remote communication partners of the device
Utilization due to the number of device relationships between DP master and DP slaves as well as between remote interconnection partners	This parameter shows the utilization (as a percentage) in relation to the number of directed communication relationships between the device and its communication partners, in both the local and the remote proxy system. All interconnections in a direction – e.g. from outputs of device A to inputs of device B – are regarded as directed communication relationships between devices A and B. All interconnections in the other direction – from outputs of device B to inputs of device A – are regarded as another directed communication relationship between devices A and B.	Reduce the number of directed communication relationships of the device. It is not sufficient simply to remove some of the interconnections that form a directed communication relationship. All the interconnections in the same direction between two devices must be removed in order to remove a directed communication relationship between these devices.

See also

Utilization parameters of the PROFINET devices (Page 145)

4.4.4.7 Parameters for acyclic remote interconnections

Utilization parameters: Parameters for acyclic remote interconnections

Parameters for interconnections with acyclic transfer to remote communication partners. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.

Parameter	Meaning	Remedy
Minimum interval for scanning frequency	Minimum time interval for the scanning frequency with frequency level "fast" in milliseconds	Increase the minimum interval for the scanning frequency for frequency level "fast" in the project settings.
Incoming interconnections:	Interconnection at the inputs of technological function(s)	
Number	Number of incoming interconnections. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of incoming interconnections with acyclic transfer to remote communication partners or • use interconnections with cyclic transfer, if necessary.
Total data length	Sum of the data lengths of all connections with incoming interconnections in bytes. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Distribution by frequency:	This parameter is represented as follows: • OK - if the distribution of interconnections by frequency level is OK. • With a warning symbol - if the distribution of interconnections by frequency level is not suitable. The following parameters show whether the performance parameters are exceeded or undershot by the configuration of the interconnection for each frequency level.	If a warning symbol appears on the line: • Determine the frequency level at which at least one device parameter limit value is exceeded or undershot by the associated configured value and • distribute the incoming remote interconnections for the affected frequency level to other frequency levels or • use interconnections with cyclic transfer, if necessary.
Device parameter: fast (<Min> ms); interconnections: <Max>; Total data length: <Max> byte	Device performance parameters (limit values) for the frequency level "fast": • The minimum time interval for the scanning frequency with frequency level "fast" in milliseconds • The maximum number of incoming interconnections with frequency level "fast" • The total data length of all inputs with interconnections of frequency level "fast" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.

Parameter	Meaning	Remedy
Configured: fast (<Actual> ms); interconnections: <Actual>; Data length: <Actual> byte	Current configured values for incoming interconnections with frequency level "fast": • The configured time interval for the scanning frequency with frequency level "fast" in milliseconds • The current number of incoming interconnections with frequency level "fast" • The current total data length of all inputs with interconnections of frequency level "fast" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Device parameter: medium (<Min>ms); interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "medium": • The minimum time interval for the scanning frequency with frequency level "medium" in milliseconds • The maximum number of incoming interconnections with frequency level "medium" • The total data length of all inputs with interconnections of frequency level "medium" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Configured: medium (<Actual>ms); interconnections: <Actual>; Data length: <Actual> byte	Current configured values for incoming interconnections with frequency level "medium": • The configured time interval for the scanning frequency with frequency level "medium" in milliseconds • The current number of incoming interconnections with frequency level "medium" • The current total data length of all inputs with interconnections of frequency level "medium" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Device parameter: slow (<Min> ms); interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) at "slow" rate level: • The mimimum interval for a scan rate at "slow" rate level in ms • The maximum number of incoming interconnections with frequency level "slow" • The total data length of all inputs with interconnections of frequency level "slow" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Configured: slow (<Actual>ms); interconnections: <Actual>; Data length: <Actual> byte	Current configured values for incoming interconnections with frequency level "slow": • The configured interval for a scan rate at "slow" rate level in ms • The current number of incoming interconnections with frequency level "medium" • The current total data length of all inputs with interconnections of frequency level "slow" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.

Parameter	Meaning	Remedy
Outgoing interconnections:	Interconnection at the outputs of technological function(s)	
Number	Number of outgoing interconnections. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of outgoing interconnections with acyclic transfer to remote communication partners or • use interconnections with cyclic transfer, if necessary.
Total data length	Sum of the data lengths of all connections with outgoing interconnections. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Distribution by frequency:	This parameter is represented as follows: • OK – if the distribution of interconnections by frequency level is OK. • With a warning symbol - if the distribution of interconnections by frequency level is not suitable. The following parameters show whether the performance parameters are exceeded or undershot by the configuration of the interconnection for each frequency level.	If a warning symbol appears on the line: • Determine the frequency level at which at least one device parameter limit value is exceeded or undershot by the associated configured value and • distribute the outgoing remote interconnections for the affected frequency level to other frequency levels or • use interconnections with cyclic transfer, if necessary.
Device parameter: fast (<Min>ms); interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "fast": • The minimum time interval for the scanning frequency with frequency level "fast" in milliseconds • The maximum number of outgoing interconnections with frequency level "fast" • The total data length of all outputs with interconnections of frequency level "fast" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Configured: fast (<Actual> ms); interconnections: <Actual>; Data length: <Actual> byte	Current configured values for outgoing interconnections with frequency level "fast": • The configured time interval for the scanning frequency with frequency level "fast" in milliseconds • The current number of outgoing interconnections with frequency level "fast" • The current total data length of all outputs with interconnections of frequency level "fast" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.

Parameter	Meaning	Remedy
Device parameter: medium (<Min> ms); interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "medium": • The minimum time interval for the scanning frequency with frequency level "medium" in milliseconds • The maximum number of outgoing interconnections with frequency level "medium" • The total data length of all outputs with interconnections of frequency level "medium" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Configured: medium (<Actual> ms); interconnections: <Actual>; Data length: <Actual> byte	Current configured values for outgoing interconnections with frequency level "medium": • The configured time interval for the scanning frequency with frequency level "medium" in milliseconds • The current number of outgoing interconnections with "medium" rate level. • The current total data length of all outputs with interconnections operating at a "medium" rate level in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Device parameter: slow (<Min> ms); interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) at "slow" rate level: • The minimum interval for a scan rate at "slow" rate level in ms • The maximum number of outgoing interconnections at "slow" rate level. • The total data length of all outputs with interconnections of the "slow" rate level in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.
Configured: slow (<Actual> ms); interconnections: <Actual>; Data length: <Actual> byte	The current number of outgoing interconnections with "slow" rate level. • The configured interval for a scan rate at "slow" rate level in ms • The current number of outgoing interconnections with "medium" rate level. • The current total data length of all outputs with interconnections of operating at a "slow" rate in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by rate..." line.

See also

Utilization parameters of the PROFINET devices (Page 145)

4.4.4.8 Parameters for cyclic remote interconnections

Utilization parameters: Parameters for cyclic remote interconnections of DP master and DP slaves

Parameters for interconnections with cyclic transfer to remote communication partners. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.

Parameter	Meaning	Remedy
Minimum interval of the transfer rate	Minimum time interval for the transfer rate at "fast" level in ms	Increase the minimum interval for the transfer rate at the "fast" rate level in the project settings.
Minimum interval of the transfer rate	Maximum time interval for the transfer rate at "slow" level in ms	Reduce the minimum interval for the transfer rate at the "slow" rate level in the project settings.
Maximum data length for arrays and structures for DP master and DP slaves	Maximum data length for arrays and structures in bytes. For PROFINET devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices. Possible cause: The data length of at least one connection of a coupled PROFIBUS device is too long for this master	Couple the PROFIBUS device to another PROFINET device with proxy functionality.
Configured transfer rates	Values of the configured transfer rates for this project	You can edit the transfer rate interval settings in the project properties.
Incoming interconnections:	Interconnection at the inputs of technological function(s)	
Number	Number of incoming interconnections. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of incoming interconnections with cyclic transfer to remote communication partners • Use interconnections with acyclic transfer, if necessary.
Total data length	Sum of the data lengths of all connections with incoming interconnections. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Configured distribution to transfer rates	The following parameters comprise the current configuration data for incoming interconnections with cyclic transfer, distributed to rate levels.	Limits are not indicated, and remedies are thus not required.
Number of interconnections	Number of incoming interconnections at the corresponding rate level.	
Data lengths	Number of incoming interconnections at the corresponding rate level in [bytes].	
Total number of data packets	Total number of incoming data packets	• Reduce the number of incoming interconnections with cyclic transfer to remote communication partners • Use interconnections with acyclic transfer as required.
Number of data packets per minimum interval of the transfer rate	Number of incoming data packets within the minimum transfer rate interval.	Reduce the number of interconnections operating at a "fast" transfer rate in the project.

Parameter	Meaning	Remedy
Number of bytes per minimum transfer rate interval	Number of incoming bytes within the minimum transfer rate interval.	Reduce the number of interconnections operating at a "fast" transfer rate in the project.
Outgoing interconnections:	Interconnection at the outputs of technological function(s)	
Number	Number of outgoing interconnections. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of outgoing interconnections with cyclic transfer to remote communication partners or • use interconnections with acyclic transfer, if necessary.
Total data length	Sum of the data lengths of all connections with outgoing interconnections in bytes. For PROFINET devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Configured distribution to transfer rates	The following parameters comprise the current configuration data for outgoing interconnections with cyclic transfer, distributed to rate levels.	Limits are not indicated, and remedies are thus not required.
Number of interconnections	Number of outgoing interconnections at the corresponding rate level.	
Data lengths	Number of outgoing interconnections at the corresponding rate level in [bytes].	
Total number of data packets	Total number of outgoing data packets	• Reduce the number of outgoing interconnections with cyclic transfer to remote communication partners • Use interconnections with acyclic transfer as required.
Number of data packets per minimum interval of the transfer rate	Number of outgoing data packets within the minimum transfer rate interval.	Reduce the number of interconnections operating at a "fast" transfer rate in the project.
Number of bytes per minimum transfer rate interval	Number of outgoing bytes within the minimum transfer rate interval.	Reduce the number of interconnections operating at a "fast" transfer rate in the project.
Dynamic load distribution	Result of the test of time-based requirements of the distribution of outgoing data to several data packets for the various remote communication partners. This also includes any reserved transfer resources for an integrated PROFINET IO controller.	• Reduce the number and transfer rate of outgoing interconnections with cyclic transfer to remote communication partners • Use interconnections with acyclic transfer as required.

See also

Utilization parameters of the PROFINET devices (Page 145)

4.4.4.9 Error messages for interconnections with cyclic transfer

Error messages for interconnections with cyclic transfer

Error message	Remedy
The device does not support remote interconnections with cyclic transfer.	• Replace the device with one with Runtime version 2.0 or later that supports cyclic transfer or • Use interconnections with acyclic transfer
The capacity limit for remote interconnections with cyclic transfer between <Device 1> and <Device 2> with a transfer rate of <nn> ms was exceeded.	Reduce the data volume transferred between the specified interconnection partners at the specified rate level, i.e.: • Reduce the number of interconnections to remote partners • Redistribute the relevant remote interconnections to other rate levels or • Use the interconnections with acyclic transfer.
The connection <name> cannot be interconnected remotely in cyclic transfer mode due to its data length.	Use interconnections with acyclic transfer, if necessary.

See also

Utilization parameters of the PROFINET devices (Page 145)

4.5 Working with modified PROFINET components

4.5.1 Editing PROFINET components

You can edit PROFINET components directly using a SIMATIC iMap library. This creates a copy of the component project in the directory defined under **Options > Customize**. You can edit the copy using the manufacturer-specific configuration and programming tool and then use it as the basic project for creating the re-edited PROFINET component.

The copy of the component project is uniquely identified by the ID and version of the original PROFINET component.

To re-edit a PROFINET component in SIMATIC iMap

1. Highlight the PROFINET component to be modified in the library.
2. Select the **Re-edit component** command from the context menu.
3. In the "Re-edit PROFINET component" dialog, select the directory in which you want to create a copy of the component project. Click the "Modify" button to search the file system for the directory.

4. Click "OK."

   If you do not yet have a copy of the component project, a copy is created and is opened for editing in the manufacturer-specific configuration and programming tool.

   If the selected directory already contains a copy of the component project, you are asked whether you want to overwrite this copy. Result:

   – Click on "Yes" to create a copy of the current component project in the specified directory and open it for editing in the manufacturer-specific configuration and programming tool. The existing copy will be overwritten in the process.
   – Click "No" to open the existing copy of the component project for editing in the manufacturer-specific configuration and programming tool.

5. Make the necessary changes to the copy of the component project.
6. Create a new version of the PROFINET component and import the newly created PROFINET component into a SIMATIC iMap library. You can then use the component in SIMATIC iMap projects.
7. If necessary, replace any instances of the earlier version of the PROFINET component with instances of the modified component (see "Replacing instances").

Note

The uniquely defined storage location for the modified component project makes it easier to make changes to PROFINET component. The next time you edit the PROFINET component, you will be reminded that an earlier copy already exists (if appropriate).

See also

Generating the Project (Page 86)

Moving interconnections (Page 134)

Replacing instances (Page 156)

Data storage in SIMATIC iMap (Page 92)

4.5.2 Replacing instances

In SIMATIC iMap, you can easily replace the instance of a PROFINET component with the instance of another PROFINET component. In this way, you can quickly incorporate changes to PROFINET components into existing SIMATIC iMap projects.

Rules for replacing instances

Rules for replacing an instance:

- The device of the instance to be set and that of the destination components must have the **same network connections**. E.g. a PROFINET device with Ethernet connection cannot be replaced by a PROFIBUS device (DP slave) and vice-versa.
- It is not possible to replace a PROFINET device with proxy functionality with a device lacking proxy functionality. However, the other way round this is possible.

- Internal DP slaves on the local PROFIBUS of a new device must be assigned PROFIBUS addresses other than those of the already connected PROFIBUS devices.
- A sufficient number of PROFIBUS addresses must be available at the new device, in order to be able to integrate the connected PROFIBUS devices in the replacement device.
- The device can only be replaced with a PROFINET device with proxy functionality if the device to be replaced is connected to the vertical Ethernet bus, but not to any Ethernet branch.
- The object name (function or device name) of the instance to be replaced may not exceed the maximum permitted length for object names of the destination component (for example, max. 16 characters for PROFINET components created in SIMATIC iMap V1.2.) Open the properties dialog box of the instance to be replaced, and assign a name with a valid length to the function and the device.

What happens during replacing?

The configured properties of the old instances, such as IP or PROFIBUS addresses, are transferred to the new instances.

Interconnections will be transferred as far as possible, if the connections of the technological function are of the same type (input or outout), name and data type. Any configured substitution values and transfer properties of the interconnections will also be applied.

NOTICE
The instance will always be replaced, irrespective of any differences in technological functions between the new instance and the new component. Interconnections may be lost when you replace the instances, if the new technological functions do not contain all connections of the replaced technological functions.

Detailed information on the replacement of special components with internal PROFINET IO system or IO devices, for example, is available (see below.) For further information on the replacement of multifunction components, refer to the chapter "Using multifunction components in a SIMATIC iMap project."

Requirement

The new component must be available in the project library. Import the new component into the project library if it is not already available.

How to replace the instance of a PROFINET component

1. Select either:
   - the component to replace from the project view, or
   - the instance or instances to be replaced. You can select these objects from the project tree and in the work area.
2. Select **Replace** from the context menu. The "Replace instances" dialog box opens.
3. If necessary, change the number of selected instances to replace. Identify the required instances in the "Instances" input box.
4. Define the new component under "Replace by". You can either accept the default component and its version, or select a different component or version from the drop-down lists.
5. Click "Details" to read additional information on the replacement of a specific instance (see "Reading replacement details".)
6. Click on the "Replace" button.

   Result: The selected instances will be replaced with those of the selected new component.

   The interconnections are transferred to the new instances in conformity with the connections.
7. Check the replaced instances:
   - to ensure that all the necessary interconnections are present and
   - to ensure that the substitute values and transfer properties of the interconnections are configured correctly.
8. Check the configuration of the replaced instances using the **Edit > Verify utilization** menu command (optional).
9. Generate the project using the **Project > Generate > Changes only** menu command.
10. Use the **Download Selected Device > All** menu command to download all the programming and configuration data to the target system.

Tip: Replace with drag-and-drop

To replace an individual instance:

Select the destination component from the library, press and hold the "ALT" key, and then drag-and-drop it to the instance you want to replace in your project. Answer "Yes" when you are asked whether you really want to replace the instance. Then carry out steps 6 to 9 as described above.

To replace a group of instances of a component:

1. Open the project view.
2. Select the destination component from the library, press and hold the "ALT" key, and then drag-and-drop it to the component in the project view. Confirm the prompt to replace the instance(s) by clicking "Yes." Next, go to step 6 to 9 as described earlier.

Requesting replacement details

Detailed information on the replacement of special components with internal PROFINET IO system or IO devices can be viewed by clicking the "Details" button of the "Instances" dialog box:

The "Replacement details" dialog box shows you how the elements of the instances are handled when you replace it. Options for specific objects, symbolic representation:

Symbol	Description
	Replacing an object with a new object. The properties of the old object are trasferred to the replacement object.
	The replacement action adds an object. You may need to assign new configuration data if you add new objects. For example: When adding an internal PROFINET IO system, or an internal IO device, always assign IP addresses to those devices.
	The replacement action removes an object. Certain project data and interconnections may be lost if you remove any objects. For example: by removing a PROFIBUS connection, you also disconnect any connected PROFIBUS devices. However, those PROFIBUS devices will be retained in the SIMATIC iMap project, and must be reconnected.

Note

Internal IE devices

In the case of instances with internal PROFINET IO systems or internal IE devices, these components are then only replaced if the new PROFINET component represents the product of a revised old. In this case, also the configuration data, like for example, IP addresses of the PROFINET IO devices are transferred to the new instance. If not (i.e. no revision), the old elements will be replaced with the new ones.

Note

Several PROFIBUS connections

In the case of instances with several PROFIBUS connections, any coupled PROFIBUS devices are then only transferred to the new instance if the numbers of the PROFIBUS connections agree. If this is not the case, any PROFIBUS devices that are connected will become uncoupled. However, these PROFIBUS devices will be retained in the SIMATIC iMap project, and must be reconnected or deleted. The number of a PROFIBUS connection can be established or checked when creating the PROFINET components in the SIMATIC Manager under the "DP subnets" tab.

Note

Recommendation

With the help of "Replacement details", check which changes are made at the new instances, and then configure the element properties as required after the replacement.

See also

Editing PROFINET components (Page 155)

Moving interconnections (Page 134)

4.6 Editing in the manufacturer-specific programming and configuration tool

SIMATIC iMap allows you to call applications from the manufacturer-specific programming and configuration tool directly at an instance within the project. You can then read or edit the device-specific data, for example. Device-specific diagnostics information is of particular importance, and can be viewed this way.

Access to the manufacturer-specific programming and configuration tool

Options of opening the manufacturer-specific programming and configuration tool in SIMATIC iMap:

- Editing the instance of a technological function
- Editing the instance of a device

Based on the selected objects, you can open various applications of the manufacturer-specific engineering tools to edit relevant elements of the instance.

Requirement

The SIMATIC iMap project is generated.

How to edit objects in the manufacturer-specific programming and configuration tool:

1. Select the object to be edited:
   - the instance of the technological function
   - the instance of the device
2. Select **Edit > Special** using one of the available commands. Those commands are device-specific. The menu is grayed out if there is nothing to edit, or if nothing has been generated yet.
3. Save your changes, and then download these delta data directly to the PLC using the configuration and programming tools.

CAUTION
When editing in the manufacturer-specific configuration and programming tool, always avoid inconsistency or any other errors in the edited component or shadow project If any errors are found, you may once again have to generate the SIMATIC iMap project.

CAUTION
If you regenerate the iMap project using the **Project > Generate > Control unit > All** menu command, any changes you have made using the manufacturer-specific configuration and programming tool will be lost. However, the system will create an optional backup copy of the old shadow project. In SIMATIC iMap, you can not undo any changes made using the manufacturer-specific configuration and programming tool.

CAUTION
If the "Accelerated generation for PROFINET devices without proxy functionality" option is activated, a temporary project is created at the instance of such a device for the execution of the **Edit > Special >** menu command. Changes that you made using the manufacturer-specific configuration and programming tool are not retained, because the temporary object is deleted.

Commissioning and online operation

5

5.1 Basic commissioning procedures

Requirements

Requirements of plant commissioning:

- The device-specific configuration and programming tools, such as STEP 7, are installed on your PC/programming device. Depending on the type of device, this software is required to perform certain actions, for example, a program download.
- The project has been generated without errors in SIMATIC iMap.
- All device configuration data are prepared (generated) for the download.
- The devices are connected via Industrial Ethernet or PROFIBUS.
- The devices are switched on.
- The PC/programming device running SIMATIC iMap is connected to the devices at the plant via Ethernet.

Basic procedure

1. Start SIMATIC iMap
2. Open the project.
3. Download the programs and interconnections to the devices.

You can then use the following test and diagnostic functions (optional):

- Monitoring and analyzing the plant in online mode
- Testing and controlling using the variable table
- IViewing and setting online values
- Performing an online device analysis
- Checking accessibility of the devices
- Comparison of the online and offline data of programs and interconnections
- Performing a device-specific diagnosis

5.2 Overview of the online functions

Requirement

SIMATIC iMap must be connected to the plant via Ethernet to allow monitoring of devices in online mode. Both PROFINET and PROFIBUS devices (via a PROFINET device with proxy functionality) are available online.

SIMATIC iMap in the online and offline views

SIMATIC iMap is opened in the offline view by default (no connections to any devices.)

You can enable and disable online mode for various SIMATIC iMap views.

- Variable table - by clicking the "Monitor variables online" icon, or by selecting the **Online > Variable table > Monitor variables** menu command.
- You can open all other views of the work area, and the "Functions" and "Devices" variable of the diagnostics window by clicking the "Online monitoring", or by selecting **Online > Monitor**.

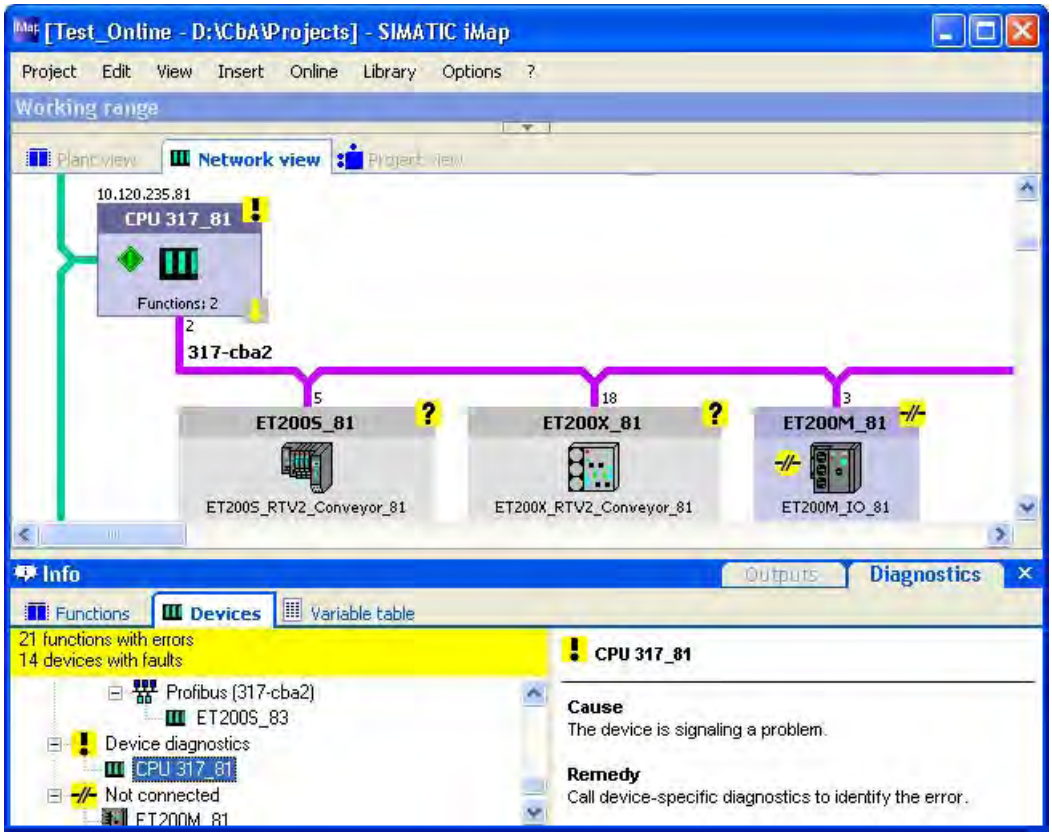


Figure 5-1 SIMATIC iMap in the online view

Note

You may only use one SIMATIC iMap application tomonitor a plant in online mode.

An enabled online view for a plant in more than one SIMATIC iMap applications will cause additional processor load on the plant PLCs.

Online functions

SIMATIC iMap supports the following functions for starting, controlling and monitoring the plant in RUN:

Online monitoring mode enabled

- Diagnostics of devices, functions and interconnections
- Download of interconnections to the devices of a plant
- Viewing and setting online values
- Viewing the module status (depending on the device type)
- Viewing the process state (depending on the device type)

Online monitoring mode disabled

- Comparison between online and offline data of interconnections and programs
- Download of programs and interconnections to the devices of a plant.
- Checking availability of the devices

Independent of the online view:

- Device-specific diagnostics using the manufacturer-specific configuration and programming tool.
- Online device analysis

Optional actions in the online view

If **Online monitoring** is enabled, certain actions which modify the project are disabled, i.e. copy, paste, delete and interconnect operations. Generation, logging, archiving an retrieving are also disabled in the online view.

Actions such as viewing (not changing) properties, printing the contents of the current window and the **Edit > Special...** menu command are also disabled in the online view.

5.3 Download

5.3.1 Download concept

Download options

The term "download" refers to the download of data from SIMATIC iMap to an automation device or field device. You can download the following data to the devices of the plant from SIMATIC iMap:

- Program

  Download the user program, including all device-specific data such as the hardware and network configuration. The manufacturer-specific configuration and programming tool, for example STEP 7, is required for the program download.

  In a program download, you can either include the entire program, or only the modified blocks.

  Advantage: If only program changes are downloaded, blocks that you haven´t changed will not be overwritten, so that any actual values that may be saved in the target system are maintained.
- Interconnections

  Download of interconnection data to the corresponding devices of the plant. Interconnections may be downloaded from SIMATIC iMap without using the manufacturer-specific configuration tool.
- All

  Downloads the program and interconnections to the devices of the plant. This action also requires the manufacturer-specific configuration and programming tool.

Download options, depending on the selected objects:

Selection	Download option	Menu command
Not selected	for the entire project	Main menu **Online > Download all instances >**
	• all	**> All**
	• program only	**> Program only > All** **> Program only > Deltas only**
	• only interconnections	**> Interconnections only**
One or several instances	for selected instances	Main menu **Online > Download selected instances >**
	• all	**> All**
	• program only	**> Program only > All** **> Program only > Deltas only**
	• only interconnections	**> Interconnections only**
		Shortcut menu **Download selected instances >**
	• all	**> All**
	• program only	**> Program only > All** **> Program only > Deltas only**
	• only interconnections	**> Interconnections only**

NOTICE
The user program may be overwritten in the destination system concerned if you set the wrong IP addresses.

Note

Make sure the program and interconnections are downloaded to the device from only **one** SIMATIC iMap application at any given time.

Note

Instances of singleton components are excluded from the program download. The program download can only be carried out using the manufacturer-specific configuration tool.

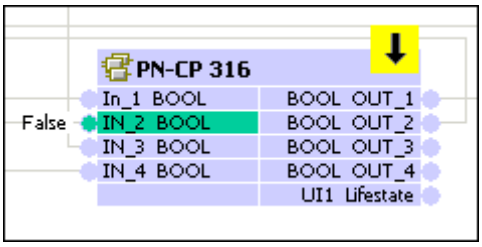
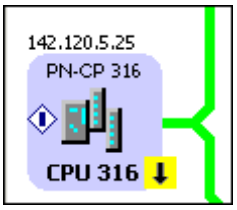
Purpose of the download

Download...	Selected device to SIMATIC iMap	Plant device as destination for the download
Program	PROFINET device	Corresponding PROFINET device
	PROFIBUS device	Corresponding PROFIBUS device
Interconnections	PROFINET device	Corresponding PROFINET device
	PROFIBUS device	Corresponding PROFINET device with proxy functionality

Note

You may need to perform additional steps to save the download data to non-volatile memory of the device, depending on the device type.

Examples: Download required

Example	Representation
Function, interconnection download required	
Device, interconnection download required	

See also

Program downloads (Page 168)

Download of interconnections (Page 174)

5.3.2 Program downloads

Situations requiring a program download

You can determine whether a program download is necessary by carrying out an online-offline comparison. A program download is required in the following situations:

- When a device is being commissioned
- After connecting or disconnecting PROFIBUS devices

  This scenario requies a program download to the associated PROFINET device with proxy functionality, and to all intelligent PROFIBUS devices associated with the proxy system.
- After replacing instances

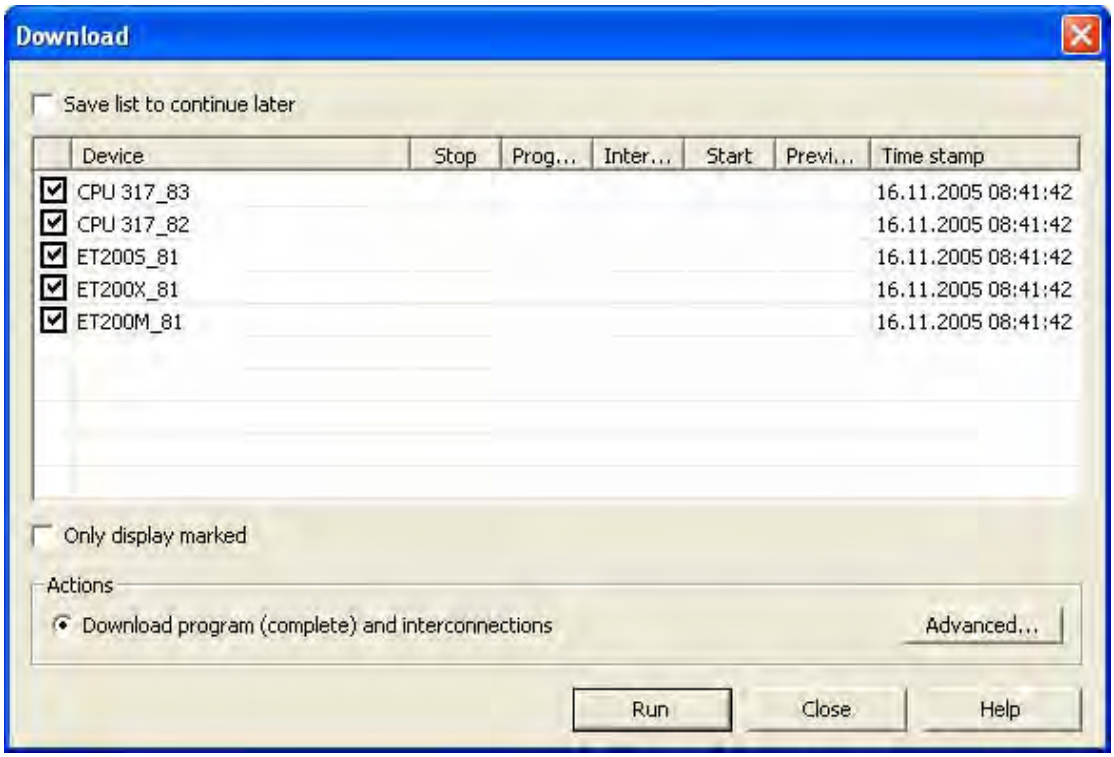
  Caution: After you replaced a PROFIBUS device, always download a program to the associated PROFINET device with proxy functionality, and to the destination device of the replaced instance.

Download actions

Most automation devices require additional actions to be carried out prior to and after the program download.

- Stopping the devices prior to program download
- Restarting the devices after program download

SIMATIC iMap opens a download manager to supports you in selecting the device and in the download.



You can open a full list of optional actions by clicking "Extras."

The pre- and post-download actions for each device are visualized symbolically.

All download actions performed for the devices can be saved, and thus reused as a basis for further downloads.

Download requirements

- The PG/PC is connected to the plant via Ethernet.
- The devices must be available on the bus.
- All instances of the PROFINET components selected for the program download must have been assigned the "generated" status in their properties. You may have to generate the SIMATIC iMap project.
- Online monitoring mode must be disabled in SIMATIC iMap.

Note

Recommendation: Before downloading, check the device utilization (with the **Edit > Verify utilization** menu command) to ensure error-free loperation of the plant.

How to download programs

To download programs to the chosen devices, select the instances of the devices for the download, then select one of the following commands from the pop-up menu:

- **Online > Download all instances > Program only > All**, to download all programs to all devices of the plant
- **Online > Download all instances > Program only > Deltas**, to download the delta data to all devices of the plant
- **Online > Download all instances > All**, to download all programs and interconnections to all devices of the plant

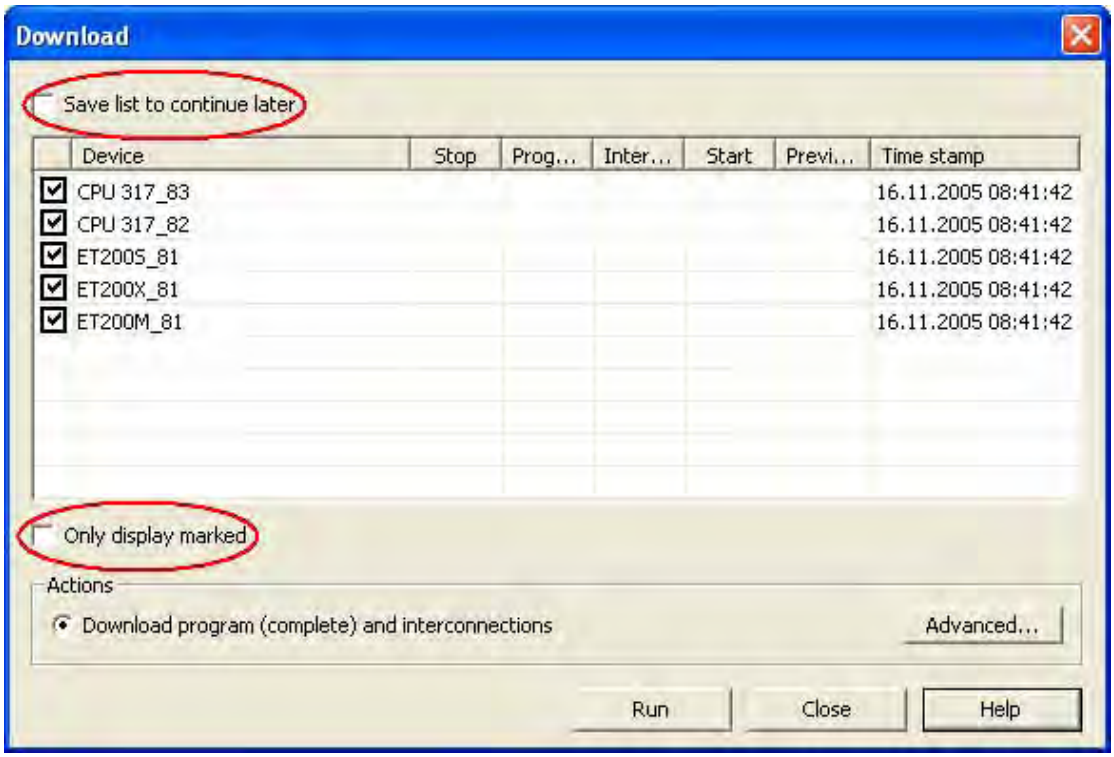
To download the programs to selected instances: Select the instances of the devices for the download, then select one of the shortcut menu commands listed below:

- **Download selected instances > Program only > All**, to download all programs to the devices
- **Download selected instances > Program only > Deltas**, to download only the program deltas to the devices
- **Download selected instances > All**, to download all programs and interconnections to the devices

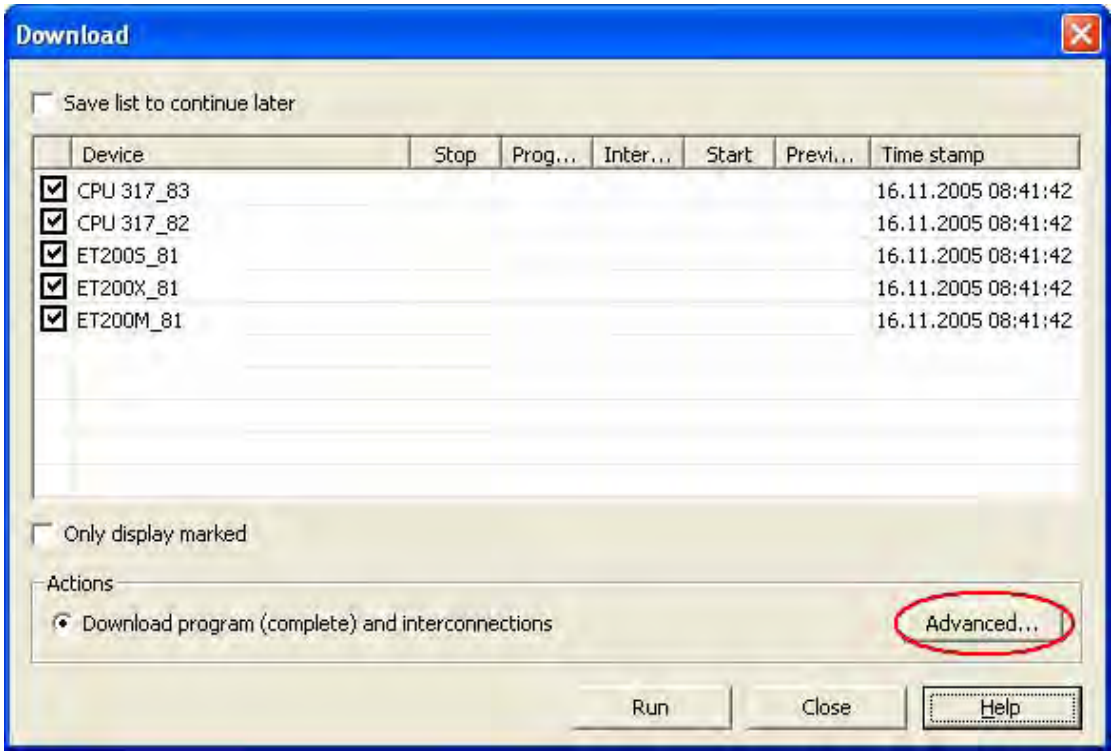
The download dialog box will always be opened. It lists either the selected or all devices, and the selected action corresponds with the menu command called. Procedure:

1. Click "Execute" to immediately execute the selected action for the marked devices, or go to the steps outlined below::
2. Optional: Activate the option "Note list to continue later", in order to save the states of the devices after the desired actions have been carried out. The list of devices contains the status of the executed download actions (success or failure), and can be used as a basis for further download.

3. Optional: Set the "Show only selected objects" to reduce the size of the list.



4. Optional: Click "Extras" to open a list of optional actions, then select an action for the selected devices.



5. Click "Execute".

   Result: The "Download - Stop" dialog box of the devices opens, except if you selected the "Download interconnections" action.

6. Delete any relevant devices from the list by deleting their identifier from the first column, then click "Next."

   Result: The selected devices will be stopped. Next, the download is started automatically, if one of the download actions is selected.

   The "Download - Start devices" dialog box opens when the program download is successfully completed. This dialog lists all devices you can restart after the program download is successfully completed.

7. Option of the "Download - Start devices" dialog box:
   - Delete any relevant devices from the list by deleting their identifier from the first column. You can restart those devices at any later time.
   - Change the start sequence using the arrow keys.

8. Press "Next" button to start the selected devices.

   Result: The devices will start.

   The download dialog remains opened and shows information regarding the executed actions as a symbol with tool tip.

   The "General" tab of the task view returns information about the progress, termination of the action, or possibly error messages.

9. Click "Close" to close the download dialog box.

Resuming a download

If in the download dialog you have activated the option "Note list to continue later" prior to closing, the device list will be saved and you can carry out further download actions at a later point, e.g. after remedying any errors.

Select **Online > Continue download**. The download dialog box shows the list of devices you saved, including information about previous download actions (success or failure.)

NOTICE
The list records already started or executed download actions. This must not be confused with the current status of the devices.

You can continue with further downloads for the listed devices.

See also

Download concept (Page 166)

Editing in the manufacturer-specific programming and configuration tool (Page 160)

Download of interconnections (Page 174)

Analyzing PROFINET components (Page 182)

Comparing online and offline data (Page 188)

Generating the Project (Page 86)

5.3.3 Download of interconnections

Scenarios requiring a download

Interconnections can be downloaded to the target devices later if required, e.g. in order to test the PROFINET communication between the components.

The instances for which interconnections have to be downloaded are identified by a vertical arrow and are listed on the "Functions" tab in the diagnostics window (see diagram).

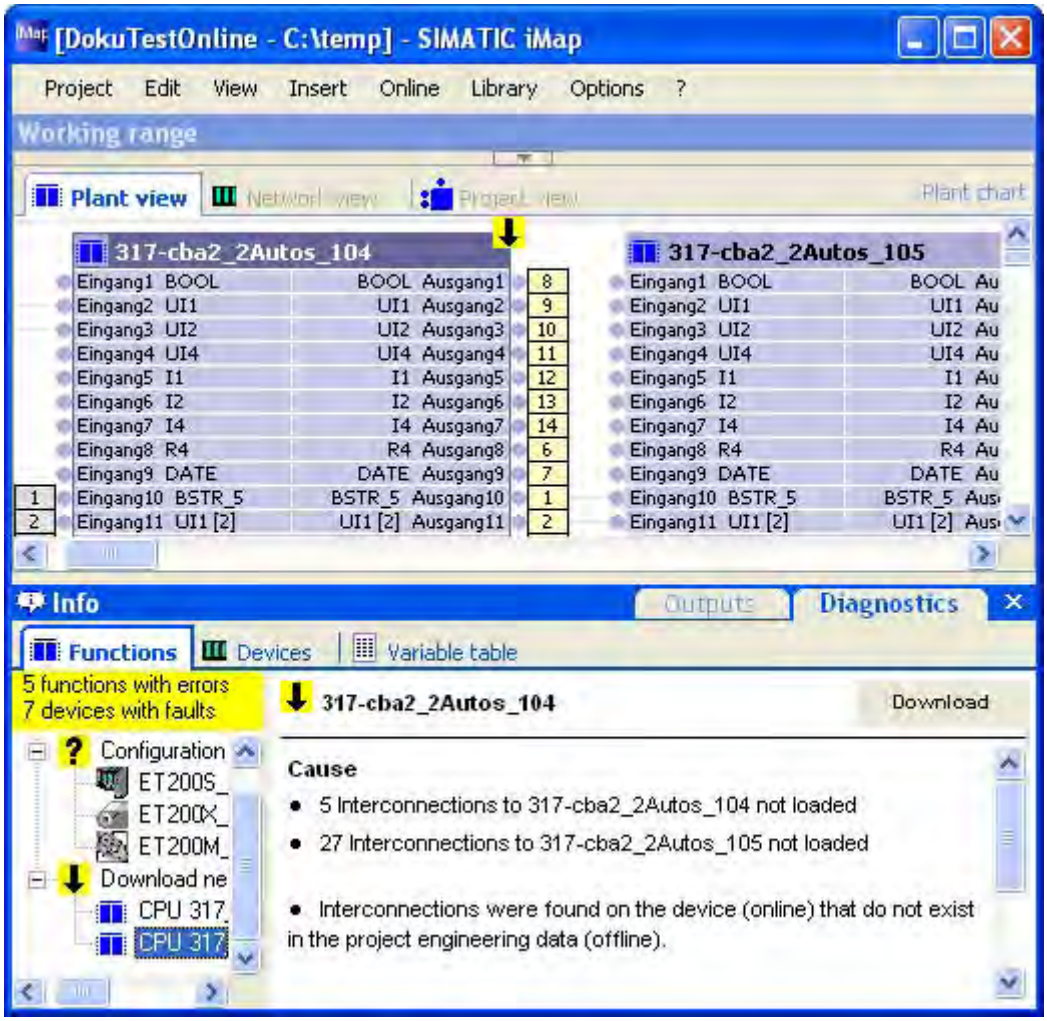


Figure 5-2 Download required

Download requirements

- The PG/PC is connected to the plant via Ethernet.
- The devices must be available on the bus.

Note

Recommendation: Check the utilization of device resources before you start the download action (select **Edit > Check utilization**) in order to ensure error-free operation of your plant.

CAUTION

The interconnections are downloaded to the target system regardless of the operating status or level of protection on the target system. Plant safety should be verified in particular by checking all settings, such as function names and IP addresses. This also applies to the "Download" button in the diagnostics window.

Select the **Online > Online-offline comparison >**... menu command to determine the differences between the SIMATIC iMap project (offline) and the plant (online).

How to download interconnections

- Select **Online > Download all instances > Interconnections only**, to download the interconnections to all devices of the plant

or

- Select the instances of the devices for which the download is performed, then select **Online > Download selected instances > Interconnections only** to download the interconnections to the devices.

Result: The interconnections are downloaded to all or selected devices of the plant. The task view returns information about the progress, termination of the action, or possibly error messages.

Downloading the program and interconnections

The program and interconnections can be downloaded in the same action. To do so, select:

- **Online > Download all Instances > All** to download both programs and interconnections to all the devices of the plant.
- **Online > Download selected instances > All**, to download all programs and interconnections to selected devices.

This opens the download dialog box. Continue as for a program download (see the chapter "Program download".)

Downloading interconnections in online mode

Provided online monitoring is enabled, the "Functions" tab of the dialog box returns all functions requiring a download of interconnections. A "download" button willl be offered in the right section of the dialog box when you select one of those functions, as in the example below:

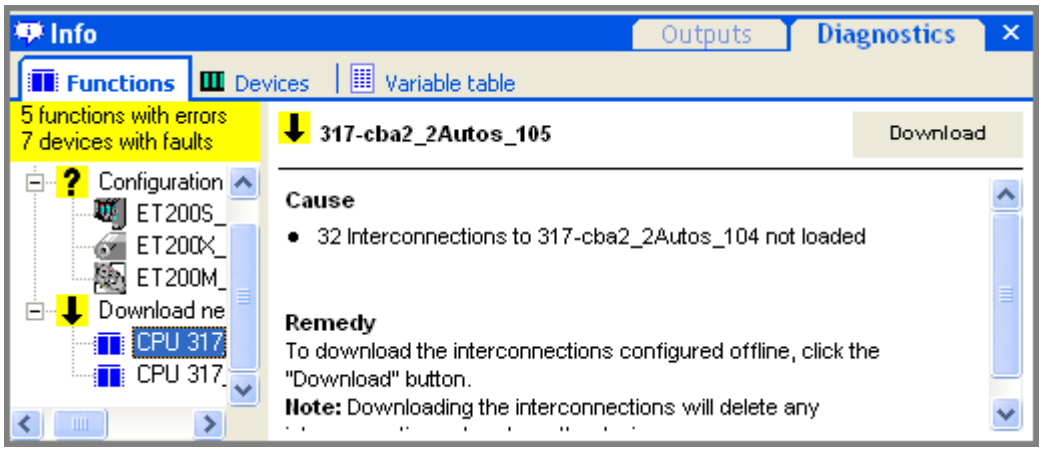


Figure 5-3 Example: Functions - Download required

Click "Download" to transfer the interconnections to the relevant device of the PLC.

See also

Download concept (Page 166)

Program downloads (Page 168)

5.3.4 Download to PROFIBUS devices

Actions triggered by a download to PROFIBUS devices

The download to the PROFIBUS devices always takes place via a PROFINET device with proxy functionality (see figure).

- The interconnections of PROFIBUS devices are downloaded to the associated PROFINET device with proxy functionality, where they are stored.
- When the program is downloaded, part of the configuration data for the coupled PROFIBUS devices is stored on the associated PROFINET device with proxy functionality. If you download programs to selected devices, you must first of all download the program to the PROFINET device with proxy functionality and then carry out the program download to the coupled PROFIBUS devices.

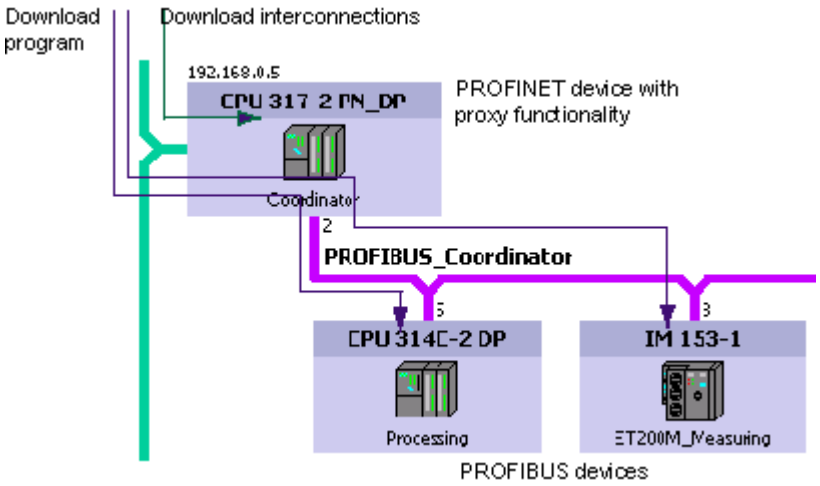


Figure 5-4 Download to PROFIBUS devices

NOTICE
When you download the program to a PROFINET device, both the interconnections of the actual PROFINET device and the interconnections of any coupled PROFIBUS devices are deleted. You will then have to download the interconnections to all devices of the DP master system.

When using a router

When the engineering PC and the PROFINET device with proxy functionality are located in different subnets, a router must be used. In this case, for the program download in coupled PROFIBUS devices (S7 slaves), a PG / PC assignment in the shadow project is required.

Procedure:

1. If necessary, generate the controller unit of the SIMATIC iMap project.
2. Select a device in the network view of SIMATIC iMap and then choose **Special > SIMATIC Manager** from the pop-up menu. The shadow project is opened in the SIMATIC Manager.
3. Choose **Add > PG / PC** and open the properties of the PG / PC object and configure a new PG / PC assignment including router.

The it is possible to download the program to the coupled PROFIBUS device (S7 slaves).

NOTICE
After a regeneration of the controller unit (**Project > Generate > Controller unit > All new**) the PG / PC object is deleted from the shadow project and you must reconfigure the PG / PC assignment.

5.4 Diagnostics information in the online view

Introduction

The active Online view in SIMATIC iMap returns diagnostics information in text-based or graphic format.

- the availability and status of PROFINET communication partners,
- the status of interconnections and online values, and
- the operating status of the devices (depending on the device type)

Diagnostics information in graphic format:

- Icons at the objects, for example, "Download of interconnections required", or
- Object colors, for example, black interconnection lines indicate the error-free state of the interconnection.

Online-offline comparison

SIMATIC iMap allows you to compare the online and offline interconnection and program data. The task view and diagnostics view return the result of an online/offline comparison in plain text.

Status of the PROFINET communication partners

With respect to PROFINET communication, the nodes may assume certain states which are visualized in SIMATIC iMap by means of symbole and diagnostics messages, for example:

- whether the devices are available online (configuration check)
- whether a diagnostic messages is available at the devices,
- whether an interconnection download is required,
- whether diagnostic information is available at all,
- whether interconnections are disrupted,
- whether a PROFIBUS device is connected to the associated PROFINET device with proxy functionality.

The plant view also indicates the validity of online values.

The network view also indicates the operating state of the devices.

Diagnostics symbols

Symbol	Error message	Meaning
	Configuration check	The connection to the device can not (yet) be established, the device is not (yet) available, or the function is not available at the destination device.
	Device diagnostics or error	• On devices in the network view: Device-specific diagnostics data available. Click the "Diagnostics" button in the right-hand pane of the diagnostics window to view the diagnostics information. • At a nested chart in the plant view: Error at one or several functions within the chart.
	Not connected	The PROFIBUS device is not connected to the PROFINET device with proxy functionality, is not switched on, or is in STOP.
	No information available	The device can be accessed, but its state can not be determined (may apply to a DP slave, for example, if the DP master is in STOP.)
	Download required	Interconnections download required.
	Interconnection error	At least one interconnection to the device is disrupted.
	Maintenance required	Maintenance information: The respective component has to be replaced within a foreseeable period
	Maintenance demanded	Maintenance information: The respective component has to be replaced within a short period
No icon		The device or function are OK

Note

If several diagnostic states occur simultaneously for a device, the icon with the highest urgency is displayed, for example when two PROFIBUS devices with differing maintenance information are coupled to a device with proxy functionality.

Normal and inverted representation

The icons are output in normal or inverted mode to the views of the work area.

- The normal representation (black icon on yellow background) applies to the currently visualiued instance, for example, a device in the network view, or a technological function in the plant view.)
- The inverted representation (yellow symbol on gray background): Diagnostic symbols of the technological functions ("Interconnection erroe", for example) are visualized in inverted mode at the devices in the network view, whereas diagnostics symbols of the devices are inverted at the technological functions .

In the project view, the diagnostic symbols are output in normal mode at the device or technological function.

Device operating states

The current operating state of a device is visualized by a symbol in the SIMATIC iMap online network view.

Symbol	Operating state
	RUN
	STOP
	STARTUP
	DEFECTIVE

The system also indicates whether the PROFIBUS devices are connected to the PROFIBUS master:

Symbol	State
	Connected to the PROFINET device with proxy functionality
	Not connected

Status of the interconnections

The status is indicated by the color of the interconnection line:

Color of the interconnection line	Meaning
Black	the interconnection is OK
Blue	the interconnection has been selected
Red	Interconnection error (the error is usually found at the technological function output of the transmitting station.)
Gray	no information about the interconnection available (the device is unavailable, or a download is required, for example)

Diagnostic messages in the diagnostics view

The active SIMATIC iMap online view outputs current messages to the "Functions" and "Devices" tabs of the diagnostics view.

- The "Functions" tab returns diagnostic messages about the faulty technological functions and interconnections, such as a list of the functions for which an interconnections download is required.
- The "Devices" tab returns diagnostic messages about the devices, such as a list of faulty or unavailable devices.

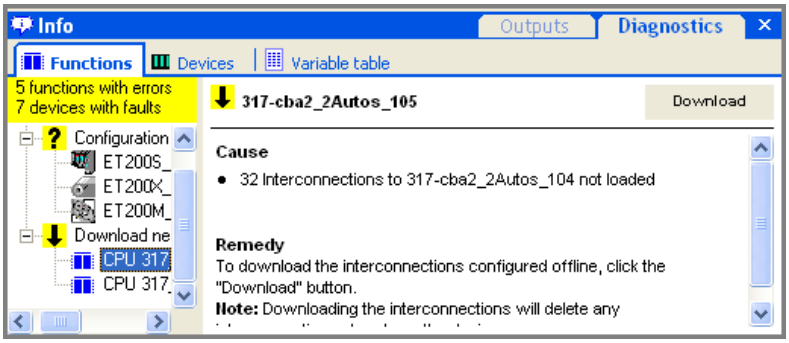
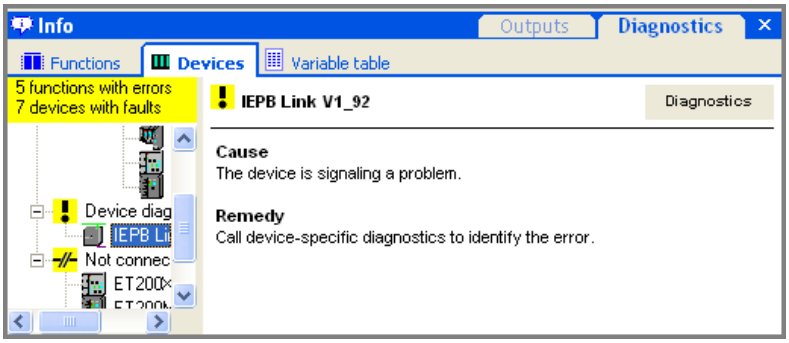
The left-hand pane shows the faulty devices or functions, sorted by error class. Unavailable devices are visualized in a hierarchic order by DP master systems, thus allowing quirck identification of all the DP slaves assigned to a DP master.

The right-hand pane outputs information about the highlighted faulty instance, based on the error class, and provides download buttons, and device-specific diagnostics and help functions.

Note

When a PROFINET device with proxy functionality (DP master) fails or is unavaulable, the system does not output detailed diagnostic messages for the connected PROFIBUS devices.

Examples

Example	Representation
Diagnostics view, "Functions" tab	
Diagnostics view, "Devices" tab	

See also

Program downloads (Page 168)

Comparing online and offline data (Page 188)

Displaying and setting online values in SIMATIC iMap (Page 190)

5.5 Analyzing PROFINET components

Basic diagnostics procedures

The functions for a diagnosis of PROFINET components in SIMATIC iMap are generally based on the sequence described below, an can be used to perform specific actions.

1. Activate the online view by clicking the "Online connection" icon, for example.
2. Open the "Devices" tab in the diagnostics view.

   Result: The left-hand pane outputs diagnostic information about the devices in a dynamic tree structure.

   The absence of diagnostic information indicates that the error-free operation of the plant's devices. Next, continue at step 4.
3. Any diagnostics information at the "Devices" tab can be processed by selecting the device, and following the detailed information and troubleshooting options output in the right pane. Eliminate any faults. Click the offered button to view device-specific diagnostics data, for example.

   Order: First, process the devices in the "Configuration check" category. As long as the check of device configuration is not completed successfully, it is not possible to run PROFINET diagnostics for that device. You can then continue by processing the remaining devices in any order.
4. Check the entries on the "Functions" tab. If no function erros are listed, you may assume error-free operation of the plant.
5. Process any diagnostics information returned at the "Functions" tab by selecting the function, and following the detailed information and troubleshooting options in the right pane. Eliminate any faults. Click the offered button to download the interconnections, for example.

   Order: First, process the functions of the "Configuration check" category. As long as the fucntion check is not completed successfully, it is not possible to run PROFINET diagnostics for that function. You can then continue by processing the remaining functions in any order.

The tables below provide a summary of the common diagnostic scenarios for devices and functions, and the troubleshooting options.

Diagnostics scenarios at the devices

The various diagnostic scenarios for devices are described in the table below.

Diagnostic scenario	Possible causes	Possible remedies
 Configuration check	• Communication error, for example, cable break, cable not connected • The device is switched off • The device has not been started, or is not initialized • The device is not a PROFINET device • Hardware configuration error (different configuration) • The program has not been downloaded yet • Wrong device or function downloaded • Different ID or the version of the components online and offline	• Compare the online / offline congfiguration of the programs and interconnections in order to find any error sources. • Check the communication connections • Eliminate the error • Switch on or restart the device • Check the IP addresses and subnet masks • Check the PROFIBUS addresses • Check the hardware configuration • Download the program to the target device
 Device diagnostics	• Program error • The device is in STOP	• Call device-specific diagnostics by clicking the "Diagnostics" button. • Eliminate the error • Download the program to the device
 Not connected	• PROFIBUS cable not connected or defective • PROFIBUS device not switched on or in STOP	• Check the PROFIBUS cable • Switch on the PROFIBUS device • Switch the PROFIBUS device to RUN
 No information available	• Error or STOP state at the associated PROFINET device with proxy functionality. • The program has not been downloaded to the PROFIBUS device	• Switch on the PROFINET device, or switch it to RUN • Eliminate any errors at PROFINET device. • Download the program to the PROFIBUS device
 Maintenance required	Maintenance information	The respective component has to be replaced within a foreseeable period
 Maintenance demanded	Maintenance information	The respective component has to be replaced within a short period

NOTICE
When you activate the online view, all configured devices will be initially assigned to the "configuration check" category, and remain present until the first check is successfully completed. If this test does not return any differences between the configured device and plant data, the device will be cleared from the category. The time it takes to run this operation may differ, depending on the plant size and PC used.

Diagnostic scenarios at technological functions

The table below describes the various diagnostic scenarios at the technological functions.

Diagnostic scenario	Possible causes	Possible remedies
 Configuration check	• The device is switched off • The device has not been started, or is not initialized • The program has not been downloaded yet • No or a different technological function found in the PLC • Different ID or the version of the components online and offline	• Check the communication connections • Eliminate the error • Switch on or restart the device • Download the program to the target device
 at the nested chart in the plant view	• The chart contains at least one faulty function	• Open the chart to check the functions.
 Download required	• Differences in interconnection data between SIMATIC iMap and the device.	• Download the interconnections to the device Click the "Download" button
 Interconnection error	• Error at the communication partner of the device, or th epartner station is not available. • Incompatible transfer properties of the interconnections (transfer mode or transfer rate)	• Check the communication connections • Check and correct the interconnection properties • Compare the online data with offline data of the interconnections, and • eliminate the error

See also

Comparing online and offline data (Page 188)

Program downloads (Page 168)

Displaying and setting online values in SIMATIC iMap (Page 190)

5.6 Checking device availability

Requirement

Your PG/PC must be connected to the plant via Ethernet in order to check availability of the devices.

Available device

A device of the plant must be accessible via PROFINET communication mechanisms in order to download the interconnections or monitor variables.

SIMATIC iMap supports a number of options of checking the online availability of a PROFINET device.

- If online monitoring mode is enabled
  - The availability of devies is indicated in graphic format in the views of the work area: Available devices are represented in darker mode, whereas non-available devices are represented in lighter and identified by a diagnostics icon.
  - The "Devices" tab of the diagnostics view returns a list of the unavailable devices.
- If the online monitoring mode is disabled, you can use the menu commands to view the availability status of individual devices.

How to check availability of a device:

1. Disable the "Online connection" optio by selecting the **Online > Monitor** command, for example.
2. Select the instance you want to test. You can also select multiple objects.
3. Select:
   - **Check availability** from the shortcut menu or
   - the **Online > Check availability** command.

Result: The system checks the online availability of the devices and outputs the results at the "General" tab of the task window.

Possible messages

Message	Possible causes	Remedies
Node at IP address <IP_Address> is not available	• The physical connection to the device has failed or is not available. • The device is not switched on • For PROFIBUS devices: The associated PROFINET device with proxy functionality is not accessible or is in STOP. Any any PROFIBUS devices connected to the PROFINET device with proxy functionality will also be unavailable.	• Check the connection or cable • Switch on the device • Check the PROFINET device with proxy functionality (DP master)
The PROFINET access to the device at <IP_address> has failed	The device is physically connected, but not ready for operation (in STOP, for example)	Switch the device to RUN
The logic device <device name> (proxy at <IP address>) is available, but the physical device is not.	Only for PROFIBUS devices: • The PROFINET configuration data for the device are available at the associated PROFINET device with proxy functionality, but the connection between the DP master and DP slave has failed, or • the PROFINET configuration data has not been downloaded.	• Check the PROFIBUS connection between the DP master and DP slave. • Download the program
Different identification of the components	The component detection (ID) in the target device (online) does not tally with the offline (in SIMATIC iMap) saved configuration data	• Download the program
Different version of the components	The component version in the target device (online) does not tally with the offline (in SIMATIC iMap) saved configuration data	• Download the program
The device <Device name> is available		

Logic device

The logic device is an element of the runtime software which handles PROFINET communication at a device, and is addressed in online monitoring mode by SIMATIC iMap. The PROFINET configuration data of a component downloaded to the device are assigned to this logic device.

Note

The logic device of a PROFIBUS device is available at the associated PROFINET device with proxy functionality.

The reason of a logic device of a PROFIBUS device being reported available, although represented differently in the online view, may have the following background:

Although the PROFINET configuration of the PROFIBUS device is OK, the physical device of the DP slave is not available because the connection to the DP master (associated PROFINET device with proxy functionality) has failed, for example.

Examples: Availability

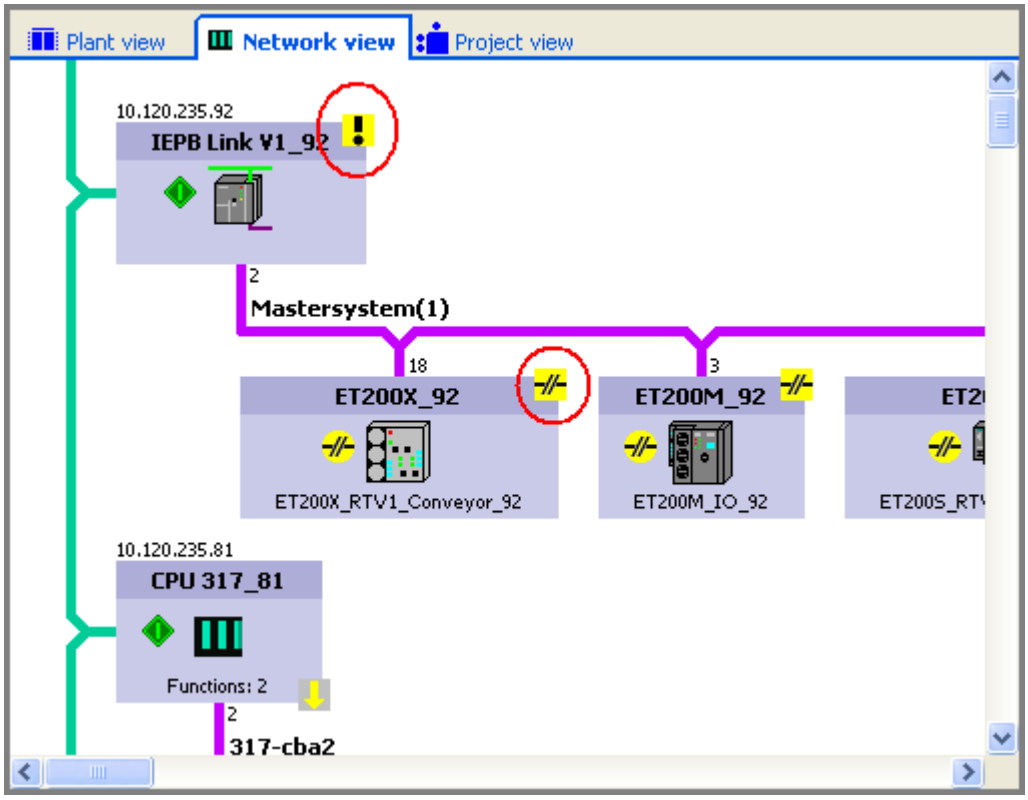


Figure 5-5 Representation in the network view

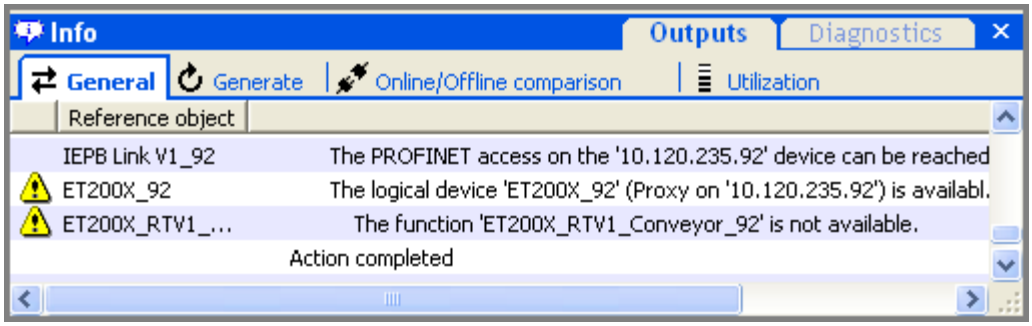


Figure 5-6 Message in the task view

5.7 Comparing online and offline data

Comparison options

If SIMATIC iMap is connected to a device of the plant via Ethernet, you can perform an online / offline comparison of one or several instances. This compares the online configuration data of the plant with offline data of the SIMATIC iMap project. You can compare the following data in SIMATIC iMap:

- Interconnections only – connectors and interconnections of technological functions
- Program only – all blocks in the user program, including all device-specific data such as the hardware and network configurations.

Online/offline comparison of interconnections

The purpose of an online / offline comparison of interconnections is to compare online and offline data of the technological functions and of their interconnections. Items checked:

- Added or removed interconnections
- Different transfer properties, for example, the transfer mode and transfer rate.
- Inputs and outputs added or removed from the technological function
- Different data types of the connectors

Note

The online and offline data of interconnections are not automatically compared before their download, because this would inevitably result in longer execution times. For safety reasons, we therefore urgently advise you to run a comparison prior to the download in order to avoid any runtime errors.

Requirements

- Your PC/PG must be connected to the plant via Ethernet.
- The SIMATIC iMap project must have been generated before you can compare online and offline programs.
- Online monitoring mode must be disabled in SIMATIC iMap.

How to compare programs

1. Select one or several instances.
2. Select the **Online/Offline comparison > Program only** command from the shortcut menu.

The result of the comparison is output to the "Online/offline comparison" tab of the task window.

Example: Comparing programs

Comparing the program code and configuration data prior to online monitoring. Devices at which differences were found are identified by a STOP symbol.

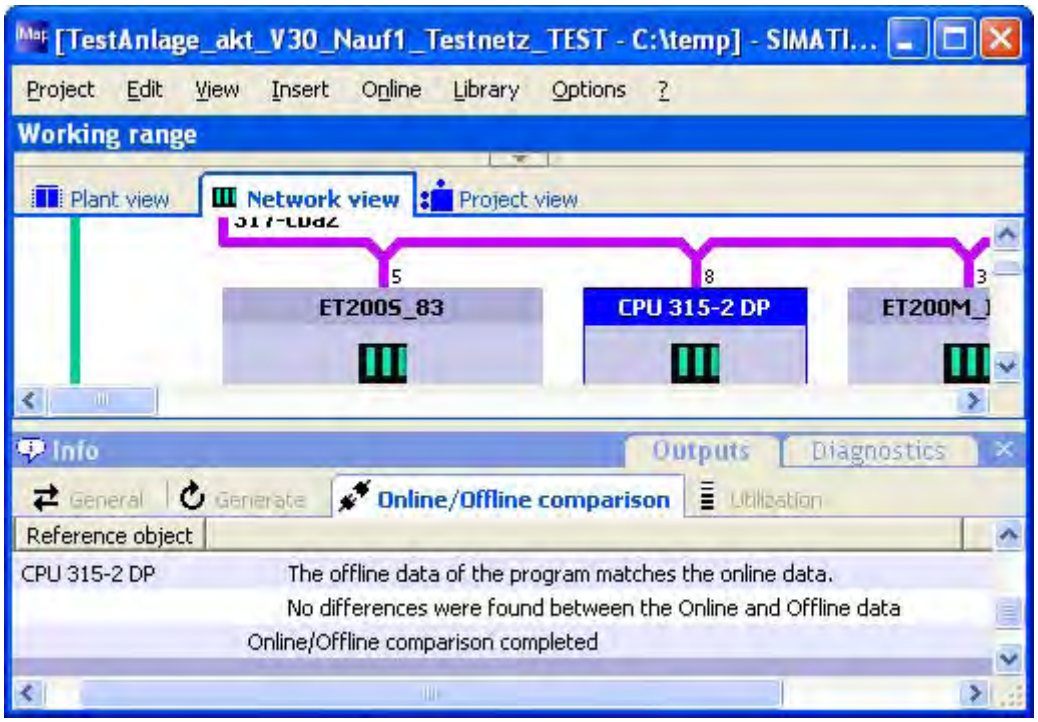


Figure 5-7 Online/offline comparison of programs

How to compare interconnections:

1. Select one or several instances.
2. Select the **Online/Offline comparison > Interconnection only** command from the shortcut menu.

The result of the comparison is output to the "Online/offline comparison" tab of the task window.

The "Functions" tab of the diagnostics view may return additional error messages about failed interconnections.

Example: Comparing interconnections

The diagram below shows that different interconnection partners require an interconnection download.

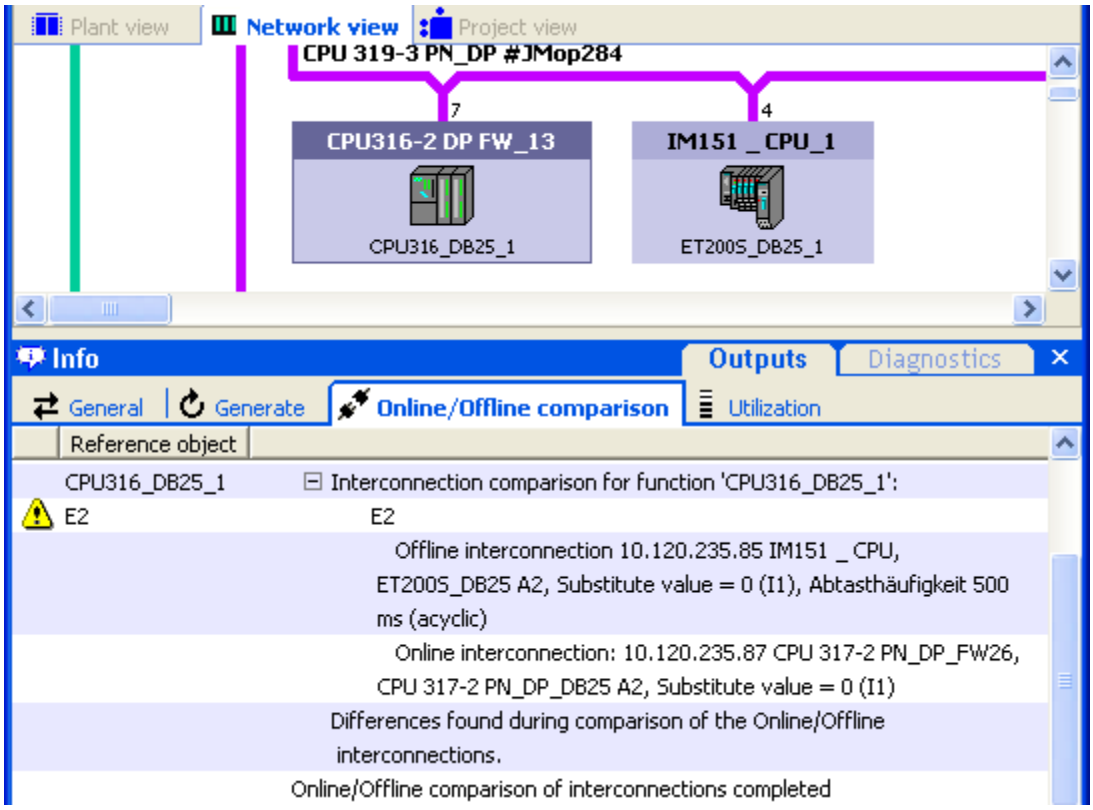


Figure 5-8 Online/offline comparison of interconnections

5.8 Displaying and setting online values in SIMATIC iMap

Online values of PROFINET variables

The online values of PROFINET variables are current values at the connectors of technological functions.

In the Online view of SIMATIC iMap you can:

- monitor selected online values at the connectors of technological functions,
- set online values of individual inputs once in order to test a PROFINET component in the commissioning phase, for example,
- monitor and set online values in the variable table (see section entitled "Online testing with the variable table).

The procedure for displaying and setting online values in the plant view is described below.

Requirements

SIMATIC iMap must be connected to the plant online ("Online connection" button pressed).

How to display online values:

1. Select the required connectors of the technological function(s) from the plant view.
2. Select the **Online > Display Online Values** menu command or **Display Online Values** from the pop-up menu.

Result: The online values of the connectors are displayed in the plant view.

The online values are updated dynamically.

⚠ CAUTION

Network load on the Industrial Ethernet and in the devices of the plant.

Additional communication functions for monitoring connectors are performed on the Industrial Ethernet.

You should note, however, that the network load can be affected both by the number of connectors to be monitored and by the frequency with which the values change.

Remedy: Individually select the connectors whose values you wish to monitor online.

Note

The display of online values of the type array and struct is limited. No more than 16 elements can be displayed via tooltips. Larger arrays and structures must be displayed via the variable table.

Validity of online values

The validity of displayed online values is indicated by different colors.

Color of the online value	Significance: the value ...
Black	is valid
Red	is invalid (e.g. due to a fault or immediately after setting, if the online value has not yet been confirmed in the target system)
Red with question mark	has not yet been confirmed or the device is not (yet) accessible
Red with exclamation mark	cannot be monitored because there are no free resources on the device
Gray	is uncertain (the validity cannot be determined)
Gray italic	is a substitute value

Example: Displaying online values

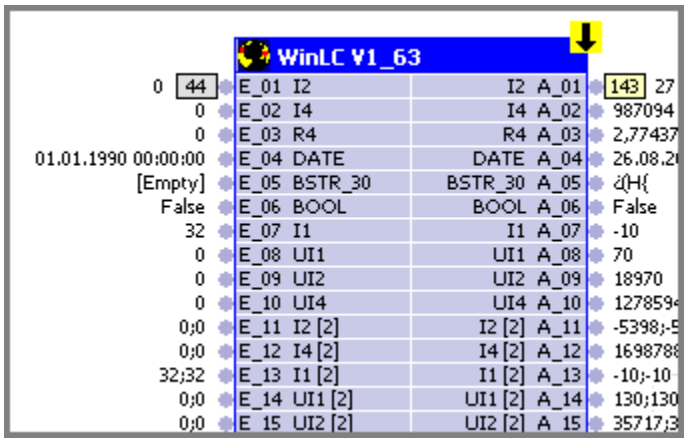


Figure 5-9 Displaying online values

To set an online value:

1. Select the desired input of a technological function in the plant view.
2. Select the **Online > Display Online Value** menu command.

   Result: The online value of the connector is displayed.
3. Click on the value or select the **Online > Set Online Values** menu command.

   Result: Depending on the data type of the connector either
   - A selection box with the permitted values, e.g. True and False for the data type BOOL, or
   - an edit box for all other data types is displayed.
4. Select the required value or enter it in the edit box and press Enter to confirm.

Result: The entered value must be confirmed by the device in the plant. It can then change to black, red or gray (see above "Validity of the Online Values").

If the device cannot be accessed online or if a fault has occurred, the set value is not confirmed. In this case, the last known value is displayed as red or as a red question mark.

The value remains constant as long as this input is not interconnected or modified by the user program of the technological function. If the input is interconnected via SIMATIC iMap, the online value can be modified via the interconnection.

Note

Online values of the data type Array and Struct cannot be set. You should use the variable table for these values.

Tip: You can also interconnect inputs to constant values for testing purposes.

Example: Setting online values

Setting a BOOL-type input.

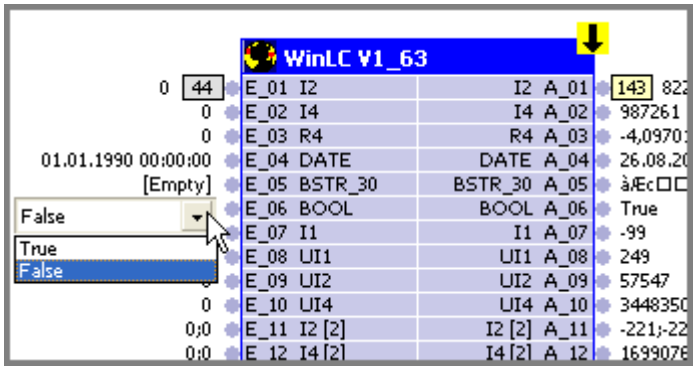


Figure 5-10 Setting online values

See also

Interconnecting Technological Functions (Page 123)
Interconnection with constant values (Page 129)
Setting the transfer properties of interconnections (Page 137)
Diagnostics information in the online view (Page 178)
Overview of the online functions (Page 164)
Creating a variable table (Page 193)

5.9 Online testing with the variable table

5.9.1 Creating a variable table

Structure of the variable table

The variable table contains the variables of the connections to be tested online.

Table 5-1 Structure of the variable table

Column	Meaning
No.	Line number
	Automatically displays whether the entry is deactivated, connected online or inaccessible.
Device	Here you can enter the device name or select it from a list.
Function	Here you can enter the function name or select it from a list.

Column	Meaning
Connection	Here you can enter the connection name or select it from a list.
Type	The data type of the connection is displayed here.
Format	Here you can select the display format for the online value. <Automatic> means the default format, e.g. decimal for I1, I2, UI1, R4 or True/False for BOOL.
Online value	Displays the online value when the variable is connected online.
Control value	Here you can enter control values for inputs. You can transfer these values to the plant at any time to set the relevant online values.
Comment	A comment is entered here.

Select the **Columns** command from the pop-up menu to show or hide individual columns.

How to insert entries

1. Open the "Variable table" tab in the diagnostics window.
2. Select the required connections or technological functions from the plant view and drag them into the variable table.

Result: An entry is completed in the variable table for every inserted connection. For arrays and structures, you can expand and shrink the lines that make them up.

Other options:

- Enter data directly into the "Function" and "Connection" boxes or
- Select the function and connection from the drop-down list.

The other fields are filled in automatically.

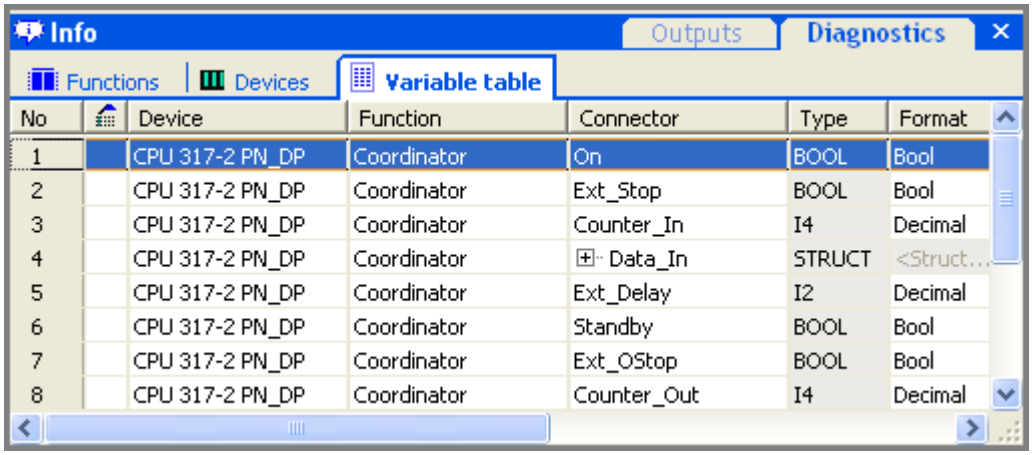
Rule

The variable table can contain up to 50 entries.

Invalid entries (e.g. unknown name for functions or connections) are displayed in red. Variables with invalid fields cannot be monitored.

Example: Variable table

The following variable table contains the connections for the "Coordinator" function.



No	Device	Function	Connector	Type	Format
1	CPU 317-2 PN_DP	Coordinator	On	BOOL	Bool
2	CPU 317-2 PN_DP	Coordinator	Ext_Stop	BOOL	Bool
3	CPU 317-2 PN_DP	Coordinator	Counter_In	I4	Decimal
4	CPU 317-2 PN_DP	Coordinator	Data_In	STRUCT	<Struct...
5	CPU 317-2 PN_DP	Coordinator	Ext_Delay	I2	Decimal
6	CPU 317-2 PN_DP	Coordinator	Standby	BOOL	Bool
7	CPU 317-2 PN_DP	Coordinator	Ext_OStop	BOOL	Bool
8	CPU 317-2 PN_DP	Coordinator	Counter_Out	I4	Decimal

Moving entries

You can move selected entries within the variable table using drag-and-drop

How to sort the entries

You can sort the entries by clicking on the required column header.

How to save the variable table

The variable table is always saved together with the SIMATIC iMap project. If you wish to save a variable table within the file system, to test another project, for example, then you will have to export it.

How to export the variable table

1. Select the **Options > Export Variable table** menu command.
2. In the "Export Variable table" dialog, select a directory from the "Search in" box.
3. In the "File name" box, enter a file name or select a name from the list.
4. Click on the "Save" button.

Result: The current variable table is stored in the file system. The file name always has the extension .CBV

How to import a variable table

By importing, you can copy a variable table from the file system into the currently opened SIMATIC iMap project.

Note

The existing entries are overwritten when you import the variable table. We recommend that you use the **Options > Export Variable table** menu command to back up the current variable table, if necessary, before importing.

Procedure:

1. Select the **Options > Import Variable table** menu command.
2. Select the required variable table from the "Import variable table" dialog. Look for a file name with the extension .CBV.
3. Click "Open."

Result: The entries in the imported variable table are copied to the variable table for the project.

Default storage location for variable tables

Use the **Options > Customize** menu command on the "Directories" tab to define a directory for storing variable tables. This directory will be suggested when you import and export variable tables.

5.9.2 Variablen online beobachten und steuern

Overview

You can use the variable table to test the plant by:

- monitoring selected variables in online mode, and
- assigning control values to selected variables in the test phase.

You can only monitor variables if their entries are activated in the variable table. You can exclude selected variables from monitoring by disabling their corresponding entries in the variables table.

The variable table lets you monitor variables in online mode, regardless whether or not **Online monitoring** is enabled in the plant view or network view. You can monitor the selected or all active variables in the variable table.

You can enter control values for selected input variables. You can then assign those control values to the variables for test purposes, and thus replace their current online values.

Disabling and enabling entries

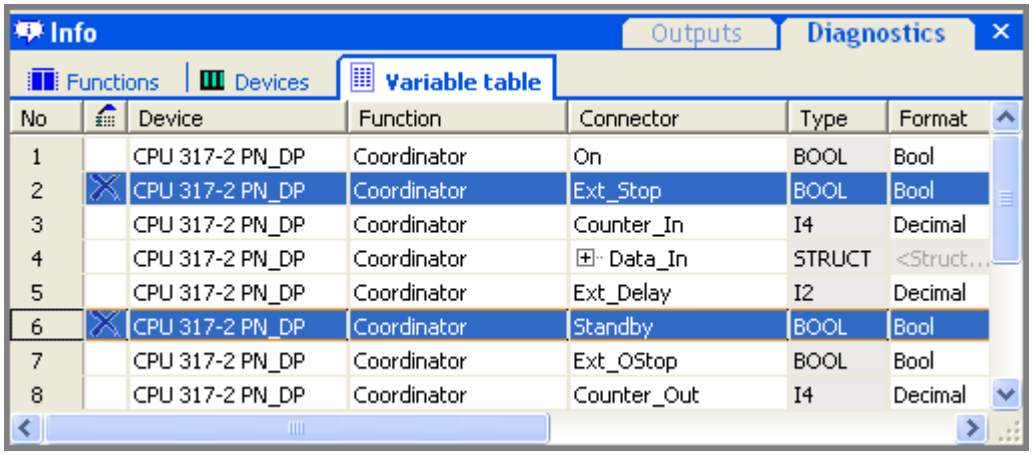
New entries are active. You must explicitly disable entries to exclude these from monitoring. To disable entries:

1. Open the "Variable table" tab in the diagnostics window.
2. Select the entries. Press the CTRL or Shift key at the same time to select several entries.
3. Select the **Deactivate** command from the shortcut menu.

Result: The selected entries are identified with a cross symbol. The associated variables can no longer be monitored.

To be able to monitor those variables again, you must first enable the entries. To do this, select the **Reactivate** command from the shortcut menu.

In the example below, entries no. 2 and 6 are disabled.



No		Device	Function	Connector	Type	Format
1		CPU 317-2 PN_DP	Coordinator	On	BOOL	Bool
2	✕	CPU 317-2 PN_DP	Coordinator	Ext_Stop	BOOL	Bool
3		CPU 317-2 PN_DP	Coordinator	Counter_In	I4	Decimal
4		CPU 317-2 PN_DP	Coordinator	⊞ Data_In	STRUCT	<Struct...
5		CPU 317-2 PN_DP	Coordinator	Ext_Delay	I2	Decimal
6	✕	CPU 317-2 PN_DP	Coordinator	Standby	BOOL	Bool
7		CPU 317-2 PN_DP	Coordinator	Ext_OStop	BOOL	Bool
8		CPU 317-2 PN_DP	Coordinator	Counter_Out	I4	Decimal

Figure 5-11 Example: Deactivating entries of the variable table

Requirement

Your PG/PC must be connected to the plant via Ethernet in order to monitor variables and set online values.

How to start monitoring using the variable table:

1. Open the "Variable table" tab in the diagnostics window.
2. Select:
   - the **Online > Variable table > Monitor all variables** command, or click the "Monitor variables online" icon to monitor all active variables, or
   - select the required entries, and then select the **Monitor** command from the shortcut menu to monitor only the selected variables.

Result: All or the selected entries are identified by a "Monitor" icon (eye glasses) in the second column, and the current online variable values are indicated at the "Online value" column. The online values are visualized in the defined format. "<Automatic>" means the default output format, i.e. decimal for I1, I2, I4, UI1, UI2, UI4, R4 or True/False for BOOL.

The system does not ouput the online values of deactivated entries.

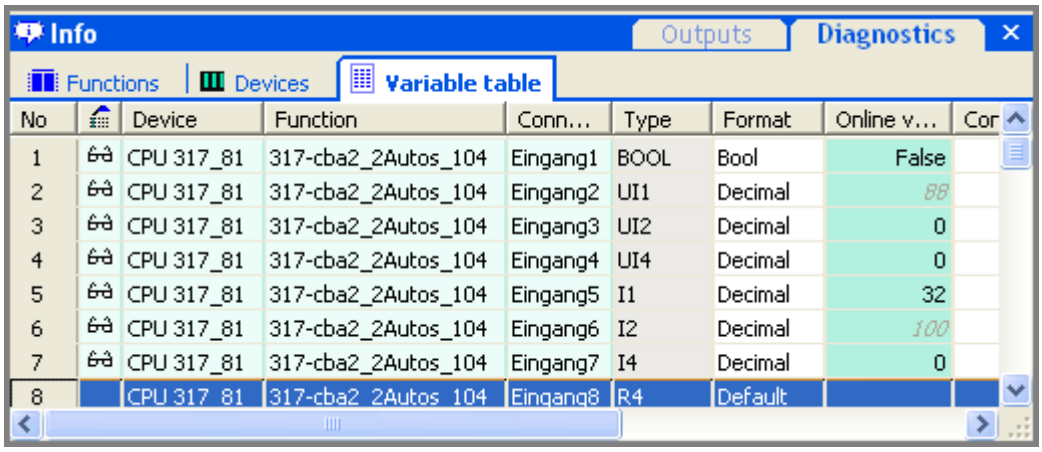
Variables of unavailable devices are identified by a separate symbol (eye glasses with a cross).

The validity of indicated online values is visualized in color, as the online values in the plant view (see "Diagnostics information in the online view").

Example - Online variable table

The diagram shows:

- Substitute values are displayed for the variables number 2 and 6.
- All other variables are monitored.



No	Device	Function	Conn...	Type	Format	Online v...	Cor
1	CPU 317_81	317-cba2_2Autos_104	Eingang1	BOOL	Bool	False	
2	CPU 317_81	317-cba2_2Autos_104	Eingang2	UI1	Decimal	88	
3	CPU 317_81	317-cba2_2Autos_104	Eingang3	UI2	Decimal	0	
4	CPU 317_81	317-cba2_2Autos_104	Eingang4	UI4	Decimal	0	
5	CPU 317_81	317-cba2_2Autos_104	Eingang5	I1	Decimal	32	
6	CPU 317_81	317-cba2_2Autos_104	Eingang6	I2	Decimal	100	
7	CPU 317_81	317-cba2_2Autos_104	Eingang7	I4	Decimal	0	
8	CPU 317_81	317-cba2_2Autos_104	Eingang8	R4	Default		

How to exit monitoring mode

- Once again, select the **Online > Variable table > Monitor all variables** command again, or click the "Monitor variables online" icon again in order to stop monitoring of all variables.
- Select the required entries from the variable table, and then select the **Stop Monitoring** command from the shortcut menu to stop monitoring of the selected variables.

How to transfer control values

At the input variables, you can enter control values for use as online test values. Online values can not be set at outputs.

Procedure:

1. Open the "Variable table" tab in the diagnostics window.
2. Enter the control values in the fields of the "Control value" column. In doing so, note that the values in the display format are interpreted, e.g. if hexadecimal is set for a variable in the "format" field, then you must also enter the control value in hexadecimal.
3. Select the variables in order to set their online values.
4. Select the **Monitor** command from the pop-up menu to start monitoring those variables.
5. Select the **Transfer control value** command from the shortcut menu, or click the "Transfer control value" button.

Result: The control values are transferred to the plant and appear in the field of the "Online value" column.

Online values are not set for deactivated entries and variables of unavailable devices.

Note

If the controlled variables are interconnected...

The control values will only be transferred to the plant if the interconnections are configured to support acyclic transfer. Variables with interconnections for cyclic transfer can not be controlled using the variable table.

Note

If the same variable is selected more than once for the transfer of control values, the operation and the transfer of control values will be cancelled and an error message will be output.

How to copy the online value of a variable:

Select the **Copy online value** command from the shortcut menu to copy the online value of a variable.

Result: The online value is copied to the clipboard.

Tips

You can always enter control values, regardless whether or not variable monitoring is enabled in the variable table. You can not enter any values if the entries are deactivated and invalid:

5.10 Online device analysis

Content of the online device analysis

If SIMATIC iMap is connected to the devices of the plant via Industrial Ethernet, you can look up specific online information about the devices for testing and diagnostic purposes. The online device analysis returns the following information:

- Performance parameters for the device (see "Performance parameters of PROFINET devices")
- Configuration data for the device and the associated technological function (if present)
- For PROFINET devices with proxy functionality only: the configuration data for the coupled PROFIBUS devices (devices and technological functions).
- Diagnostic information, e.g. error statistics and timeouts

The online device analysis can only be run for one PROFINET device. The online data for the PROFIBUS devices is recorded together with the data for the associated PROFINET device with proxy functionality.

Storing the online device analysis

The information from the online device analysis is stored in HTML format in a separate folder. Using the **Options > Customize** menu command you can define a default path on the "Directories" tab.

Requirement

SIMATIC iMap must be connected to the target device via Industrial Ethernet.

How to look up the online data for a device

1. Highlight a device in the net view.
2. Select the **Online > Online device analysis...** menu command.
3. The IP address of the device is displayed in the "IP address" box in the "Online device analysis" dialog. If this is not the case, enter the IP address of the device to be analyzed.
4. If necessary, click on the "Modify" button and change the path.
5. Click on the "OK" button.

Result: The current version of the online device data is stored in the folder in the form of several HTML files.

Note

The information is updated for the specified IP address whenever you call the **Online > Online device analysis...** menu command.

You can display stored versions of the online device analysis by opening the HTML files directly in an HTML browser.

See also

Parameters of limit values (Page 143)

5.11 Accessing information variables

5.11.1 Create OPC symbol file

OPC symbol file

SIMATIC iMap supports the creation and analysis of an OPC symbol file for the current project using the client programs of SIMATIC NET PN OPC server. The OPC symbol file is created for the entire SIMATIC iMap project, and saved to a user-specific folder.

Options: You can define the scope of the OPC symbol file you created, i.e. only the HMI variables, only the MES variables, or all variables of the project. When you create the PROFINET components in the manufacturer-specific engineering tool, the variables will be identified as HMI or MES variables.

Requirement

The SIMATIC iMap project is generated. If the project contains any objects at which the "generated" status is not set, you will not be able to create an OPC symbol file.

Name length of the OPC information variables

The name of an OPC information variable consists of the following elements:

- Optionally one or more chart levels
- Function name
- I/O name
- Structure component name (only with composite data types)
- One separator each between the individual names

Note

The name of an OPC information variable may contain a maximum of 255 characters. If this length is exceeded for one of the OPC information variables, the OPC symbol file cannot be created.

How to create the OPC symbol file for the project

1. Select the menu command
   - **Options > Create OPC symbol file > All** in order to generate an OPC symbol file for all (HMI and MES) variables of the project.
   - **Options > Create OPC symbol file > HMI only** in order to generate an OPC symbol file for all HMI variables of the project.
   - **Options > Create OPC symbol file > MES only** in order to generate an OPC symbol file for all MES variables of the project.

   The "Create OPC symbol file" dialog opens.
2. Optional: Enter a user-specific character string in the "Prefix" box. You need the prefix in order to identify OPC information variables uniquely in all projects. Any changes to the prefix are stored in the project.
3. The current path of the OPC symbol file is indicated in the "Save As" field. Accept the settings, or click the "Modify" button to select a different path. You can select another folder, or enter a different file name.

Result: The OPC symbol file with the extension .sti is saved to the selected folder.

Note

Use the **Options > Customize** command to define a folder for the OPC symbol files. This folder will be suggested as default whenever you search for the storage location.

Select the **Project > Properties** command, "Special" tab to define the OPC prefix.

The created OPC symbol files can be implemented in the configuration data of SIMATIC NET PN OPC server.

CAUTION
Network load on Industrial Ethernet and at the devices of the plant. Monitoring of connections, including monitoring using OPC, requires the execution of additional communication functions on Industrial Ethernet. Note that network load may be influenced by the number of monitored connections, and by the rate of values changes.

5.11.2 OPC information variables in SIMATIC iMap

Syntax

At the OPC interface, process variables are identified by a unique name, namely the runtime name (OPC item ID.) The OPC item ID consists of:

<protocol ID>:[<connection name>]<variable name>

Significance of the elements in PROFINET:

- The protocol ID specifies the protocol used to access the process variable. The protocol ID "PN" is implemented for the PROFINET protocol.
- The connection name specifies the connection or device which can be reached using the variable:
- The variable name is the symbolic name of the variable.

Symbolic access to variables

The browser (symbol file configuration of SIMATIC NET, for example) outputs the process variable symbols in the following hierarchical order:

[<project_prefix>] [<Chart>] <function> <variable>

Whereby:

Element	Description
<project_prefix>	user-specific ID used in all projects
<chart>	nested chart nested charts are optional, and may have multiple layers.
<Funktion>	Name of the technological function
<variable>	Name of the input or output

Variable types for PROFINET

In PROFINET, we distinguish between three types of variables:

- Process variables
- System variables
- Device-specific information variables

Process variables

Process variables are assigned to the IO of technological functions. Syntax of the runtime name of a process variable:

PN:[aaa.bbb.ccc.ddd|<devicename>|<funcname>]<variable>

Designation	Description
aaa.bbb.ccc.ddd	• The IP address of PROFINET devices • At PROFIBUS devices the IP address of the master (proxy)
<devicename>	Name of the configured device in iMap
<funcname>	Name of the technological function in iMap
<variable>	Name of the input or output of the technological function

Access security of process variables

Process variables for inputs are assigned the read and write attribute.

Process variables for outputs are read only.

Note

If the variables are interconnected...

You can only write variables if their interconnections are configured for cyclic transfer mode.

Example – process variables

Representation of process variables in the SIMATIC NET symbol file configuration

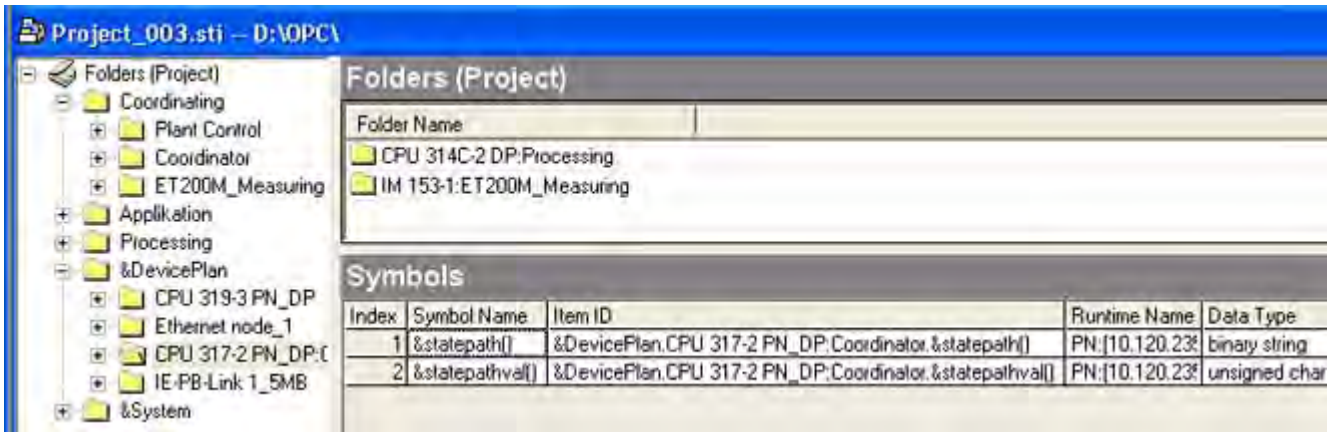


Figure 5-12 Example – process variables

System variables

Those information variables are located in the browser's "&System" folder. They apply to the entire plant.

Variable symbol	Runtime name	Meaning
&localhost	PN:[SYSTEM]&localhost()	Name of the host computer
&version	PN:[SYSTEM]&version()	Version of the PROFINET core server

Example - system variables

Representation of system variables in the SIMATIC NET symbol file configuration

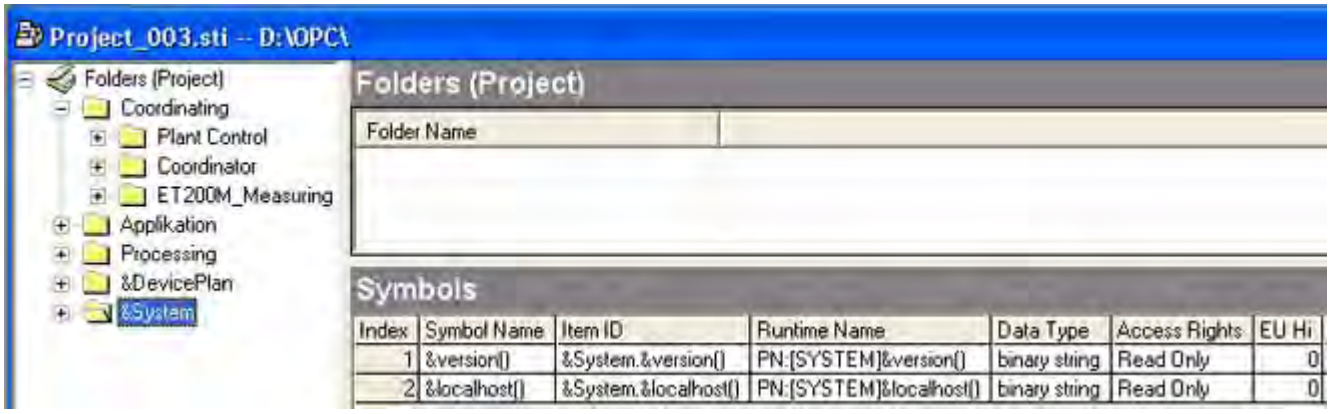


Figure 5-13 Example - system variables

Device-specific information variables

Those information variables are located in the "&DeviceChart" folder, and are assigned to the various devices.

Variable symbol	Runtime name	Meaning
&statepath	PN:[aaa.bbb.ccc.ddd|<devicename>]&statepath()	Status of the connection in string format
&statepathval	PN:[aaa.bbb.ccc.ddd|<devicename>]&statepathval()	Status value of the connection

&statepath()

Returns the state of a communication connection to a partner device in string format.

Return values:

- DOWN - connection not up
- UP - connection is up
- RECOVERY - Connection is being recovered
- ESTABLISH (reserved for future enhancements)

Data types:

OLE data type	Visual Basic type
VT_BSTR	String

&statepathval()

Returns the state of a communication connection to a partner station

Return values:

1 - Connection not up

2 - Connection is up

3 - Establishing connection

4 (reserved for future upgrades)

Data types:

OLE data type	Visual Basic type
VT_UI1	Byte

Example - device-specific information variables

Representation of device-specific variables in the SIMATIC NET symbol file configuration

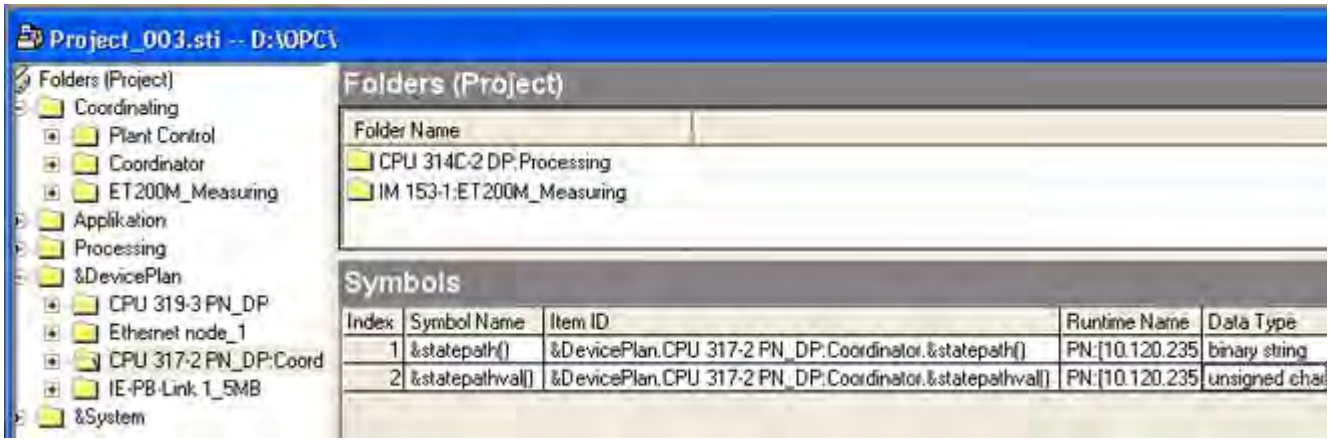


Figure 5-14 Example – device-specific information variables

See also

Create OPC symbol file (Page 201)

5.12 Plants with SIMATIC devices

5.12.1 Special features of systems containing SIMATIC devices

SIMATIC devices in SIMATIC iMap projects

To observe when using SIMATIC devices as PROFINET devices in a project:

- Plant commissioning demands specific software requirements and settings in STEP 7.
- STEP 7 provides a number of special options for editing PROFINET components of SIMATIC devices.
- The SIMATIC iMap online view provides device-specific online functions and diagnostics functions.
- Allowances must be made for specific features when downloading programs to SIMATIC device.
- The OPC server must be configured in order to monitor variables via OPC.

Plant commissioning requirements

- STEP 7 is required on your PG/PC in order to:
  - generate the project
  - download device-specific data (programs) to the devices
  - edit the PROFINET components of the SIMATIC iMap project in STEP 7
  - to compare the online and offline data of the programs
- The associated optional packages for configuring and programming specific to the devices used must be installed.
- SIMATIC NET Softnet IE PG is required to allow OPC access to process variables.
- The devices of the plant must have been assembled, wired, networked, and started up correctly. All the necessary addresses, such as the IP address, subnet mask, router address and PROFIBUS address, must have been assigned using the device-specific resources, e.g. using STEP 7 via MPI. You will find the necessary information in the associated product documentation.
- To access PLCs in SIMATIC iMap, configure a PG/PC interface, and then assign your engineering system to the configured PG/PC. In this way, you can transfer default settings to the installed interfaces of your created system during the configuration process. (In this situation, interfaces are module parameter settings on the PG/PC). The steps are as follows:
  - Set the PG/PC interface
  - Assigning the PG/PC - only for particular device types such as drives

Data storage - the STEP 7 shadow project

When you generate a SIMATIC iMap project with PROFINET components of SIMATIC devices for the first time, a common STEP 7 project is formed from all the component projects (control units) in the shadow project. The STEP 7 shadow project is located in the SIMATIC iMap project directory under **Step7\Shadow**. It contains a station for each component with programmable functionality in the SIMATIC iMap project. PROFIBUS devices with fixed functionality are assigned to the station of the DP master system concerned.

The PROFINET devices without proxy functionality at accelerated regeneration are excepted (see below).

The following figure shows the different ways to use the STEP 7 projects in SIMATIC iMap. (Information on data storage of the singleton projects can be found under "Properties of singleton components").

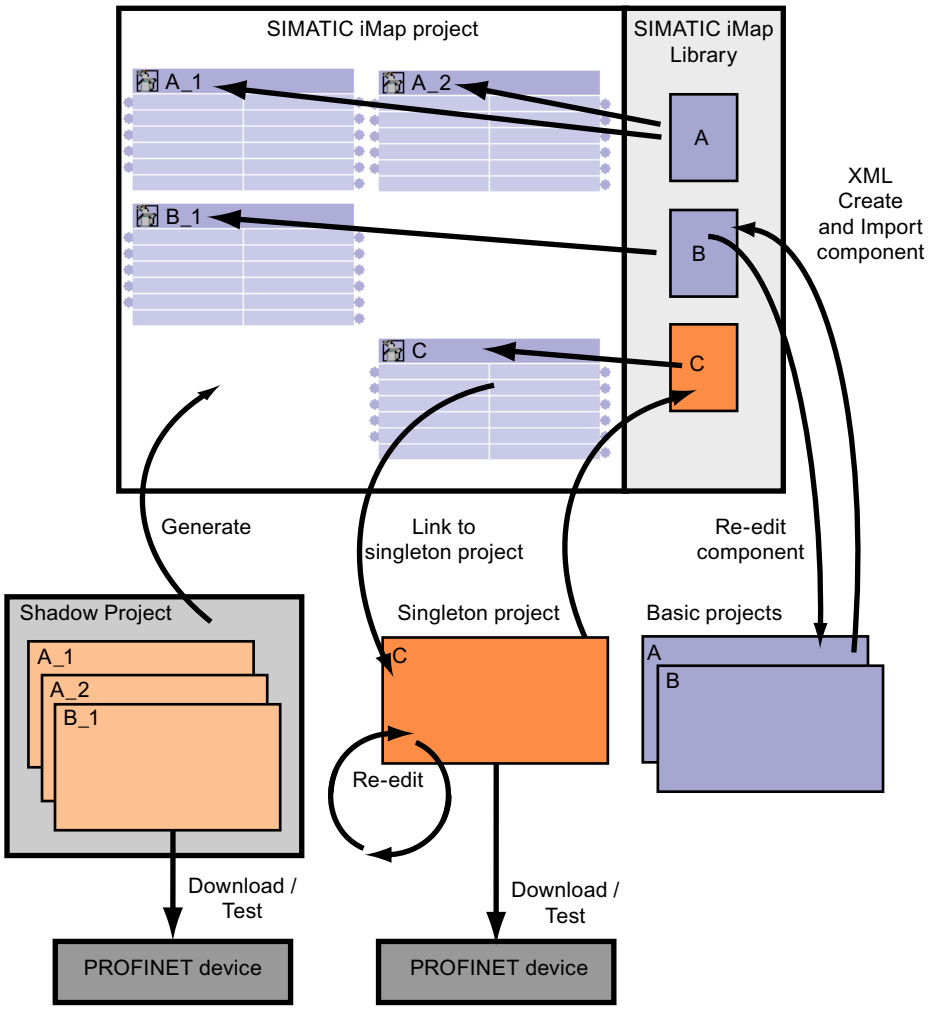


Figure 5-15 Data storage with STEP 7 projects

All changes to PROFINET components, e.g. IP addresses or PROFIBUS addresses, are transferred to the STEP 7 shadow project whenever the SIMATIC iMap project is regenerated.

The shadow project is automatically opened for editing in SIMATIC iMap whenever the **Edit > Special > SIMATIC Manager** menu command is called for a technological function or device.

CAUTION
The shadow project may not be modified directly under STEP 7! Changes to the shadow project may lead to inconsistent data in the SIMATIC iMap project, preventing any further program downloads. **Possible remedies:** • Regenerating a project • **Edit > Re-edit component** menu command from the modified shadow project to create a new PROFINET component

CAUTION
Changes that you make to the shadow project in STEP 7 are ignored when you generate with SIMATIC iMap, and may therefore be overwritten.

Generating the project

The **Project > Generate > Control unit > Changes only** menu command only generates the changes. If this is not possible because the S7 program or the hardware or network configuration contains incorrect or inconsistent data, for example, then the STEP 7 shadow project must be fully regenerated.

When you select the **Project > Generate > Control unit > All** menu command a new STEP7 project is created, and all the stations of the associated component projects from the library are added to the library once more.

CAUTION
Any changes you have made to the shadow project using STEP 7 will be overwritten by the newly generated shadow project. The system generates a backup copy of the old shadow project as required to let you trace any changes in the new shadow project. Tip: Select **Edit > Edit component** to make any relevant changes at the component type, rather than at the shadow project.

The new shadow project is always called "Shadow". An extension is appended to the name of the copy of the old shadow project.

Accelerated regeneration for PROFINET devices without proxy functionality

When this option is active in the properties of the project, the control units of the PROFINET devices without proxy functionality are not copied into the shadow project when the project is regenerated.

Tip: Check consistency of the generated project

Select **Edit > Check consistency > Generated project** to perform a consistency check in order to locate any differences between the blocks of the station in the shadow project and the blocks of the corresponding component project.

Note

The following devices are not taken into consideration in the consistency check:

- Any local DP slaves
- PROFINET devices without proxy functionality if the "Accelerated generation..." option is active.

Simultaneous actions with STEP 7 access

Note

Simultaneous actions with STEP 7 access to a PG/PC are not supported. Actions in SIMATIC iMap with active STEP 7 application, for example:

- Generating the Project
- Program download

Always make sure only one STEP 7 application is active on the PG/PC at any given time.

See also

Set the PG/PC interface (Page 215)

Online operation of SIMATIC devices (Page 211)

Processing instances with STEP 7 (Page 212)

5.12.2 Online operation of SIMATIC devices

Special features of SIMATIC devices

The following online functions are provided for SIMATIC devices:

- Online/offline comparison of STEP 7 data
- Device-specific diagnostics with STEP 7

Online-offline comparison of the Programs

The Online-offline comparison of the program data for SIMATIC device compares the blocks of the associated STEP 7 shadow project with the online blocks. The result of the comparison is displayed is displayed on the "Info" tab in the diagnostic window.

Note

In the online / offline comparison of the programs, any existing local DP slaves are not taken into consideration.

Device-specific diagnostics

You can call the device-specific diagnostics as follows:

- If there is a diagnostic message for a device, you can click on the "Diagnostics" button in the right-hand part of the diagnostic window to call up device-specific diagnostics.
- You can use the **Edit > Special >** menu command to call up the available device-specific diagnostic functions, e.g. "Module state" or "Diagnose hardware", in STEP 7.

Program download

NOTICE
Program downloads can only be carried out when the devices are in the STOP operating state.

The devices must be in the STOP operating state while the program is downloaded. If this is not the case, the devices attempt to switch to STOP when one of the following menu commands is called:

- **Download all Instances > All / > Program only**
- **Download selected instances > All / > Program only**

Before the program is downloaded, you are asked whether the device should be switched to STOP. You may also have to press the operating mode switch, and possibly enter a password, depending on the type of device, and the currently set level of protection.

Once the program has been downloaded to a device, you are asked whether you wish to switch the device to RUN. If you click on "Yes" to confirm, this occurs automatically. If you click on the "No" button, the device remains set to STOP, and can subsequently be switched to RUN.

Tip: Permanently storing the downloaded data

With some devices in SIMATIC iMap, once you have downloaded the program you must call the **Special > Copy RAM to ROM** menu command in order to transfer the data to the ROM area of a device. This means that the data is retained even after the power is switched off.

PROFIBUS device inputs

When a PROFINET device acting as a PROFIBUS master is switched to the STOP operating state, the inputs of the technological functions of the associated PROFIBUS devices are set to zero (safe state).

See also

Generating the Project (Page 86)

5.12.3 Processing instances with STEP 7

Introduction

If you have created a PROFINET component using STEP 7, you can call certain STEP 7 applications from SIMATIC iMap, e.g. SIMATIC Manager or HW Config, in order to modify the S7 program or parameter settings for a module. In doing so you edit the associated STEP 7 shadow project.

CAUTION
When you edit the STEP 7 shadow project, you must make sure that no inconsistencies occur in the configuration data, since this can lead to inconsistencies in the SIMATIC iMap project and to communication faults in the system.

In SIMATIC iMap you can edit the instances of PROFINET components using STEP 7 in the following ways:

- Modify a function in the SIMATIC iMap project.
- Modify a device in the SIMATIC iMap project.

The available editing functions are device-specific, i.e. different menu commands can be called for each type of device. The following descriptions contain the generally accessible editing functions.

Special editing functions for SIMATIC devices

Table 5-2 Editing functions

Edit > Special > menu command	Meaning
SIMATIC Manager	Opens the shadow project in SIMATIC Manager.
Monitor variable	Opens variable table VAT1 for the station in the shadow project. You can enter the variables of the technological function (from the interface DB) to be monitored in the variable table, for example. If a variable table called VAT1 already existed when you created the PROFINET component, it is opened at the first call, otherwise the VAT1 table in the shadow project is originally empty.
Program	Opens the program folder for the associated module in SIMATIC Manager. You can open the blocks, sources and symbol table for editing.
Compare blocks	Runs an online-offline comparison of the program blocks, i.e. compares the blocks in the target system (online) with the blocks in the SIMATIC iMap shadow project (offline).

Table 5-3 Editing devices

Edit > Special menu command	Meaning
SIMATIC Manager	Opens the shadow project in SIMATIC Manager.
Hardware configuration	Opens the station's hardware configuration (offline, on the PG/PC).
Network configuration	Opens the network configuration (Netpro) for the station
Module state	Displays the current state of the module. The "Module State" tab opens in the online view.
Diagnose hardware	Opens the hardware setup for the station that can be accessed online in diagnostic mode.
Clear / Reset	Clears / Resets the device.
Operating state	Displays the current operating state of the module. You can then modify the module's operating state in the "Operating state" dialog.
Assigning the PG/PC	Opens the "Assign PG/PC" DIALOG BOX
Copy RAM to ROM	Copies the content of the RAM memory of the current module to the ROM area (only for modules that support this functionality).
Download user program to memory card	Downloads the generated user program to the CPU's memory card (only for modules that support a memory card).
Set Time of Day	Allows you to set the time on the module.
Assigning device names	Only for PROFINET IO controllers: Offers the possibility of assigning PROFINET IO devices the device names that have been configured in SIMATIC iMap. With the subsequent program download from SIMATIC iMap to the PROFINET IO controller, the PROFINET IO devices are assigned the IP addresses by means of these device names.
Compare blocks	Runs an online-offline comparison of the program blocks, i.e. compares the blocks in the target system (online) with the blocks in the SIMATIC iMap shadow project (offline).

Requirements

The following software must be installed on your computer in order to edit instances of PROFINET components using STEP 7:

- STEP 7 basic package with the necessary optional packages
- SIMATIC iMap STEP 7 Add-on

The project must have been saved and generated in SIMATIC iMap (**Project > Generate >** menu command).

How to edit a function or device

1. Select the function or device in the SIMATIC iMap project.
2. Select **Edit > Special >**from the pop-up menu using one of the available commands.
3. Save any changes and close STEP 7.
4. Select the device from the net view.
5. Select the menu command **Download selected instances > Program only** menu command to download the program to the target system.

Note

If you modify the interface DB and download it to the device from STEP 7, you must make sure that all associated PROFINET blocks with the attribute **CBA_**... are downloaded as well, otherwise run-time errors may occur in the program.

CAUTION
The shadow project is overwritten when you regenerate the SIMATIC iMap project using the **Project > Generate > Control unit > All** menu command. The system will optionally generate backup copy of the old shadow project in the same folder. You can use this copy to update any changes that you made in the shadow project using special editing functions.

Tips

Re-editing PROFINET components

To ensure that you do not lose changes you have made to the shadow project, we recommend that you create a copy of the component project using the **Edit > Re-edit component** menu command, and then accept the changes in this copy and create a new version of the PROFINET component.

Program download from STEP 7

After a special editing function the program download can alternatively be carried out from STEP 7. This is particularly recommended if only blocks have been altered, because the device does not have to be switched to STOP for this.

5.12.4 Set the PG/PC interface

Application

You must establish a connection from STEP 7 to the Ethernet in order to download programs or use certain online functions on the SIMATIC devices in the plant. In STEP 7, you must set up the PG-PC interface as follows:

- To TCP/IP if all remote devices in the plant can be accessed via Ethernet or
- To "PC internal" (local computer) if a WinLC PN is installed there.

In this way you can access all the SIMATIC devices, whether they are on the Ethernet or PROFIBUS or are on a local PG/PC, e.g. a WinLC PN.

Set the PG/PC Interface to TCP/IP

Proceed as follows:

1. Select **Start > SIMATIC > STEP 7 > Set PG-PC interface**.
2. On the "Access path" tab in the "Set PG-PC interface" dialog, select **S7ONLINE (STEP 7)** from the "Application access point" box.
3. In the "Interface parameter settings used" box, select "TCP/IP..." with the associated network adapter.
4. Click on "OK" to confirm your settings.

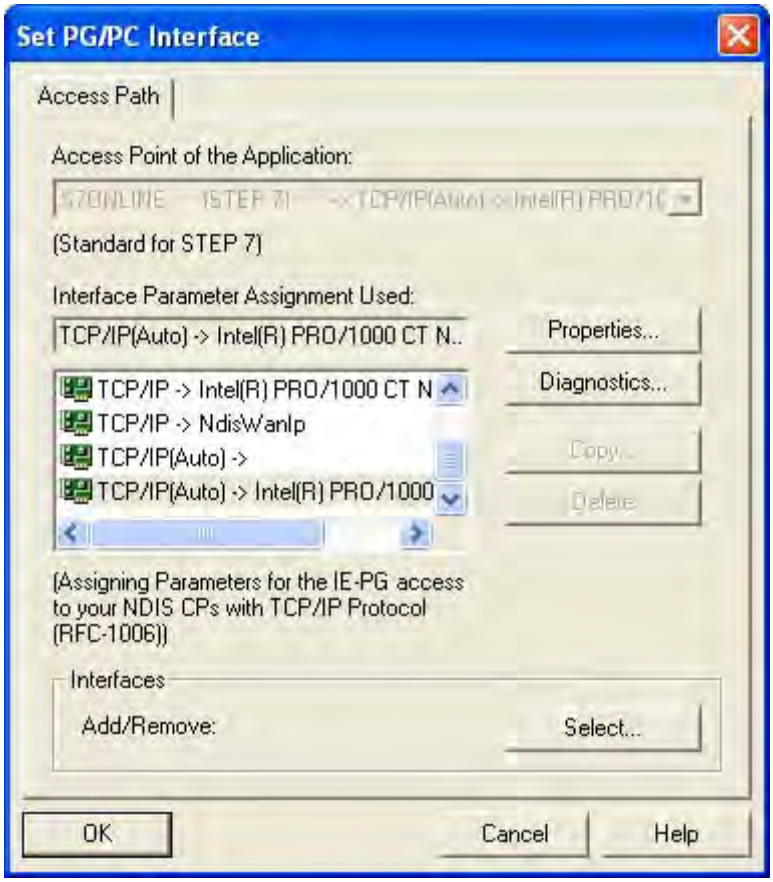


Figure 5-16 Set the PG/PC Interface to TCP/IP

Setting the PG/PC interface to local computer

If a WinLC PN representing part of the SIMATIC iMap project is installed on the local computer, this WinLC PN takes over communication with the PROFINET communication partners. The procedure is as follows:

1. Select **Start > SIMATIC > STEP 7 > Set PG-PC interface**.
2. On the "Access path" tab in the "Set PG-PC interface" dialog, select **S7ONLINE (STEP 7)** from the "Application access point" box.
3. Select "PC internal (local) from the "Interface parameters settings used" box.
4. Click on "OK" to confirm your settings.

5.12.5 Assigning the PG/PC

Note

The PG/PC assignment in SIMATIC iMap is automatically performed during the initial generation and anytime the project is newly generated. The PG / PC assignment is necessary so as to be able to carry out the program download to the intelligent PROFIBUS devices.

In special cases it may not be possible to automatically assign the PG/PC, for example:

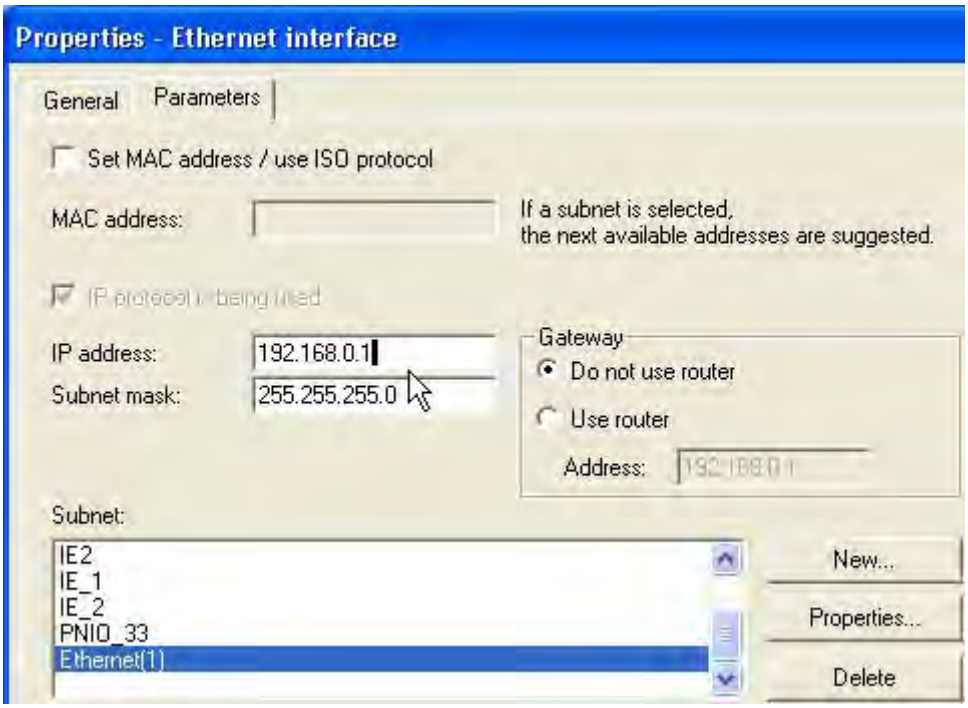
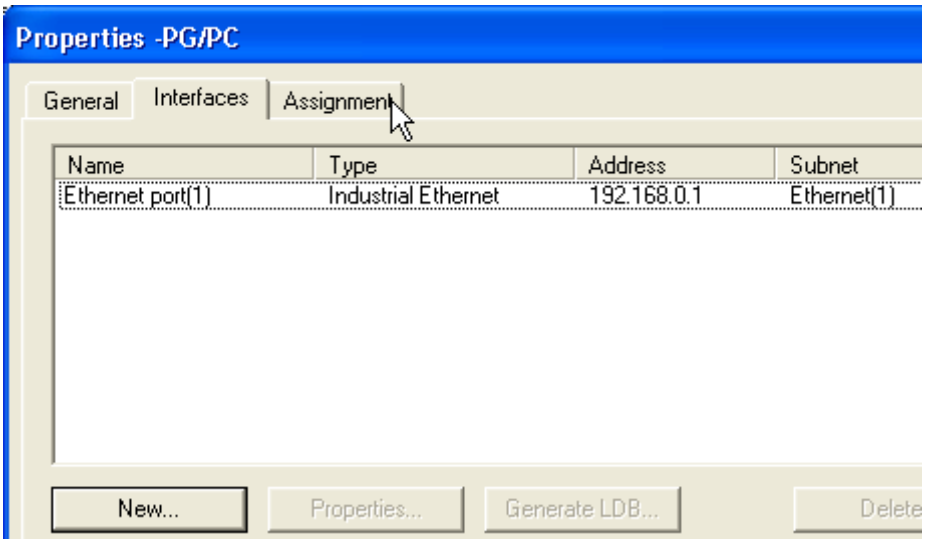
- When several network cards are installed in the PG/PC or
- When the TCP/IP protocol is not set at the PG/PC interface S7ONLINE (STEP 7)
- In the plant there are special types of device e.g. SIMOTION devices, Micromaster drives or starter components as intelligent DP slaves.

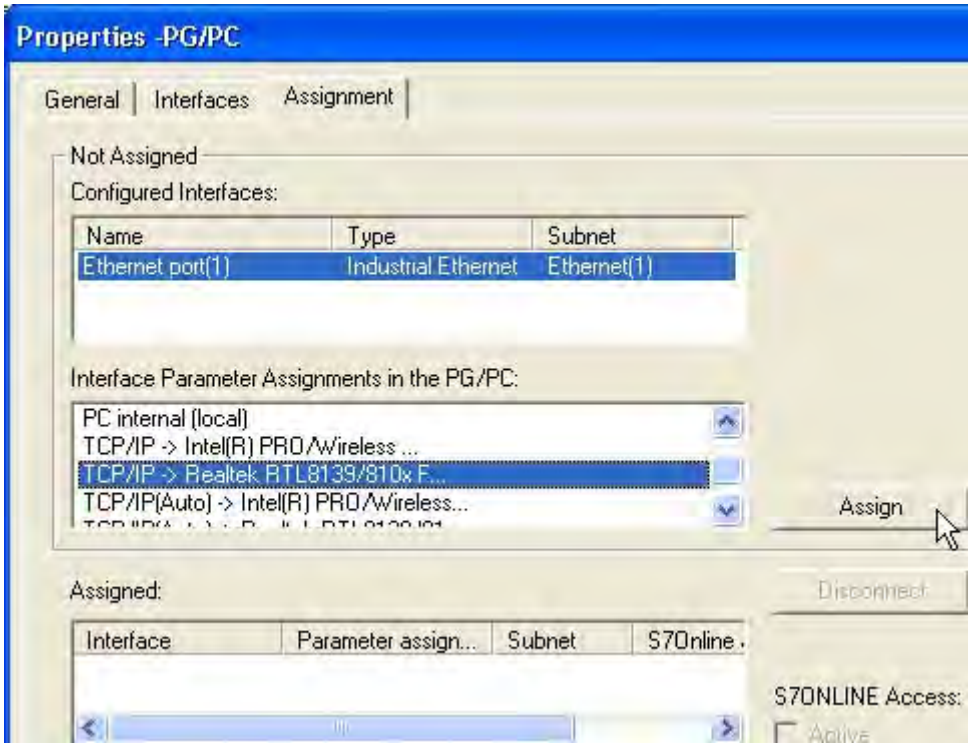
In such situations, an error message will be output to the task window during generation, and you need to assign the PG/PC as described in the section below.

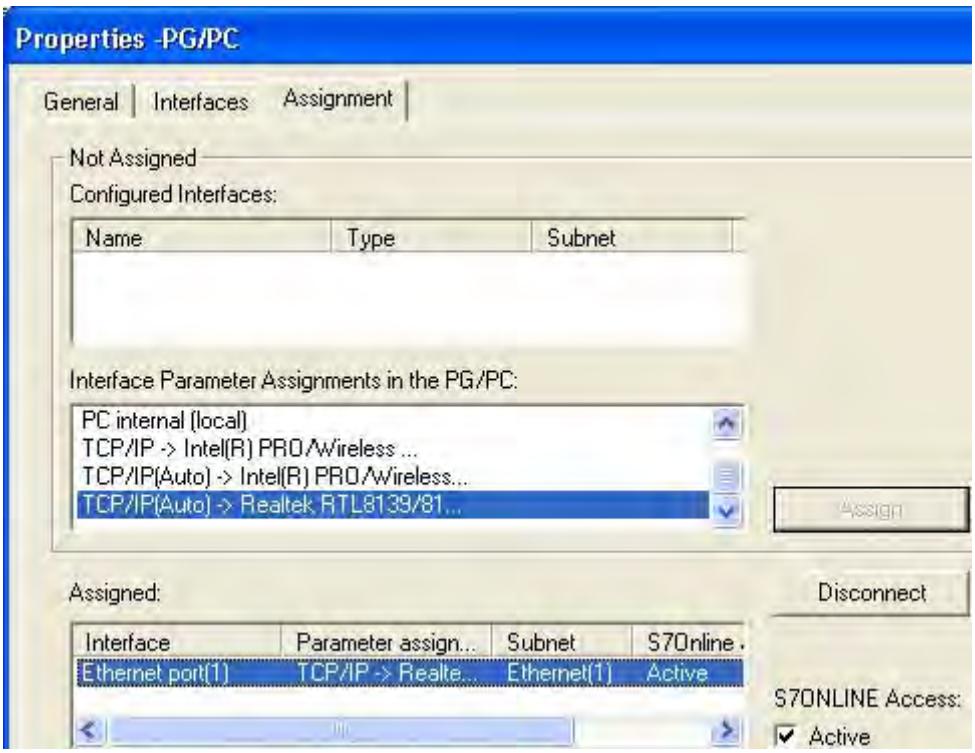
The PG/PC assignment is not necessary when you are using a local WinLC PN which contains a network card in its configuration.

How to assign the PG/PC interface to the SIMATIC iMap project

Task	Procedure
1.	Open the SIMATIC iMap project. Select any device from the SIMATIC iMap net view, then select **Special > Assign PG/PC** from the pop-up menu. If this menu command is not available, select **Special > SIMATIC Manager** from the pop-up menu, add a PG / PC object in the shadow project and open its properties.
2.	In the "Properties - PG / PC" dialog box, "Interfaces" tab, press "New" and then select "Industrial Ethernet" from the selection list.  Click on the "OK" button to confirm your entry.

Task	Procedure
3.	In the "Properties - Ethernet Interface" dialog, enter the IP address and the subnet mask of the local computer and select the Ethernet subnet. 
4.	Click on the "OK" button to confirm your entry. Result: The newly configured interface is displayed in the "Interfaces" tab. 

Task	Procedure
5.	In the "Assignment" tab, mark the Ethernet interface you have just configured in the "Configured interfaces:" selection field below "Not assigned". In the "Interface parameter settings on the PG/PC:" select **TCP/IP -> <network card used>** 

Task	Procedure
6.	Confirm by clicking on the "Assign" button. Result: The assigned interface is displayed in the "Assigned" field. Activate the option "S7ONLINE access".  The assignment becomes effective by clicking on "OK".

NOTICE
After a regeneration of the controller unit (**Project > Generate > Controller unit > All new**) the PG / PC object is deleted from the shadow project and you must reconfigure the PG / PC assignment.

5.12.6 Set up the OPC server

OPC symbol file

You create the OPC symbol file for the plant in SIMATIC iMap under **Extras > Create OPC symbol file >**. The OPC symbol file <projectname>.sti is created and stored in a directory of your choice:

Setting up the OPC server

How to set up the OPC server

1. Run the following command: **Start > Simatic > SIMATIC NET > Set PC station**. The configuration console opens. This is used to make your new OPC symbol file known to a SIMATIC NET OPC server.
2. In the left window open the folder "Applications > OPC settings".
3. Open the OPC protocol selection dialog box and select the following protocols:
   - PROFINET – always
   - S7 – for non-connectable connectors of programmable PROFIBUS devices (intelligent DP slaves) only.
4. Click on the "Accept" button.

   Open the "Symbols" folder. Select the active symbol file (<projectname>.sti, see above). Use the "Edit list" icon in order to find the file.
5. Click on the "Extended symbols" button and select the module for the TCP/IP protocol on your PG/PC from the "PROFINET" box.
6. Click on the "Accept" button.

The OPC server is now set up on your PG/PC, and you can visualize process data with reference to the OPC symbol data using an OPC client such as the OPC Scout.

Special PROFInet component types

6

6.1 Overview - special PROFINET components

PROFINET component types

The current version of SIMATIC iMap supports the following PROFINET component types:

- Standard PROFINET components - as described above
- Multifunction components

  The technological interface of a multi-function component is divided over several part functions.
- Singleton components

  In SIMATIC iMap, the device-specific configuration and programming data for these PROFINET components is held and edited in the STEP 7 basic project, rather than in the common shadow project. This component type allows you to incorporate hardware configurations with SIMATIC devices that were previously not supported into PROFINET communication.
- PROFINET components with HMI unit – this component type allows the integration of special HMIs in PROFINET communication. WinCCFlexible V1.0 or higher is required to create those PROFINET components and edit these in SIMATIC iMap.

The special features of working with these special component types are described below.

6.2 Multifunction components

6.2.1 Properties of the multi-function components

Multi-function component

The technological interface of a multi-function component is divided in several part functions. The part functions form the technological function of the component type.

Advantages

The division of large technological interfaces with several hundred connectors over several subfunctions offers the following advantages:

- Clearer display in SIMATIC iMap
- Better structuring possibilities of the plant in SIMATIC iMap on account of the flexible arrangement and, if necessary, division of the part functions over several charts.

Structure of a multi-function component

Compared to PROFINET components with just one function, the PROFINET interface of a multi-function component is divided into several part functions. Each instance includes all part functions that are shown and handled individually in SIMATIC iMap.

The user program including the hardware configuration data however continues to form one unit. Therefore, the device-specific actions, like for example generating, as well as all online and diagnostics commands always refer to the complete instance.

Multifunction components must be programmable, i.e. thes can only be created based on the data of controllers or intelligent DP slaves.

Multi-function components can be either standard or Singleton components.

Number of functions per device

The maximum permitted number of subfunctions of a multi-function component depends on the component type:

- With standard components with programmable functionality, up to 7 subfunctions are permitted.
- With standard components with fixed functionality, a maximum of 1 function is permitted.
- With singleton components, the maximum permitted number of subfunctions is variable, depending on the device type.

In all cases, the entire PROFINET interface may not exceed the performance parameters of the device with reference to the number of connectors and the maximum data length.

The maximum permitted number of subfunctions is a technical datum of the PROFINET CBA-compliant devices and is displayed in SIMATIC iMap for the following actions:

- Check utilization, device parameter "Number of functions on master and slaves"
- Online device analysis, parameter "Number of operable functions"

Note

Multi-function components with proxy functionality

For PROFINET devices with proxy functionality, this incorporates the functions or subfunctions of the coupled PROFIBUS devices.

Example:

The multifunction components of a CPU 319-3 PN/DP with proxy functionality has 4 functions. A maximum of 30 subfunctions are allowed for this device. A maximum of 26 PROFIBUS devices can therefore each be coupled to a function. The number of PROFIBUS devices which can be coupled to it is reduced accordingly if one or more of these instances also contain several subfunctions.

6.2.2 Using multi-function components in the SIMATIC iMap project

This chapter describes the special features in applications with multifunction components in SIMATIC iMap.

Selecting and editing function units

The actions in SIMATIC iMap outlined below always refer to all function units of an instance:

- Actions at objects, for example: Cut, Delete, Copy, Paste
- Generating the Project
- Download
- Online and diagnostics functions:
  - Online/Offline comparison
  - Consistency check
  - Utilization test
- Creating OPC symbol files

Exceptions:

- Moving objects between charts
- Removing objects from the chart hierarchy
- Assigning objects to a chart

Edit and Delete

Select all function units of an instance which are already assigned to a chart in order to delete or cut the instance.

Assigning objects to a chart

Function units of the instances of a multifunction component can be moved separately between different charts in the chart or plant views using the drag-and-drop function, or by selecting the **Edit > Move to new chart** command. On the other hand, you may also delete specific function units from the chart hierarchy by selecting **Edit > Remove from chart hierarchy**.

Function units outside the chart hierarchy

Function units not assigned to a chart are only visualized in the project view (see the chapter "Project view".) They can not be interconnected

Function units of a PROFINET component

Options of viewing the function units of a PROFINET component:

- In the library: Open the preview window, select the "Function" tab, and the select the PROFINET component from the library.

  The preview window offers all function units in a selection list and visualizes the selected fucntion units.

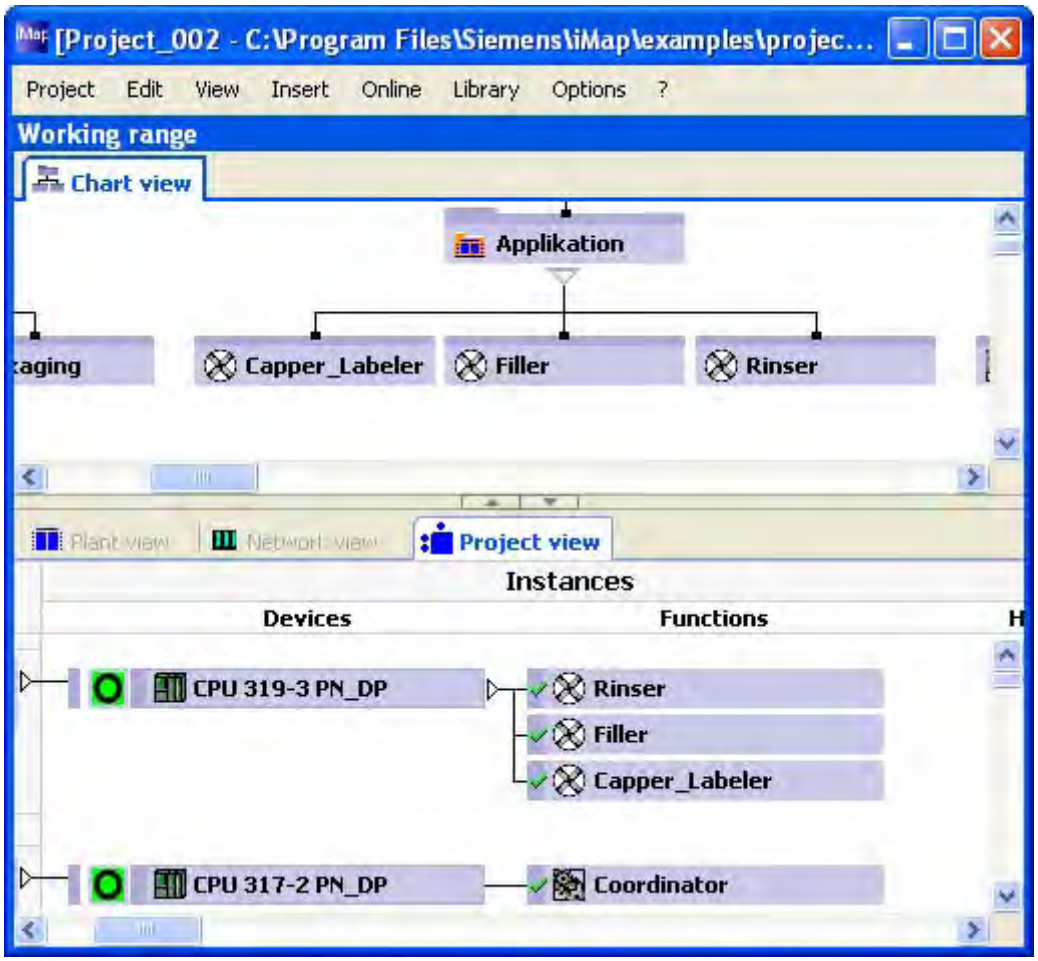
- In the project view: If the project already contians an instance, all function units will be listed in the "Instances, functions" column. Function units assigned to a chart are identified by a check mark, and those without assignment by a vertical dash.

- In the chart view: Select a function unit, then select **Go to > Chart view: All function units**...

  Result: All function units of the instance will be marked in the chart view. This action may change the zoom ratio accordingly. Unused function units are not indictaed in the chart view, but rather in the project view.

Example - Representation of a multifunction component in SIMATIC iMap

The next example shows a multifunction component and its instance in the chart and project views of SIMATIC iMap.



Replacing function units of an instance

Function units of the instances multifunctions components are only replaced if the new PROFINET component represents the product of a revised old component. If so, the interconnections will be included in the transfer to the relevant function units of the new instance (if the connection names and data types are identical.) If not (i.e. no revision), the old fucntion units of the instance will be replaced with the new ones.

New function units are not yet assigned to a chart. Assign the new replacement function units to a chart and interconnect these as requried.

6.3 Singleton components

6.3.1 Properties of singleton components

What are singleton components?

Singleton components are PROFINET components for which the device-specific data is stored and handled separately. The device-specific configuration information and program data is located in the STEP 7 basic project for the PROFINET component, rather than in the common shadow project.

Advantages in use

The use of singleton components has the following advantages:

- Because the device-specific configuration and program data are stored separately, Singleton components in SIMATIC iMap are excluded from certain time-consuming functions such as generation or program downloads, and thus do not affect the processing time of the overall project.
- Singleton components may have default names and addresses. Thus, these properties do not have to be configured for instances of Singleton components in SIMATIC iMap.
- Special hardware configurations with SIMATIC device that were not supported in PROFINET components in the past can now be incorporated into PROFINET communication as Singleton components.
- Singleton multi-function components may contain more than 7 subfunctions. The maximum number of subfunctions depends on the device type.

Separate storage of the singleton components

Singleton components do not have a STEP 7 component project but rather only the STEP 7 basic project (singleton project). For this reason, the following actions in SIMATIC iMap are performed directly in the Singleton project and not through the shadow project: Generation, program downloads and revision of the singleton component. This concept is illustrated in the figure below.

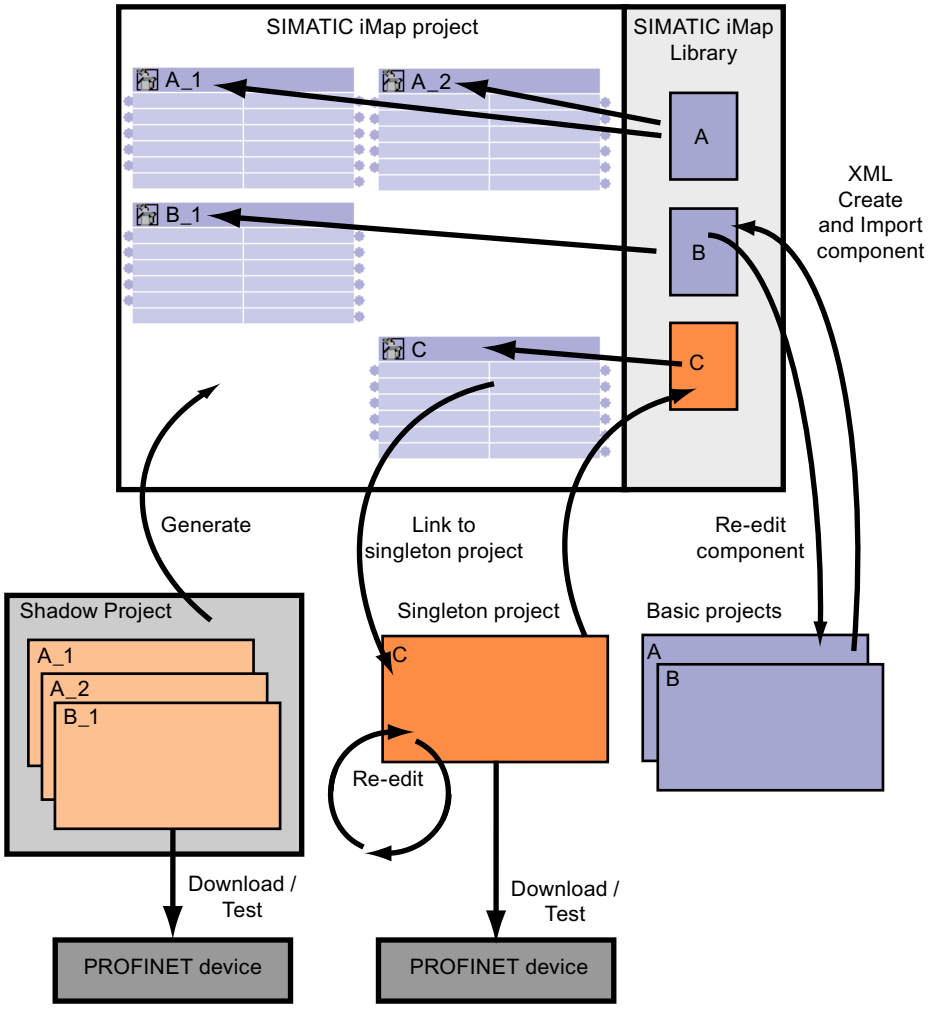


Figure 6-1 Actions in the basic project of the singleton component

Rule

Singleton components can only be created for PROFINET devices without proxy functionality. Thus, singleton components have only one bus connection on the Industrial Ethernet.

Special hardware configurations

The Singleton concept allows special hardware configurations with SIMATIC devices to be incorporated into the PROFINET communication, such as:

- Integration of process diagnostics
- Configurations with function modules (FM)
- Configurations with several central modules (multi-computing)
- Integration of connections to other stations via ISO protocol

6.3.2 Integrating Singleton components in the SIMATIC iMap project

SIMATIC iMap project

You can insert singleton components into a SIMATIC iMap project one or more times depending on the project settings:

How to set the project properties

Select the **Project > Properties** menu command and, in the "Use of singletons" box on the "Special" tab, select the

- Once option if you only want one instance per project, or
- Multiple option if several instances per project are to be permitted.

Editing in SIMATIC iMap

In SIMATIC iMap, you can carry out all the same actions on singleton components as on standard components, with the following exceptions:

- Changing the properties of the instance when more than one instance is permitted in the SIMATIC iMap project. If only one instance is permitted in the project, you cannot change the name and address(es) of the instance.
- Generating and downloading the program

  Instances of the singleton components are neither included when the SIMATIC iMap is generated (**Project > Generate >** menu command), nor in the program download (**Online > Download... > All/Programs only** menu command.)
- Editing in the vendor-specific programming and configuration tool (see below).

Note

If an action is not supported for singleton components, the corresponding menu commands are not available (grayed out). Otherwise a message will appear in the information window or in a separate message window.

Modifying properties

The following properties of the instance cannot be modified for singleton components that may only have one instance in a SIMATIC iMap project:

- Name of the technological function
- Name of the device
- IP address and subnet mask

For the instance, the properties are taken from the basic project of the singleton component. To modify these properties, you will have to recreate the singleton component and insert it into the SIMATIC iMap project, e.g. by replacing the old instance.

Editing in the vendor-specific tool

Use the **Edit > Special >** menu command to directly call up the vendor-specific configuration and programming tool, e.g.SIMATIC Manager, from SIMATIC iMap. Some functions, such as "Diagnose hardware", are not available using the **Edit > Special >** command. These have to be called up from inside the tool.

Notes on editing with STEP 7

The following actions must be carried out directly in the STEP 7 basic project for the singleton component:

- Open the STEP 7 basic project - using the **File > Open** menu command in SIMATIC Manager.
- Modify the hardware configuration - in HW Config
- Modify the S7 program - in the relevant block editor.
- Compile configuration information - in HW Config using the **Station > Save and Compile** menu command.
- Download the program - in SIMATIC Manager using the **Target system > Download station to PG** menu command.
- Look up device-specific diagnostic information - in SIMATIC Manager using the **Target system > Diagnostics/Settings >** menu command.

Note

Notes on the program download

When you create the singleton component from the basic project in STEP 7, the system data blocks (SDB) for PROFINET communication are created as well.

Once you have created the singleton components, you must download the blocks from the program folder to the device. In SIMATIC Manager, this is done using the **Target system > Download station to PG** menu command.

6.4 PROFINET components with HMI units

This section provides an overview of the use of PROFINET components with HMI units in SIMATIC iMap. A detailed description can be found in the user documentation for WinCC Flexible V1.0.

Requirement

You require a PG/PC with at least 1 GB RAM to create PROFINET components with HMI unit and to configure these in SIMATIC iMap.

WinCC Flexible is needed in order to create, configure, generate and download PROFINET components with HMI units.

Creation

PROFINET components with HMI units are created using the WinCC Flexible Component Merger function.

Use in SIMATIC iMap

PROFINET components with HMI units are used just like standard components in SIMATIC iMap. They first have to be imported into a SIMATIC iMap library, and can then be inserted into projects.

The HMI units of a PROFINET component are handled in a special way in SIMATIC iMap:

- Generate - using the **Project > Generate > HMI units** menu command.
- Edit - using the **Edit > Special** menu command.

Representation of HMI units

The properties of the PROFINET component in the library will show whether a PROFINET component has HMI units. The HMI parts are listed on the tab of the "Properties" dialog and on the "HMI" tab in the preview window.

The HMI units of the instances are displayed in the project tree and in the project view (see example in the diagram below).

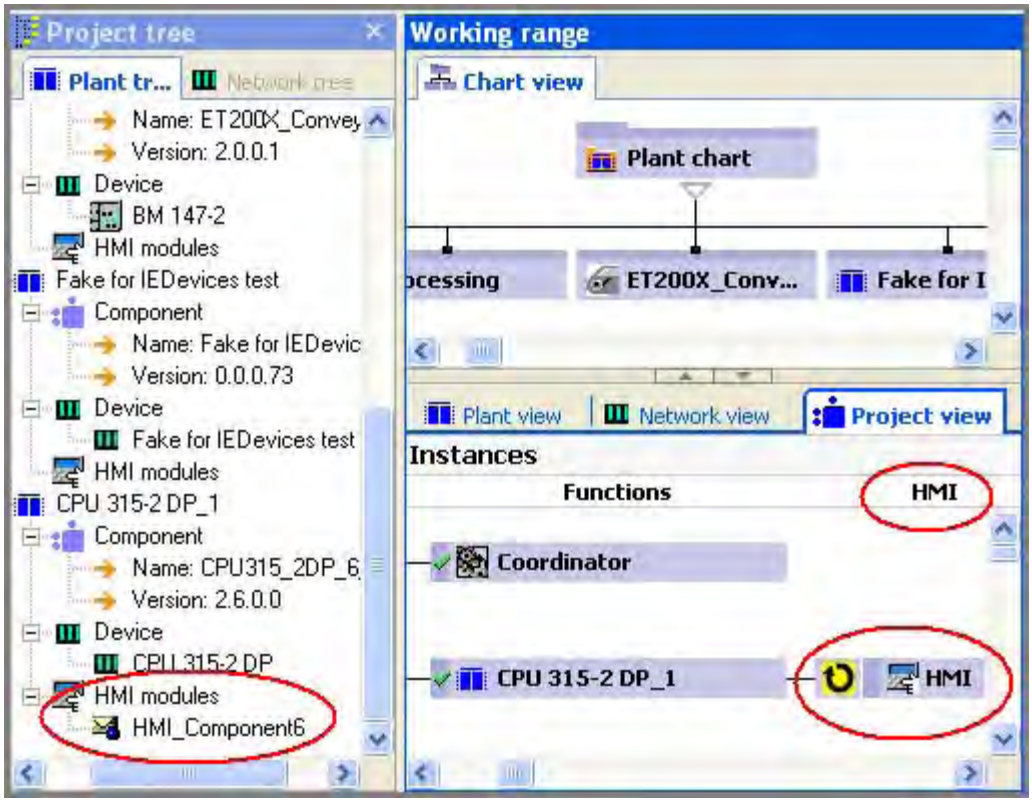


Figure 6-2 Representation of the HMI units in the project view and project tree

How to generate the HMI units of the project

To be able to download the configuration data for the HMI units to the target system, this data must first be generated.

- Changes to the HMI units are generated using the **Generate > HMI units > Changes only** menu command.
- The HMI units of all instances are generated using the **Generate > HMI units > All** menu command.

The generated data is stored in a separate shadow project.

You can then download the configured HMI units.

Note

The link to WinCC Flexible is needed in order to generate and download the configuration data for the HMI units in SIMATIC iMap.

6.5 Off-the-shelf PROFINET components

6.5.1 IE/PB link

IE/PB Link, network transition Industrial Ethernet - PROFIBUS DP

Off-the-shelf PROFINET components

SIMATIC iMap is supplied with off-the-shelf PROFINET components for the IE/PB Link for different transmission speeds.

The off-the-shelf PROFINET components are to be found in the **\Step7\S7CbaCompProj** folder. You will have to import them into a SIMATIC iMap library (**Library > Import Component** menu command) before they can be used in SIMATIC iMap.

Application

The IE/PB Link is a network transition that interconnects the two types of network: Industrial Ethernet (factory level) and PROFIBUS (cell level).

Function in the PROFINET environment

IE/PB Link is a PROFINET device, and is represented accordingly in the SIMATIC iMap net view.

The IE/PB Link acts as a DP master on the PROFIBUS interface. The IE/PB Link provides the connection to coupled PROFIBUS devices for the PROFINET devices connected to the Ethernet. For the coupled PROFIBUS devices, the IE/PB-Link is a DP master with proxy functionality.

Representation in SIMATIC iMap

The PROFINET component of the IE/PB Link has fixed functionality, but has no technological function. The PROFINET component of the IE/PB link is supplied ready for use in the SIMATIC iMap system library. It is not necessary to create a component in STEP 7 for the IE/PB Link.

- Net view in SIMATIC iMap

  In the net view, the IE/PB Link is represented as a component that links the Ethernet and PROFIBUS. The IE/PB Link can be selected and configured from this view.

- Plant view in SIMATIC iMap

  IE/PB Link is neither visible in the plant view, nor can it be instantiated.

Network connectors

The PROFINET components of the IE/PB link have two network connectors:

- a connector to PROFIBUS as the DP master and
- a connector to the Industrial Ethernet

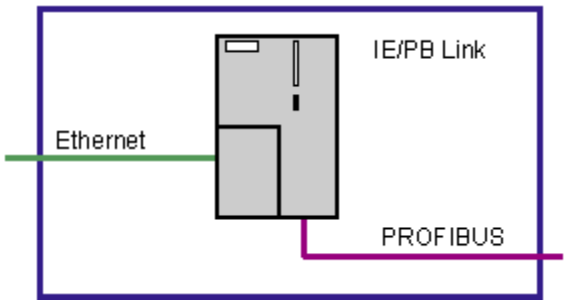


Figure 6-3 Network connectors of the IE/PB link

Special Features

- Range of functions as a DP master

  The IE/PB Link supports operation with DP standard slaves (DP V0). Acyclical services (reading and writing records) are not supported.

- Substitute values for DP slaves under PROFINET

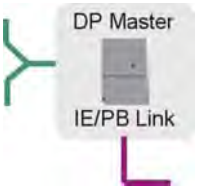
  When it acts as a DP master under PROFINET, the IE/PB Link is configured to apply substitute values.

  If the IE/PB Link detects that a connected (interconnected in PROFINET) DP slave has failed, it sets the inputs interconnected with this DP slave to the substitute value "0".

  Lifestate monitoring allows this PROFINET component to detect if the input values supplied are substitute values.

Example

Table 6-1 PROFINET components of IE/PB Link, representation in SIMATIC iMap

Technological function	PROFINET device
None	

Appendix

A

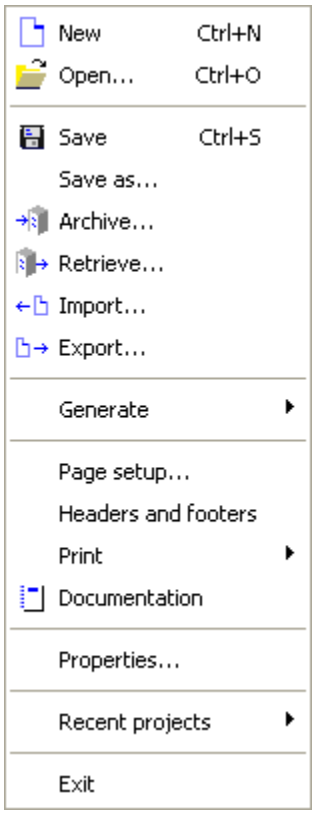
A.1 Menu commands

Overview

Menu commands can be used to create and edit selected objects (e.g.charts, functions and libraries). They are accessed via the menu bar, in the shortcut menu or as an icon on the toolbar.

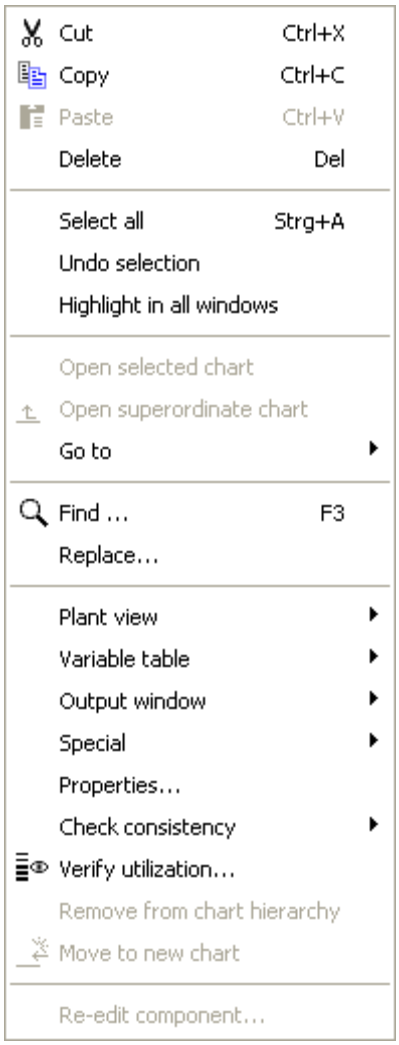
The menus on the menu bar of the SIMATIC iMap user interface are explained briefly below. This description may differ slightly from the actual application, but any differences will be updated in the next version.

Project menu



Menu command	Description
New	Creates a new project. Before it is opened, the currently open project is closed.
Open...	Opens an existing project. Before a new project is opened, the currently open project is automatically closed.
Save	Saves the current project.
Save as...	Saves the current project under a new name.
Archive > Open project	Archives the currently opened project.
Archive > Stored projects	Archives a stored project.
Retrieve...	Retrieves an archived project.
Import...	Imports a project desription to the current project.
Export...	Generates a project descriptoin for the current project.
Generate > Control unit > Changes only	Saves the current project, and generates the delta data of the controller units, i.e. the delat data will be synchronized with the shadow project. This is required in order to use the online functionality (download and diagnostics).
Generate > Control unit > All	Saves the current project, and generates the controller units, i.e. it generates the shadow project based on the PROFINET components of the library.
Generate > HMI units > Changes only	Saves the current project and generates the changes to the HMI units.
Generate > HMI components > All new"	Saves the current project and generates new HMI units
Page setup...	Defines the page margins and other layout options.
Headers and footers...	Displays the settings for the header and footer of a printout.
Print > Active view...	Prints the current view
Print > All views...	Prints the network view and all charts in the plant view.
Documentation...	Creates the documentation for the current project.
Properties...	Opens a dialog box that shows the project properties. There, you can define the security level and a password for the project, including the general transfer properties of the interconnections with remote partners.
Recent projects	Lists the recently opened projects.
Exit	Exits SIMATIC iMap. If the edited project has not yet been saved, you are prompted to save it.

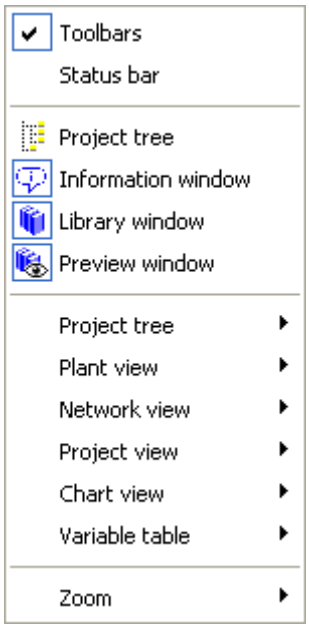
Edit menu



Menu command	Description
Cut	Deletes selected objects from the project and copies these to the clipboard.
Copy	Copies the highlighted objects to the clipboard.
Paste	Inserts the clipboard contents.
Deleting	Deletes selected objects from the project.
Select all	Highlights all the objects in the current window.
Undo selection	Deselects the selected objects.
Select in all Windows	Transfers the current selection to all other windows.
Open selected chart	Opens the selected chart.
Open parent chart	Opens the chart one level up.
Go to > <view/window/tree>	Lets you navigate between windows and views.
Go to > Chart view All function units	Marks all function units of the instance in the chart view.

Menu command	Description
Go to > Chart view Interconnected functions	Marks all functions in the chart view which are interconnected with selected functions.
Find...	Searches for objects in the project.
Replace...	Replaces selected instances with the instances of a target component.
Plant view > In chart interface	Transfers the selected connections to the chart interface.
Plant view > Interconnect constants	Sets a constant value at the input.
Plant view > Interconnect externally	Interconnects the input with an external output.
Plant view > Move interconnections	Moves the interconnections of technological functions
Plant view > Select connections > All	Selects all the connections of the complete chart or of the selected functions.
Plant view > Select connections > Not interconnected	Selects all the connections that are not interconnected of the complete chart or of the selected functions.
Plant view > Select connections > Interconnected	Selects all the interconnected connections of the complete chart or of the selected functions.
Plant view > Select interconnections	Selects all interconnections, or interconnections with specific properties.
Plant view > Highlight interconnections	Highlights all interconnections which are assigned the selected properties in the open chart, for example, acyclic mode at slow scan rate.
Variable table > Deactivate	Deactivates monitoring of the selected tags.
Variable table > Reactivate	Reactivates monitoring of the selected tags.
Variable table > Delete control value	Deletes the selected control values from the variable table
Variable table > Complete structure	Lists all the structure elements up to the selected connection.
Output window > Copy all	Copies all the messages in text format to the clipboard.
Output window > Delete all	Deletes all messages from the output window.
Special >	Calls up functions or dialogs associated with the vendor-specific programming / configuration tool, e.g. SIMATIC Manager, module status.
Properties...	Displays the properties of the selected object.
Check consistency > Generated project > All instances	Compares the shadow project with the component project of all instances.
Check consistency > Generated project > Selected instances	Compares the shadow project with the component project of selected instances.
Check consistency > Runtime versions	The system checks whether the PROFINET devices with proxy functionality and the connected PROFIBUS devices are compatible with the PROFINET runtime versions.
Check the utilization	Compares configuration requirements with the performance parameters of selected devices.
Remove from chart hierarchy	Removes selected objects from the chart hierarchie, and deletes their interconnections.
Move to new chart	Adds a chart to the project and moves selected objects to this chart.
Re-edit component...	Defines where the copy of the component project is to be stored. Opens SIMATIC Manager in order to re-edit the PROFINET component.

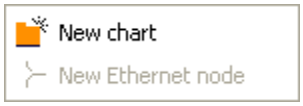
View menu



Menu commands	Description
Toolbars	Shows or hides the toolbar.
Status Bar	Shows or hides the status bar.
Project tree	Shows/hides the window with the plant and net tree.
Diagnostics window	Shows or hides the diagnostic window.
Information window	Shows or hides the information window.
Library window	Shows or hides the library window.
Preview	Shows or hides the component preview window.
Project tree > Plant tree >	Shows auxiliary data of the functions, such as integrated devices, the component type, or HMI modules.
Project tree > Net tree >	Shows auxiliary data of the functions, such as integrated functions, the component type, or HMI modules, or the bus system.
Project tree > Show layers	Shows all nested layers of selected objects.
Project tree > Hide levels	Hide all nested layers of selected objects.
Plant view > Recalculate interconnection lines	Refreshes the interconnection lines.
Plant view > Display interconnection lines	Shows or hides the interconnection lines.
Plant view > Dot screen	Shows or hides the dot screen in the plant view.
Plant view >Page margins	Hides or shows the page margins of the printed copy.
Network view > Page margins	Hides or shows the page margins of the printed copy.
Project view > Show instances	Shows all instances of the component type.
Project view > Hide instances	Hides all instances of the component type.
Project view > Page margins	Hides or shows the page margins of the printed copy.
Project view > Show header	Hides or shows the header in the project view.

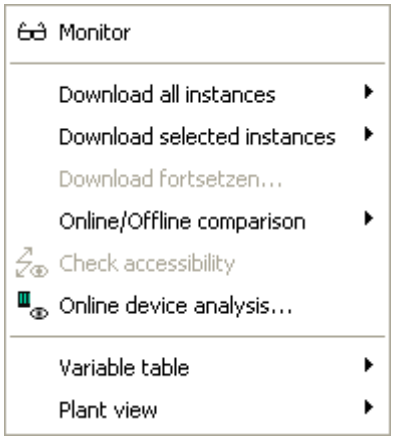
Menu commands	Description
Chart view > Show all layers	Shows all nested layers of selected charts.
Chart view > Hide all layers	Hides all nested layers of selected charts.
Chart view > Page margins	Hides or shows the page margins of the printed copy.
Variable table >	Shows / hides the columns of the variable table.
Zoom >	Allows you to change the size of the view of the projects in the plant view, project view or network view.

Insert menu



Menu commands	Description
New chart	Inserts a new chart into the project and moves selected objects into this chart, if necessary.
New Ethernet node	Inserts a new Ethernet node.

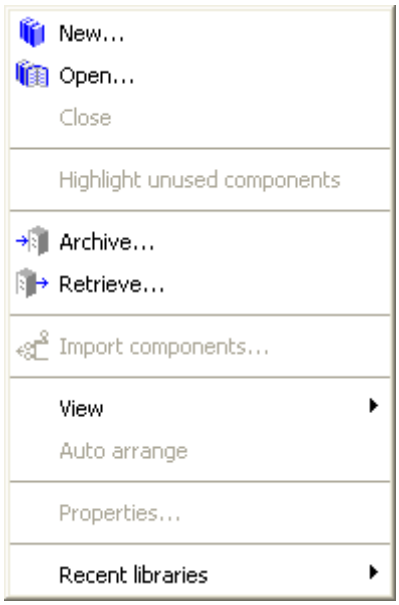
Online menu



Menu commands	Description
Monitor	Activates / deactivates the online connection between SIMATIC iMap and the devices of the plant. Activating the online connection does not result in a download. "Monitor" must be activated for the diagnostics.
Download all Instances > All	Downloads the interconnections and programs to all the devices of the plant.
Download all Instances > Program only	Downloads all programs, or only the delta data to the devices of the plant.
Download all Instances > Interconnections only	Downloads the interconnections to all the devices of the plant.

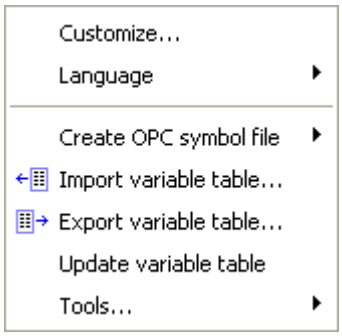
Menu commands	Description
Download selected instances > All	Downloads the programs and interconnections to the selected devices.
Download selected instances > Program only	Downloads all programs, or only the delta data to selected devices of the plant.
Download selected instances > Interconnections only	Downloads only the interconnections to the selected devices.
Continue download	Opens the Download dialog box with the list of devices saved last.
Online/Offline comparison > All	Runs an online-offline comparison for the programs and interconnections of the selected devices. The results are output to the output window.
Online/Offline comparison > Programs only	Runs an online-offline comparison for the programs of the selected objects. The results are output to the output window.
Online/Offline comparison > Interconnections only	Runs an online-offline comparison for the interconnections of the selected objects. The results are output to the output window.
Check accessibility	Checks the availability of selected devices and outputs the results to the output window.
Online device analysis...	Returns online device information for an IP address as an HTML file.
Variable table > Monitor all tags	Activates online monitoring with the variable table. The result appears in the diagnostic window.
Variable table > Monitor selected tags	Activates online monitoring of the selected tags. The result appears in the diagnostic window.
Variable table > Stop monitoring selected tags	Deactivates online monitoring of the selected tags.
Variable table > Transfer selected control values	Transfers the control values of the selected tags to the plant.
Variable table > Copy online value	Copies the online value of the select tags to the clipboard. The value can be entered as a control value, for example, via the **Paste** shortcut menu.
Plant view > Display online values	Shows / hides the current values of the selected connections.
Plant view > Set online values	Changes the current value of the selected connection.

Library menu



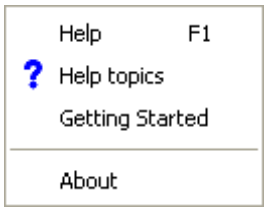
Menu commands	Description
New...	Opens a dialog box where you can create a new shared library, for example, for a project or new actions.
Open...	Opens a dialog box where you can select a shared library.
Close	Closes the active shared library.
Select components that are not used	Selects all the components of the project library that are not used.
Archive...	Opens a dialog box where you can backup a shared library.
Retrieve...	Opens a dialog box where you can select an archived shared library.
Import components...	Imports an existing PROFINET component from a folder to a library.
View >	Changes the view of the PROFINET components in the selected library.
Auto arrange	Automatically arranges the representation in the library window.
Properties...	Opens the properties dialog box for the selected library.
Recent libraries	Opens a list of recently opened shared libraries.

Options menu



Menu commands	Description
Customize ...	Modifies the customize general tab in SIMATIC iMap.
Language >	Changes the language of the SIMATIC iMap user interface.
Create OPC Symbol File >	Creates an OPC symbol file for the entire project.
Import variable table...	Imports a saved variable table into the diagnostic window.
Export variable table...	Saves a variable table as a cbv file.
Update variable table	Updates the variable table view.
Tools...	Opens the programs that are defined under "Settings".

menu



Menu commands	Description
Help F1	Opens the online help for the current window
Help Topics	Opens the online help for "Component Based Automation and SIMATIC iMap".
Getting Started	Opens the introduction to SIMATIC iMap.
About	Provides information on the current software version and copyright.

A.2 Toolbar

Toolbar buttons

The toolbar buttons are designed in particular for working in SIMATIC iMap. They correspond with the following menu commands:

Table A-1 Buttons the SIMATIC iMap toolbar

Icon	Description	Menu command
	New project	Project > New
	Open Project	Project > Open...
	Save project	Project > Save
	Generating the Project	Project > Generate >Control unit > Deltas only
	Print	Project > Print > All Charts
	Cut	Edit > Cut
	Copy	Edit > Copy
	Paste	Edit > Paste
	Open parent chart	Edit > Open parent chart
	Insert chart	Insert > New chart
	Move to new chart	Edit > Move to new chart
	Interconnection lines on/off	View > Plant view > Display Interconnection Lines
	Online monitoring	Online > Monitor
	Monitor variables online	Online > Variable table > Monitor all variables
	Transfer control value	Online > Variable table > Transfer control value

Icon	Description	Menu command
	Open Help	Help > Help Topics
	Project view	View > Project view
	Information window	View > Information window
	Library window	View > Library window
	Preview	View > Preview
	Zoom in	View > Zoom > Zoom in
	Zoom out	View > Zoom > Zoom out
	Entire content	View > Zoom > Entire content
	Normal	View > Zoom > 100%
	Previous	View > Zoom > Previous

A.3 Actions

Which actions do you want to carry out?

The table below lists actions supported in SIMATIC iMap, including a description of how and when you can perform such actions. The corresponding objects are listed in alphabetical order.

Objects to be processed usually have to be selected.

Table A-2 Actions in SIMATIC iMap

Which object?	Which action?	In which window?	How?
Addresses	Assign	Plant view, network view, project view, project tree	Edit > Properties > Addresses tab
Plant	Arrange	Chart view	Arranging the charts and functions layout using drag-and-drop
Connections	Show and hide	Plant view	Click the connection and hide/show it with right-click.
Utilization	Check	Network view	Edit > Check utilization
Library	create	Library	Library > New
	Archive		Library > Archive

Which object?	Which action?	In which window?	How?
	Retrieve		Library > Retrieve
	Close	Library	Library > Close
	Open	Library	Library > Open
Library window	Display	SIMATIC iMap	View > Library window.
Diagnostics window	Display	SIMATIC iMap	View > Diagnostic window
Download	Run	SIMATIC iMap	Online > Download...
Documentation of PROFINET components	Open	Preview	Info tab > Documentation
Documentation for SIMATIC iMap	Open	Desktop	Start / Programs / Component Based Automation / Documentation
Inputs / Outputs	interconnecting	Plant view	Click the input to interconnect, and then click the corresponding output.
Properties	Monitor / modify	Plant view, network view, project view, project tree	Edit > Properties... Project > Properties
Error	diagnosing	Diagnostics window	Online > Monitor
Information window	Display		View > Information window
Instance	replacing	Plant view, network view, project view, project tree	Edit > Replace
Internal PROFINET IO and Industrial Ethernet devices	Configuring	Plant view, network view, project view, project tree	Edit > Properties
IP address	Assign	Plant view, network view, project view, project tree	Edit > Properties > Addresses tab
Consistency of the generated project	Check	Plant view, network view	Edit > Check consistency > Generated project
Check consistency of runtime versions	Check	Plant view, network view	Edit > Check consistency > Runtime versions
Multifunction component	Insert in project	Library	Drag and drop Edit > Paste
Chart	Print	Network view	Project > Print
	zoom	Network view	View > Zoom
Nested chart	Creating	Plant view	Insert > New chart
Online device analysis	Run	SIMATIC iMap	Online > Online device analysis
Online value	Display	Plant view	Online > Monitor Online > Plant view > Show online value
	set	Plant view / Variable table	Select connection Online > Plant view > Set Online Values
	copy	Variable table	Online > Variable table > Copy online value
	Paste	Variable table	Edit > Paste
PROFIBUS address	Assign	Plant view, network view, project view, project tree	Edit > Properties > Addresses tab
PROFINET component	Import to a library	Library	Library > Import components

Which object?	Which action?	In which window?	How?
	Insert in project	Library	Drag and drop Edit > Paste
	Create	SIMATIC Manager	Edit > Create PROFINET component
	Rename	Library	Not supported
	re-edit	Library, Project view	Edit > Re-edit component...
	Move	From library to library	Drag and drop Edit > Copy / Edit > Paste
Project	Archive	SIMATIC iMap	Project > Archive
	Retrieve		Project > Retrieve
	documenting		Project > Document
	Print		Project > Print (Keyboard: Ctrl + P)
	Export		Project > Export
	Generate		Project > Generate
	Import		Project > Import
	Open		Project > Open (Keyboard: Ctrl + O)
	Save		Project > Save / Project > Save as (Keyboard: Ctrl + S)
	Deleting	Windows Explorer	Del key
Project tree	Display	SIMATIC iMap	View > Project tree
Technological function	Rename	All views	Edit > Properties > General tab
Variable table	Display	SIMATIC iMap	View > Diagnostic window > Variable table tab
	Monitor	SIMATIC iMap	Online > Variable table > Monitor variables
	Import / Export	SIMATIC iMap	Options > Import / Export variable table
Interconnections	Create	Plant view	Click the input to interconnect, and then click the corresponding output.
	Highlight	Plant view	Click the interconnection and highlight it with right-click.
	Deleting	Plant view	Highlight the line, the press DEL.
	Insert in all projects		Click the entry, then select right-click > External interconnection
	Move	Plant view	Select connection Edit > Plant view > Move Interconnections Left-click the new connection
Preview	Display	SIMATIC iMap	If the library is open: View > Preview
Tools	Paste	SIMATIC iMap	Options > Customize > Tools tab
	use	SIMATIC iMap	Options > Tools...

Note

Overview of the most important actions

This table shows a list which is restricted to the most important actions and corresponding objects.

A.4 Naming conventions

A.4.1 Naming conventions in SIMATIC iMap

Naming conventions in SIMATIC iMap

Naming rules:

File and folder names

A file or folder name may not contain any of the following characters:
\ / : ?" * < > |

Project names

Same as file names, but also not allowed are: , ;=

Library names

Same as file names.

Object names

The following naming conventions apply to SIMATIC iMap projects, libraries, technological functions, devices and charts.

- The names may not be blank.
- Space characters are not allowed as first and last characters of the name.

Additional conventions for names of technological functions, devices, charts, PN IO system names, and Ethernet branches

- Name length: The maximum length of the object names of technological functions and devices is defined in the PROFINET component. Object names of charts and Ethernet nodes may have a maximum length of 32 characters in SIMATIC iMap.
- Unambiguousness: The names of functions, devices, charts, Ethernet branches and PN IO systems must be unique within their category in an iMap project. No distinction is made between upper and lower case.
- Legal characters All characters of the ISO 8859-1 (ISO-Latin-1, corresponds with UNICODE Codes 1-255) font, except the illegal characters.
- Illegal characters: All non-printable characters (code 0 to 31, and 127 to 159 to ISO 8859-1, including the exclamation mark (!, code 33.)
- Additional illegal characters for devices and technological functions in PROFINET components created in STEP 7:

Code	(appearance, English Unicode name)
34	(",QUOTATION MARK)
38	(&, AMPERSAND)
42	(*, ASTERISK)
43	(+, PLUS SIGN)
44	(,, COMMA)
46	(., FULL STOP)
47	(/, SOLIDUS)
96	(`, GRAVE ACCENT)
124	(|, VERTICAL LINE)
180	(´ ACUTE ACCENT)

Those restriction do not apply to Singleton components.

Additional conventions for PN IO system names

The name of a PN IO system consists of one or more parts separated by dots. Each part consists of 1 to 63 characters and may only consist of characters, digits and the minus sign (-). Special characters, such as umlauts, ß and characters accent are not permitted.

Each name part must start with a character and may not end with a minus sign.

The total character length is limited to 240 characters.

Examples - invalid PN IO system names:

name_1.x	Underscore is forbidden
name..y	Two succeeding dots (would correspond to a number part having the length 0)
Name.-xyz	Name part begins with a -
name.xyz-	Name part ends with a -
name.1a	Name part begins with a digit

Examples - valid PN IO system names:

name.abc-123.xyz	Each name part begins with a character, the minus sign is located within the name part
a	Shortest possible system name, one name part consisting of one character (has to be a character)

A.4.2 Naming conventions for PROFINET components

Naming conventions for PROFINET components

Naming conventions to be observed:

File and folder names

A file or folder name may not contain any of the following characters: \ / : ?" * < > |

Names of PROFINET components, technological functions and devices

- The names may not be blank.
- Space characters are not allowed as first and last characters of the name.
- Name length: The names may not exceed a length of 24 characters.
- All printable characters from ISO 8859-1 (ISO Latin 1) are allowed except the following characters:

Characters	English Unicode Name
!	EXCLAMATION MARK
"	QUOTATION MARK
&	AMPERSAND
*	ASTERISK
+	PLUS SIGN
,	COMMA

Characters	English Unicode Name
.	FULL STOP (= PERIOD)
/	SOLIDUS (= SLASH)
:	COLON
;	SEMICOLON
<	LESS-THAN SIGN
=	EQUALS SIGN
>	GREATER-THAN SIGN
?	QUESTION MARK
[	LEFT SQUARE BRACKET(= OPENING SQUARE BRACKET)
\	REVERSE SOLIDUS (= BACKSLASH)
]	RIGHT SQUARE BRACKET (= CLOSING SQUARE BRACKET)
^	CIRCUMFLEX ACCENT
`	GRAVE ACCENT
|	VERTICAL LINE (= VERTICAL BAR)
´	ACUTE ACCENT

Note

The € character is not allowed because it is not included in the ISO Latin 1 set.

Connector names

- Characters allowed in connector names (to ISO 10646-1):

  Letters A to Z and a to z, digits 0 to 9, and the underscore character "_".
- The first characters of a connector name must be a letter (not underscore or a number.) Connectors with names beginning with an underscore cannot be assigned a PROFINET CBA characteristic, such as "Connectable".
- The length of a connector name may not exceed 24 characters.

A.5 File types

Overview of the file types in SIMATIC iMap

The following table shows the file name extensions for the file types used in SIMATIC iMap.

File type	Extension	Created with the menu command...*	In ...
Project	CBP	**Project > Save** or **Project > Save As**	the project folder of the same name
Library	CBL	**Library > New** or **Library > Create New Library**	the library folder of the same name
Project library	CPL	is automatically created and opened with the project	the \projlib subfolder of the project folder
Archived project	ARP	**Project > Archive**	any folder in the file system
Archived library	ARL	**Library > Archive**	any folder in the file system
PROFINET components	XML	**Edit > Create PROFINET component** in the device-specific configuration and programming tool, e.g. STEP 7	the component folder - in the file system or - in a library
Variable table	CBV	**Options > Export Variable table**	any folder in the file system
Project documentation	HTML	**Project > Document**	any folder in the file system
Online device analysis information	HTML	**Online > Online device analysis**	any folder in the file system
OPC symbol file	STI	**Options > Create OPC symbol file**	any folder in the file system
Project description	CBI	**Project > Import**	any folder in the file system

Note

In SIMATIC iMap you can use the menu command **Options > Customize**, "Folder" tab, to define a folder for every file type that will always be suggested when you create, save and select this file type.

* Menu command in SIMATIC iMap, unless otherwise specified.

A.6 Data types of connectors

Data types, data lengths and ranges of values for connections

A PROFINET data type conforming to Microsoft© OLE 2.0 is assigned to every S7 data type. The following table show the permissible S7 data types for PROFINET CBA and the corresponding PROFINET data types as well as the data lengths and value ranges.

Table A-3 Data types for PROFINET CBA

PROFINET data type	S7 data type	Data length in bytes	Range of values
BOOL	BOOL	2	TRUE / FALSE
I1	CHAR	1	-128 to +127
UI1	BYTE	1	0 to 255
R4	REAL	4	-3.402823 E+38 to -1.175495 E-38 0 1.175495 E-38 to +3.402823 E+38
I2	INT	2	-32.768 to +32.767
UI2	WORD	2	0 to 65.535
I4	DINT	4	- 2.147.483.648 to +2.147.483.647
UI4	DWORD	4	0 to 4.294.967.295
DATE	DT (DATE_AND_TIME)	8	01.01.1900 00:00:00 to 31.12.9999 00:00:00*)
BSTR	STRING	4 + 2 * number of characters	Character string
ARRAY	ARRAY	Number * data type length	Multidimensional, from the data types listed here**)
STRUCT	STRUCT or UDT	Sum of the data type lengths	Combined from the data types listed here**)

*) There may be restrictions in the range of values, depending on the type of device e.g. for SIMATIC devices this would be: 01.01.1990 00:00:00 to 31.12.2089 23:59:59.

**) Maximum of 6 dimensions. The maximum length depends on the amount of memory in the device

***) Maximum 8-level structures. The maximum length depends on the amount of memory in the device.

Data types supported in PROFINET runtime version V2.0.0.0 or later

The following data types are supported by PROFINET devices in runtime version V2.0.0.0 or later:

- Data type STRUCT with all simple data types, including STRING
- Data type ARRAY with the data types BOOL, REAL, DATE_AND_TIME, STRING
- User-defined data types (UDT) with all simple data types, including STRING

Earlier Runtime versions do not support these data types.

Data types supported in PROFINET runtime Version V2.3.0.0 or higher

The following data types are supported by PROFINET devices in runtime version V2.3.0.0 or higher:

- STRUCT/UDT data type with all the data types listed above
- ARRAY data type, multidimensional, with all the data types listed above

Earlier Runtime versions do not support these data types.

Abbreviations

B

Abbreviations

Abbreviation	Explanation
CBA	**C**component **B**ased **A**utomation
COM	**C**omponent **O**bject **M**odel
DCOM	**D**istributed **C**component **O**bject **M**odel
HMI	**H**uman **M**achine **I**nterface
IE	**I**ndustrial **E**thernet
IRT	**I**sochronous **R**ealtme
MES	**M**anufacturing **E**ngineering **S**ystem
MAC	**M**edium **A**ccess **C**ontrol
OLE	**O**bject **L**inking and **E**mbedding
OPC	**O**LE for **P**rocess **C**ontrol
PB	**P**ROFIBUS
PCD	**P**ROFINET **C**component **D**escription
UDT	**U**ser-defined **D**ata **T**ype
PN	**P**ROFI**N**et
QoS	**Q**uality **o**f **S**ervice
TIA	**T**otally **I**ntegrated **A**utomation
UNC	**U**niform **N**aming **C**onvention
URL	**U**niform **R**esource **L**ocator
XML	E**X**tended **M**arkup **L**anguage

Technical Support SIMATIC

C

C.1 SIMATIC Technical Support

SIMATIC Technical Support

You can contact Technical Support for all A&D products:

- via the Internet using the **Support Request:**
  http://www.siemens.com/automation/support-request
- E-mail: adsupport@siemens.com
- Phone: +49 (0) 180 5050 222
- Fax: +49 (0) 180 5050 223

Further information about our technical support is available in the Internet at www.siemens.com/automation/service

Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base online on the Internet at:

http://www.siemens.com/automation/service&support

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- Our newsletter, providing you with the latest information about your products.
- A Knowledge Manager to find the right documents for you.
- Our bulletin board, where users and specialists share their knowledge worldwide.
- your local contact partner for Automation & Drives in our Partner Database
- Information about field service, repairs, spare parts and lots more under "Services"

Additional Support

Please contact your local Siemens representative and offices if you have any questions about the products described in this manual and do not find the right answers.

Find your contact partner at:

http://www.siemens.com/automation/partner

A signpost to the documentation of the various SIMATIC products and systems is available at:

http://www.siemens.de/simatic-tech-doku-portal

Training center

SIEMENS offers a range of courses to help you to get started with your S7-300 Automation System. Please contact your local Training Center, or the Central Training Center in Nuremberg, D -90327 Germany.

Phone: +49 (911) 895-3200

http://www.sitrain.com

See also

Preface (Page 3)

Glossary

Basic project

Project folder in the manufacturer-specific configuration tool which is used to create a PROFINET component. Example: STEP 7 basic project

Chart

In SIMATIC iMap: Folder which contains the technological functions and their interconnections. The chart is used to structure the plant. We distinguish between the plant chart and nested charts.

Chart interface

The chart interface of a nested chart contains the IO of its technological functions which can be interconnected beyond the chart boundaries.

Chart view

In SIMATIC iMap: representation of the chart hierarchy of the plant, including all function instances and charts.

Chart, nested

In SIMATIC iMap: a nested chart may be located on any lower level in the plant view's hierarchy. It may contain technological functions and further nested charts.

Component Based Automation

→ *PROFINET CBA*

Component project

Contains manufacturer-specific project data of the PROFINET component, for example, as STEP 7 project.

Continuation connector

Graphical representation of the end point of an interconnection. SIMATIC iMap represents interconnections in the form of lines or continuation connectors.

Device

Within the context of PROFINET, "device" is the generic term for:

- Automation systems (e.g. PLC, PC)
- Field devices (for example, PLC, PC, hydraulic devices, pneumatic devices), and
- active network components (e.g. switches, gateways, routers)

In PROFINET CBA: part of the PROFINET component that contains the hardware-specific data for that component.

In SIMATIC iMap, a device is considered the software representation of the physical device for which the PROFINET component was created. It is represented in the network view of SIMATIC iMap as an object with one or several bus connections.

The main feature of a device is that it is integrated into the PROFINET communication via Industrial Ethernet or PROFIBUS. We differentiate between the following types of devices based on their bus connectors:

- PROFINET devices
- PROFIBUS devices

Device instance

→ *Instance*

fixed functionality

→ *Functionality, fixed*

Function instance

→ *Instance*

Functionality, fixed

A PROFINET component with fixed functionality does not contain an inherent user program.

Functionality, programmable

A PROFINET component with programmable functionality contains an integrated user program.

Instance

The instance of a PROFINET component represents the use of a component type in a SIMATIC iMap project. The instance comprises the function and device instances.

Interconnection

General: Logic link of data between two objects.

In SIMATIC iMap: Logical link between two technological functions. An output is always connected to an input of the same data type. SIMATIC iMap represents interconnections in the form of lines or continuation connectors.

Interconnections with local communication partners

Interconnections with local communication partners are:

Interconnections between two PROFIBUS devices on the same PROFIBUS

Interconnections between a PROFIBUS device and the associated PROFINET device with proxy functionality

Interconnections with remote communication partners

Interconnections with remote communication partners are routed across Industrial Ethernet.

Interface DB

Component Based Automation Data block in STEP 7 which describes the IO of the technological function.

Library

In SIMATIC iMap: Folder which contains reusable PROFINET component types. There are two types: the project library, and the shared library.

MAC address

Each PROFINET device is assigned a worldwide unique device identifier in the factory.

This device ID has a length of six byte and represents the MAC address (MAC = Medium Access Control.) The MAC address consists of:

- 3 bytes for the manufacturer ID, and
- 3 bytes for the device ID (consecutive number).

The MAC address is usually printed on the front panel of the device.

For example: 08-00-06-6B-80-C0

Multi-function component

The technological interface of a multi-function component is divided in several part functions. The part functions form the technological function of the component type.

nested chart

→ *Chart, nested*

Network view

Representation of devices and networks (Ethernet, PROFIBUS) in SIMATIC iMap.

PCD

→ *PROFINET Component Description*

Plant chart

In SIMATIC iMap: the plant chart represents the highest layer in the hierarchy of the plant view. It contains all technological functions, the nested charts and their interconnections

Plant view

Representation of technological functions of the automation system and their interconnections in SIMATIC iMap. The plant view shows one chart.

PROFIBUS device

In PROFINET CBA: A PROFIBUS device has just one PROFIBUS connector and is always a slave. It can not directly participate in PROFINET communication, and must be integrated using a PROFIBUS device with proxy functionality.

PROFINET

PROFINET is the open Industrial Ethernet standard for automation.

The PROFINET standard defines a manufacturer-independent communication and engineering model. PROFINET is implemented within the TIA framework based on two automation concepts:

- PROFINET IO - for communication between a PROFINET IO controller and PROFINET IO devices.
- PROFINET CBA.(Component Based Automation) - for machine-to-machine communication (between PLCs and intelligent field devices.)

PROFINET CBA

PROFINET CBA represents an automation concept in modular systems engineering, based on ready-to-use components. PROFINET CBA incorporates the communication between the PLC and intelligent field devices (machine-to-machine communication) at unit level.

PROFINET component

Software representation of a technological module with defined functionality. An automation system consists of several PROFINET components.

A PROFINET component always comprises one or several technological functions and the corresponding device.

PROFINET Component Description

The PROFINET component description refers to components you have generated in the engineering system (for example STEP 7.) The PCD is an XML file that you can import into SIMATIC iMap so that you can configure the PROFINET CBA communication.

PROFINET controllers

Controller which may be a PROFINET component (CBA) and also supports PROFINET IO.

PROFINET device

A PROFINET device always has at least one Industrial Ethernet port. A PROFINET device may feature one or several PROFIBUS connectors, and thus act as a master with proxy functionality.

PROFINET device with proxy functionality

The PROFINET device with proxy functionality is a proxy for PROFIBUS devices on Industrial Ethernet. The proxy functionality allows a PROFIBUS device to communicate with all participants in the PROFINET communication, as well as with its DP master.

A device featuring only a local (internal) PROFBUS represents a DP master to the local DP slaves.

programmable functionality

→ *Functionality, programmable*

Project library

Element of a SIMATIC iMap project which is automatically opened, closed, archived or retrieved alongside with the project file. The project library contains all PROFINET components whose instances reside in the project.

Project tree

In SIMATIC iMap: hierarchic representation of the SIMATIC iMap project. The representation comprises two elements:

- the plant tree, which contains the technological functions. This element can be structured in a hierarchy using nested charts. The plant element always contains the plant chart and may contain any number of nested chart levels.

- the network tree, which contains the devices. The tree represents a hierarch view of the slaves connected to a PROFIBUS master.

Project view

Representation and assignment between PROFINET components and their instances in a SIMATIC iMap project.

Proxy functionality

see PROFINET device with proxy functionality

Proxy system

Consists of a PROFINET device with proxy functionality all all its connected PROFIBUS devices

Scan rate

In acyclic transfer mode, the scan rate represents the interval between two successive checks for changes in data on provider side, for example, 200 ms. The scan interval is usually equivalent to the maximum time expiring prior to the transfer of deltas.

Shadow project

Folder to which manufacturer-specific project data are saved when configuration data are generated in SIMATIC iMap.

Shared library

Library the SIMATIC iMap user can open, close, archive and retrieve from an archive. A shared library contains PROFINET components which can be used in several projects.

SIMATIC iMap

PROFINET CBA engineering tool for the configuration, commissioning, and monitoring of modular distributed automation systems. It is based on the PROFINET standard.

SIMATIC iMap STEP 7 AddOn

Optional software for SIMATIC iMap integration in STEP 7.

Singleton component

In SIMATIC iMap, the device-specific configuration and programming data of a PROFINET component which are retained and edited in the STEP 7 basic project, rather than in the common shadow project. This component type allows you to incorporate hardware configurations with SIMATIC devices that were previously not supported into PROFINET communication.

Technological function

General: Task or partial task within a technological process, such as measuring, motor control, positioning. A technological function can be implemented by hardware, for example an FM, or by software, for example, a loop control block.

Component Based Automation The technological functions of a PROFINET component comprise the application-specific functionality of an automation or field device, and the technological interfaces for the communication with other PROFINET components.

A technological function is visualized in the plant view of SIMATIC iMap as block with IO.

Transfer rate

In cyclic transfer mode, the transfer rate represents the interval between two successive transfers of a parameter, for example, 100 ms.

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