SIEMENS

SIMATIC

Process Control System PCS 7 Service support and diagnostics (V8.1)

Service Manual

Valid for PCS 7 as of V8.1

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Legal information

Warning notice system

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

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

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Purpose of this documentation

This documentation contains information to support you in the following:

- Performing steps to ensure the availability of a PCS 7 system
- Verifying requirements for effective diagnostics for your PCS 7 system
- Understanding the alarm concept of a PCS 7 system
- Responding appropriately to faults and preparing detailed information about the state of the PCS 7 system for service experts
- Selecting the correct diagnostic tool, enabling you to perform diagnostics on your PCS 7 system with the help provided

Disclaimer of liability

WARNING

Siemens assumes no liability for improper use of the instructions provided in this documentation or for any consequences that might result for the customer.

- Only trained service employees should be authorized to work on the process control system.
- Always observe the plant-specific rules and government regulations when making changes to your system.
- Observe the plant-specific boundary conditions and adjust the work accordingly.
- Always bear in mind that changes in a system can impact other sections of the system.

Target Audience of this Documentation

This documentation is intended for use by the following trained service personnel (Service Level 1):

- PCS 7 users
- SIMATIC S7 specialists

Options for accessing PCS 7 documentation

You can find the PCS 7 documentation at the following locations:

- On the *Process Control System; SIMATIC PCS 7* DVD
- After installation, on the computer
- On the Internet

Full versions of the documentation are available from the "Technical Documentation SIMATIC PCS 7" website: www.siemens.com/pcs7-documentation (www.siemens.com/pcs7-documentation)

Note

PCS 7 Readme (Internet version)

The information provided in the *PCS 7 Readme* on the Internet takes precedence over **all** PCS 7 documentation.

Please read this *PCS 7 Readme* carefully; it contains important information and amendments on PCS 7.

PCS 7 documentation on the *Process Control System; SIMATIC PCS 7* DVD

- **PCS 7 Readme (DVD version)**
  The *PCS 7 Readme* on the *Process Control System; SIMATIC PCS 7* DVD contains important information about PCS 7 and takes precedence over the PCS 7 documentation supplied with the product. After installation of PCS 7, you can find the *Process Control System PCS 7; PCS 7 Readme* document in the Windows Start menu using the following path:
  Siemens Automation > SIMATIC > Product Notes > <language>
- You will find the most important PCS 7 system documentation at the following locations:
  - On the *SIMATIC PCS 7* DVD in the "_Manuals" folder
  - On the engineering station as online help (CHM file) for the SIMATIC Manager application
  - On the engineering station as a PDF file in the Windows Start menu using the following path:
    Siemens Automation > SIMATIC > Documentation > <language>

    Note

    The following PCS 7 system documentation is included:
    - Catalog Overview *Process Control System PCS 7; PCS 7 Documentation*
    - Configuration manual *Process Control System PCS 7; Engineering System*
    - Function manual *Process Control System PCS 7; PCS 7 - PC Configuration*
    - Configuration manual *Process Control System PCS 7; Operator Station*
    - Function manual *Process Control System PCS 7; OS Process Control*
- The product documentation is installed with the relevant product.

PCS 7 documentation on the Internet (current versions)

The latest documentation on the PCS 7 versions is available from the "Technical Documentation SIMATIC PCS 7" website:

- **In the section "Software manuals for SIMATIC PCS 7 ..."**
  - The link to the latest system and product documentation of the particular PCS 7 version.
  - The link to download the Setup for the latest system documentation "PCS 7 Documentation Portal Setup".

    Note

    PCS 7 Documentation Portal Setup

    Setup includes the complete system documentation for PCS 7 (PDF files and online help).
    - You can install this Setup without PCS 7.
    - The following documentation is updated when you install the Setup on the engineering station (completed and overwritten - if you select the original installation folder):
      - Online help of the "SIMATIC Manager" application: (CHM files)
      - System documentation for PCS 7 in the Windows Start menu: **Siemens Automation > SIMATIC > Documentation > language >** PDF files
    - The PCS 7 Newsletter keeps you informed when new versions of the system documentation become available.

  - The link to download the entire PCS 7 documentation as a *Manual Collection* in the My Documentation Manager (http://support.automation.siemens.com/WW/view/en/38715968).
    The *Manual Collection* includes the manuals for hardware and software.
- **In the section "Hardware Manuals for SIMATIC PCS 7 ..."**
  - The link to the latest manuals for components approved for a PCS 7 version.
  - The link to the latest manuals for approved SIMATIC PCS 7 industry software for PCS 7.

Catalogs, brochures, customer magazines and demo software

This information is available on the Internet at: Information and Download Center (http://www.automation.siemens.com/mcms/infocenter)

Required Knowledge

This documentation provides information about working with PCS 7 and is intended for **trained service personnel**. The following knowledge is required to understand the documentation:

- Basic knowledge of Microsoft Windows operating systems
- Knowledge of the functions and configurations of SIMATIC PCS 7 (Engineering System, PCS 7 Operator Station).
- Knowledge of the functions and configurations of SIMATIC S7 (S7-400, STEP 7)
- Knowledge of the functions and configurations of SIMATIC NET (network components and transmission media)

Important information about this documentation

This documentation is a guide for service support. It therefore does not claim to be complete. Due to our lack of knowledge of the particular circumstances in your plant, we **cannot guarantee** the following with this documentation:

- That you will be able to use this documentation to remedy problems yourself.
- That, if service is required (similar to what is presented), the procedure described will necessarily enable you to find the cause of the fault or to correct the fault.
- That detailed information about individual hardware or software components is complete.
- That detailed information about individual hardware or software errors is complete.
- That this documentation cannot provide the same expert knowledge as that provided by a service technician or a member of the hotline staff.
- That procedures carried out will not disturb the system.
- That the procedures described can be performed via remote access.

Changes compared to the previous version

Below you will find an overview of the most important changes in the documentation compared to the previous version:

New as of PCS 7 V8.1

- Upgrade of the System Expansion Card for a CPU 410-5H (Page 56) (as of firmware version 8.1)

New as of PCS 7 V8.0 Update 1

- Diagnostic tools for PROFINET
- Diagnostic tools for FOUNDATION Fieldbus
- BANY for PROFINET

New as of PCS 7 V8.0

- Monitoring the time synchronization of the OS server
  You can find information on this in the section "Time master role of the OS server (status) (Page 135)"
- Diagnostic tools for the following operating systems:
  - Microsoft Windows 7
  - Windows Server 2008

New since PCS 7 V7.0

- Maintenance Station for universal diagnostics/maintenance in PCS 7
  You can find information on this in the section "Diagnostics with the maintenance station (asset management) (Page 95)".
- Diagnostics for PROFIBUS PA
  You can find information on this in the section "Diagnostics for PROFIBUS PA (Page 108)".
- Other diagnostic tools:
  - Simatic Shell (Page 130)
  - Microsoft Baseline Security Analyzer (MBSA) (Page 129)
  - BANY PROFIBUS (Page 145)

Conventions

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

Additional support

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If this manual does not contain the answers to any questions you may have about how to use the products described, please contact your local Siemens representative.

You can locate your local representative at:

http://www.siemens.com/automation/partner (http://www.siemens.com/automation/partner)

The guide that provides details of the technical documentation offered for the individual SIMATIC products and systems is available at:

http://www.siemens.com/simatic-tech-doku-portal (http://www.siemens.com/simatic-tech-doku-portal)

The online catalog and online ordering system are available at:

https://mall.industry.siemens.com/ (https://mall.industry.siemens.com)

Technical support

Technical support for all A&D products can be accessed

- Via the Support Request web form
  Technical support (http://www.siemens.en/simatic-tech-doku-portal)
- You can find information on our technical support on the Internet at
  http://www.siemens.com/automation/service (http://www.siemens.de/automation/support-request).

Service & Support on the Internet

In addition to our documentation pool, we also offer you a knowledge base on the Internet.

http://www.siemens.com/automation/service&support (http://www.siemens.com/automation/partner)

Here you will be able to access:

- The newsletter, which will keep you constantly up-to-date with the latest information about our products
- The right documents via our Service & Support search facility
- A forum that provides users and specialists with an international platform for exchanging experiences
- Your local Automation & Drives representative
- Information about local service, repairs, spare parts The "Our service offer" section offers even more options.

Ensuring Availability

3

3.1 Introduction

Overview

This section presents measures for ensuring availability of a PCS 7 system.

You can find information on fault-tolerant systems in the *Process Control System PCS 7; Fault-Tolerant Process Control Systems* manual.

The information in this section enables you to perform the following tasks:

- Maintain the reference condition of a plant.
  Examples: Adherence to maintenance intervals, replacement of batteries
- Optimize the plant and prevent faults
  Examples: perform firmware updates, eliminate known sources of errors
- Minimize downtime caused by faults
  Examples: provide backups

Note to reader

This section is split up into several topical fields. The following information is provided for each topic area:

What?	What is described?
When?	When can you perform this action?
How ?	You can find Information on the topic in the section entitled "...".

Contents

Topic area	Information
Data backup	• **WHAT?:** Information on backing up and restoring data in a PCS 7 plant. Backups are necessary if you want to restore the state of a component or configuration (because a hard disk is damaged, for example). • **WHEN?:** You should perform a data backup if changes have been made in a PCS 7 plant. • **HOW**?: You can find information on creating data backups in the section "Options for data backup (Page 17)".
Hardware update	A SIMATIC station may switch to STOP mode if you change the hardware. • **WHAT?**: Information on how to perform a firmware update and the subsequent configuration steps required. • **WHEN?:** If you want to convert components to a current firmware version (because new functions are to be used or errors must be corrected, for example). • **HOW?:** For information on firmware updates, refer to the "hardware updates (Page 36)" section.
Software update	A SIMATIC station may switch to STOP mode if you change the software. • **WHAT**?: Information on converting projects from older versions to a current version. There are two types of software updates: – Updates that **utilize** the new functions of a new version of PCS 7 – Updates that **do not utilize** the new functions of a new version of PCS 7 • **WHEN?:** – If you want to utilize new functions of a new version of PCS 7. – If you want to continually adapt your PCS 7 projects to the current state of technology. – If software corrections necessitate conversion. • **HOW?:** For information about software updates, refer to the "Software updates (Page 54)" section.

3.2 Data backup

3.2.1 Options for data backup

Introduction

You can backup project data in various ways and for different purposes, for example, with project archiving, image files.

After system failure, you can use a backup to quickly restore the system to its original state.

Recommendations for increasing data security

- Always back up the data in the following cases:
  - After configuration changes
  - Before and after system component upgrades
  - Before and after configuration software upgrades
- Keep at least the three most recent versions of your PCS 7 project.
- Use different storage media for backing up the data.
  Examples:
  - LAN hard disk
  - USB hard disk
  - MOD
  - CD/DVD

  This retains availability of your data even after failure of a device.
- You can also backup your data on hard disks of PCs in a network. Simultaneous hard disk failure on more than one PC is very unlikely.

Data backup options

The sections below describe the options for backing up data:

Backing up ES project data

- Backing up parameter settings of the SIMATIC station (Page 19)
- Archiving a PCS 7 project (Page 20)
- Retrieving a PCS 7 project (Page 21)
- Archiving and retrieving a multiproject (Page 22)
- Archiving custom libraries (Page 24)
- Exporting operator and display texts (Page 25)
- Backing up custom functions and actions (Page 26)

Backing up OS project data

- Backing up OS configuration data (Page 26)

Backing up batch data

- Backing up configuration data (Page 27)
- Generating a backup (Page 28)
- Restoring data from a backup (Page 29)
- Archiving batches (Page 30)

Backing up SIMATIC Route Control data

- Backing up configuration data (Page 31)
- Backing up project data from SIMATIC Route Control (Page 32)
- Restoring data from a backup (Page 33)

Creating an image file

- Backing up data by generating an image file (Page 33)

Note

Make sure that backups are stored in a protected location (in separate rooms, fireproof cabinets, etc.).

Make sure the backups are readable (particularly when reusable storage media such as floppy disks are used).

Using Version Trail

Version Trail is software for versioned archiving and retrieval of projects, multi-projects or libraries. Version Trail offers you the following options:

- Backup of objects at times specified by the user.
  The backup object is assigned a version when entered in the version archive. This version uniquely identifies the object.
- Retrieving and re-using versioned project data
- Automatic archiving
- Automatic readback

You can find additional information on this in the SIMATIC Manager online help.

3.2.2 Backing up ES project data

3.2.2.1 How to back up parameter settings of the SIMATIC station

Introduction

You can change parameters (such as controller settings) online in the SIMATIC station using the PCS 7 OS and the engineering station.

Some situations make it necessary to back up the current data blocks, FBs or parameter settings from the SIMATIC station. This is the case, for example, when the configuration data have been restored from a data backup.

You can make use of the following backup options:

- Reading data blocks and FBs from the SIMATIC station
- Reading charts with current parameters from the SIMATIC station

Note

These actions overwrite all settings in the configuration with the current values of the system. Make sure that the settings for start values, for example, are correctly maintained.

⚠ DANGER

Reading data back

If you read back the data from the SIMATIC Station, you must ensure that hazardous conditions cannot occur following a hot restart of the system or after configuration data are downloaded.

Reading data blocks and FBs from the SIMATIC station

1. Open the project in the SIMATIC Manager.
2. Select the menu command **View > Online**.
3. In the tree view, select the data blocks and FBs you want to read from the SIMATIC Station.
4. Select **Edit > Copy** from the menu.
5. Select the menu command **View > Offline**.
6. Select **Edit > Paste** from the menu.

Reading charts with current parameters from the SIMATIC station

1. Double-click any CFC chart in SIMATIC Manager to start the CFC Editor.
2. Select the menu command **Chart > Read Back**.
3. In the "Read Back Chart" dialog box, make the following settings:
   - Source files: Program of the CPU
   - Scope: OCM-capable parameters

Recommendation: back up the project at this point. You can find information on this in the section "How to archive a project (Page 20)".

This data backup includes all current parameter settings of the SIMATIC station.

3.2.2.2 How to archive a project

Introduction

You can use various tools to archive project data.

Below, the *PKZip* (*PKZip* Server) program is used for archiving:
You can find the setup for *PKZip* on the SIMATIC PCS 7-DVD. *PKZip* is automatically installed during the PCS 7 system setup.

You can start *PKZip* from the SIMATIC Manager.

Requirement

- A tool is installed for archiving project data (default: *PKZip*).

Making settings in SIMATIC Manager

1. In SIMATIC Manager, select the menu command **Options > Settings**.
   The "Settings" dialog box opens.
2. Select the "Archive" tab.
3. Select your "preferred archiving program" from the drop-down list box (*PKZip* is the default).
4. Select the following "options":
   – Check options
   – Check target directory on retrieval
5. You can set the default path for the archiving or retrieving projects in the "Archive directory during" area.
6. Click "OK" to apply your settings.

Archiving a project

1. In SIMATIC Manager, select the menu command **File > Archive**
   The "Archive" dialog box opens.
2. Select the "Multiprojects" (or "User Projects") tab.
3. Click "Browse" and select the project you want to archive from the list.
4. Click "OK" to save your settings.
   The "**Archive - Select Archive**" dialog box opens.

5. Make the following settings for the archiving:
   - Select the drive and folder for the archive file from the "Save" drop-down list.
   - In the "File name" box, enter the file name under which the archive file should be saved.
     Recommendation:
     Name the archive file of the project in such a way that it allows you to deduce the date of the archiving from the name. Example: "yearmonthdayprojectname"; 091230name
6. Click "Save" to apply your settings.
   The "Archive – Options" dialog box opens.
7. If you want to archive the project on floppy disks, select the size of the diskette.
   For additional information about this dialog box, click "Help".
8. Click "OK".
   The archiving process begins.

When the "Archive" dialog box closes, archiving is completed.

Write protection

Note

If you copy the project directly to the CD/DVD, all files and directories will be write-protected. Before using the project again, you need to remove the "Read-only" file attribute for all files and folders in the project.

Backing up configuration data

Also back up the following configuration data:

- GSD files (Siemens\STEP 7\S7Data\GSD) to another partition or to another drive
- C scripts of the standard functions

Backup of PDM configuration data on the Engineering Station

PDM configuration data is included automatically in the backup of your PCS 7 project.

Additional information

You can find information on product versions in the *Process Control System PCS 7; PCS 7 - Readme* file (see "Preface (Page 7)").

3.2.2.3 How to retrieve a project

Requirements

- The tool that was used to archive the project is installed (default: *PKZip*).
- The defaults required for the tool that is used to archive the project have been set (for additional information, refer to the section "How to archive a project (Page 20)").

Note

You can find the setup for *PKZip* on the *Process Control System; SIMATC PCS 7* DVD. *PKZip* is automatically installed during the PCS 7 system setup.

Procedure

1. In the SIMATIC Manager, select the menu command **File > Retrieve**.
   The "Retrieve - Select an archive" dialog box opens.
2. Edit the following settings for the archive file:
   - In the "Search in" list:
     Enter the drive and folder where the project was archived.
   - In the "File name" box:
     Enter the name of the file where the project was archived.
3. Click "Open" to save your settings.
   The "Select destination directory" dialog box opens.
4. Select the destination directory / project folder in the list.
5. Click "OK" to apply your settings.

The retrieval is finished when the "Retrieving" dialog box closes.

3.2.2.4 How to archive and retrieve a multiproject

Introduction

You can store a multiproject in compressed form in an archive file in the same way as individual projects or libraries. This can be done on a hard disk or on transportable storage media (such as a ZIP disk).

If individual projects of a multiproject are stored on more than one PC in a network, you must use the following programs to archive the multiproject:

PKZip
This program is installed automatically together with PCS 7 (STEP 7 add-on package).

Recommendation:
Archive the multiproject on an engineering server.

Requirements for archiving a multiproject

- A tool is installed for archiving project data (default: *PKZip*). *PKZip* is automatically installed during the system setup from PCS 7.
- Archiving a multiproject is a cross-project function. Therefore, no other process can access any of the projects in the multiproject during archiving.

Archiving a multiproject

1. Select the multiproject in SIMATIC Manager.
2. Select the menu command **File > Archive**.
   The "Archive" dialog box opens.
3. Select the "Multiprojects" tab.
4. Confirm the selected multiproject by clicking "OK" to save your entries.
5. Make the following settings for the archiving:
   - In the "Save to" drop-down list:
     Select the drive and folder.
   - In the "File name" box:
     Enter the name of the file in which the data are to be saved.
6. Click "Save" to apply your settings.
   The "Archive – Options" dialog box opens.
7. If you want to archive the project on floppy disks, select the size of the diskette.
   For additional information about this dialog box, click "Help".
8. Click "OK".
   The archiving process begins.

When the "Archive" dialog box closes, archiving is finished.

Retrieving a multiproject

1. In SIMATIC Manager, select the menu command **File > Retrieve**.
2. In the next dialog box, select the archived multiproject.
3. Click "Open" to save your entries.
   The "Select Destination Directory" dialog box opens.
4. Select the destination directory where the archive is to be unzipped. Click "OK".
   The multiproject is retrieved.
   After the retrieval operation, the "Retrieve" dialog box opens.
5. Click "OK".
   The following is displayed in the "Retrieve" dialog box.
   - The name of the retrieved project
   - A prompt for opening the project
6. Click "Yes" as required to open the project, or click "No" to close the session.

Result

A subdirectory is automatically created in the destination directory you selected. The subdirectory contains the following:

- By default: The name of the multiproject
- Individually: A unique directory name derived from the name of the multiproject

The following are placed in the subdirectory:

- Multiproject
- Projects contained in the multiproject
- Libraries, including the master data library

Once a multiproject is retrieved, all project directories of the multiproject are located on the same level below this directory.

3.2.2.5 How to archive custom libraries

Introduction

If you have created a custom project library in PCS 7, we recommend that you archive it. Perform the steps below for each library to be backed up.

Procedure

1. In SIMATIC Manager, select the menu command **File > Archive**.
   The "Archive" dialog box opens.
2. Open the "Libraries" tab.
3. Click "Browse" and select the library you want to archive from the list.
4. Click "OK" to save your settings.
   The "Archive - Select Archive" dialog box opens.
5. Make the following settings for the archiving:
   - In the "Save to" drop-down list:
     Select the drive and folder
   - In the "File name" box:
     Enter the name of the file in which the data are to be saved.
6. Click "Save" to apply your settings.
   The archiving process begins.

Folder for custom pictures

As of PCS7 8.1, the "PCS7CustomPictures" folder is automatically created in the "GraCS" project folder when the project editor is opened. You can create additional folders in the "GraCS" project folder for custom pictures.

Files of the custom pictures are used when compiling the OS for process display, if the files of the custom pictures are located in the "GraCS" project folder or its subfolders.

You can find more information on this in the documentation *Configuration manual Process Control System PCS 7; Operator Station*.

3.2.2.6 How to export operator and display texts

Introduction

To visualize the process on the operator station you use faceplates, which show the plant operator the measured values, operating limits, units, and operator texts of the blocks, for example.

If you have changed operator or display texts in your blocks, we recommend that you back up the operator and display texts.

Exporting operator and display texts

In SIMATIC Manager you can export information relating to parameters, signals and messages to a file (format: *.csv).

You can edit this file in standard MS Office applications (such as Excel and Access).

The same mechanisms that are used for converting to project-specific languages are used for the export.

Requirement

PCS 7 allows you to store all operator and display texts in every desired language. The only requirement is that the language is installed in your project:

- The languages available in SIMATIC Manager can be displayed via the menu command **Options > Language for Display Devices**.
- The number of languages offered is specified when Windows is installed (system characteristics).

Procedure

1. Open the project in the SIMATIC Manager.
2. In the component view, select the master data library (or, if not available, the project folder).
3. Select the menu command **Options > Manage Multilanguage Texts > Export**.
   The "Export User Texts" dialog box opens.
4. Make the following settings:
   – In the "Text Tables" group, set the storage location and the format for the export file (available formats: *.xls and *.csv).
   – In the "Language" group, set the source and target languages in accordance with your display language.
5. Click "OK".
6. If you have to manage several project-specific languages, repeat steps 3 to 5 for each language. Please note that you then have to set different export file names or target directories.

3.2.2.7 How to back up custom functions and actions

Introduction

PCS 7 enables you to create dynamic sequences in your OS project by creating custom functions and actions. These functions and actions are written in ANSI-C language.

You must back up any project functions, standard functions, local actions, and global actions that you have created or modified.

Project and standard functions

Project functions and standard functions have file names with the extension *.fct. By default, PCS 7 places these functions in the following folders:

- Project functions are placed in the "\library" folder of the OS project.
- Standard functions are placed in the "\aplib" folder in the installation directory of PCS 7.

Local and global actions

Local and global actions have file names with the extension *.pas. By default, PCS 7 places these actions in the following folders:

- Local actions are placed in the "\<Name of PC>\Pas" folder of the project directory.
- Global actions are placed in the "\Pas" folder of the OS project.

Additional information

- Online Help for *WinCC Information System*

3.2.3 Backing up OS project data

3.2.3.1 Backing up configuration data

Introduction

The configuration data of the PCS 7 operator station is automatically backed up when a multiproject is archived. A separate backup is not required.

Backing up OS configuration data

Configuration data for the PCS 7 operator station are saved by default in the following folder: **..\Siemens\WinCC\WinCCProjects**.

To back up data, compress the project paths in this folder and save them on a suitable medium (such as a CD).

Backing up OS PC data

The OS configuration data are located on the PCS 7 engineering station. You therefore back up OS server PCs or OS client PCs with an image. You can find information on this in the section "Backing Up Data by Generating an Image File (Page 33)".

3.2.4 Backing up batch data

3.2.4.1 Backing up configuration data

Data backup options

SIMATIC BATCH offers several options for backing up and restoring project data.

Data	Menu command for backup operation	Menu command for restore operation
• Materials • Libraries • Basic recipes • Formula categories • Formulas • Rights and roles • User settings (1) • Project settings	**Options > Backup** You can find information on this in the section "How to generate a backup (Page 28)". (2)	**Options > Restore** You can find information on this in the section "How to restore data from a backup (Page 29)". (3)
• Completed batches	Select batch(es), select **Archive** in the shortcut menu You can find information on this in the section "How to archive batches (Page 17)".	-

(1) "User settings" can/will only be backed up to a database copy.

(2) Save the data to an SBB file (compressed XML file).

(3) Restore the data from an SBB file (compressed XML file).

Additional information

- Manual *Process Control System PCS 7; SIMATIC BATCH*

3.2.4.2 How to generate a backup

Elements of the backup

You can back up all configured data with the **Backup** command. The backup includes the following elements:

- Materials
- Libraries
- Basic recipes
- Formulas
- Rights and roles
- Project settings

Rule

Note

The follow applies when a backup is running:

Operator input cannot be executed on the BATCH client where a backup is being generated.

Procedure

1. In BatchCC, select the menu command **Options > Backup**.
2. If there are non-archived batches in the project, you must acknowledge the message dialog for non-archived batches. In this case, click "OK".
   The "Save as..." dialog box opens.
3. Enter the name of the backup file ("...".sbb) in the "File Name" input field.
4. Select the storage location for your backup file from the "Save to" input field.
5. Click on the "Save" button.
   The backup file is generated.

Import/Export Assistant

Using the IEA, you can export/import the following batch objects to/from a file with the extension *.sbx:

- Libraries
- Basic recipes
- Formula categories

The export is supported in SIMATIC BATCH V6.1 or higher.

Note

For reasons of performance, you should only export/import one recipe to/from a file when exporting/importing large recipes.

Note

All referenced objects such as libraries, materials and formula categories are included in the export.

All formulas that belong to a formula category are included in the export.

Starting with the Import/Export Assistant (IEA)

- Start the export assistant from BatchCC by selecting the **Options > Export** menu command.
- Start the import assistant from BatchCC by selecting the **Options > Import** menu command.

Additional information

- *SIMATIC BATCH* Manual

3.2.4.3 How to restore data from a backup

Introduction

You can restore the data from a backup file and update the Batch process cell in the SIMATIC BATCH Control Center (BatchCC).

Requirement

No Batch process cell is available in the BatchCC.

Reading a backup

1. In BatchCC, select the menu command **Options > Restore**.
   The "Restore" dialog box opens.
2. Select the storage location for the backup file ("...".sbb).
3. Click "Open".
   The backup file is loaded.

Updating the Batch process cell

1. Select the Batch process cell in the tree view of BatchCC.
2. Select the menu command **Edit > Update Process Cell**.
   The "Batch Process Cell - ..." dialog box opens.
3. Click "OK".
   The "Update Process Cell" dialog box opens.
4. Compare the columns "Current process cell" und "New process cell" line-by-line. Rearrange them if necessary.
   You can find additional information about this in the manual *Process Control System PCS 7; SIMATIC BATCH*.
5. Click "OK".
   The "Updating Process Cell" dialog box opens and closes automatically when the update is completed.

Result

In BatchCC, the data from the backup file is entered into the batch database and made available again to the plant.

3.2.4.4 How to archive batches

Long-term archive

You archive batches in long-term archives in BatchCC. Long-term archives are used for long-term storage of batch data in accordance with the FDA.

Rules

- Only completed batches can be archived.
- Data from long-term archives cannot be used to restore defective batch data or batch structures.

Requirement

The archiving technology is preset in BatchCC.

- Technology "Directory":
  The archive files are saved to a shared network folder. SIMATIC BATCH does not use any specific login or password settings for access to this folder.
- Technology "SQL Server":
  The archive files are saved to an SQL database. Login and password are mandatory for this technology; a specification of the domain is not used.
- Technology "FTP Server":
  The archive files are saved to an FTP Server. Login and password are mandatory for this technology; a specification of the domain is only required if the login is assigned to a domain.

For additional information, refer to the SIMATIC BATCH online help.

Archiving Individual Batches

You archive a **single** completed batch as follows:

1. Select the batches to be archived in the detail view.
2. Right-click to open the shortcut menu and select the **Archive** menu command.

Archiving multiple batches

You archive **multiple** completed batches as follows:

1. Open a Batch overview list from the "Details" shortcut menu.
2. Select the batches to be archived.
3. Right-click to open the shortcut menu and select the **Archive** menu command.

3.2.5 Backing up SIMATIC Route Control data

3.2.5.1 Backing up configuration data

Data backup options

SIMATIC Route Control provides the following options for backing up and restoring project data.

- You can back up the project data from SIMATIC Route Control with a PCS 7 project.
  For additional information, refer to the "How to archive a project (Page 20)" section.
- You can generate an image of the partition on which the project database is located.
- You can export/import the partial routes of SIMATIC Route Control.
  For additional information, refer to the "How to back up project data from SIMATIC Route Control (Page 32)" section.

Additional information

- Manual *Process Control System PCS 7; SIMATIC Route Control*

3.2.5.2 How to back up project data from SIMATIC Route Control

Introduction

This section describes the separate backup of partial routes from SIMATIC Route Control to a file.

Note

You can back up the partial routes with the offline project data from SIMATIC Route Control. The interface blocks are part of the PCS 7 project and are backed up during the archiving of the PCS 7 project.

Preparing the database backups

Before performing a backup, you must always carry out the following steps in Route Control engineering:

- Check the database consistency via the menu command **Options > Check Consistency**.
- Compress the database via the menu command **Options > Compress Database**.

Creating a backup

1. Select the multiproject/project in the SIMATIC Manager.
2. Select the **Options > SIMATIC Route Control> Engineering** menu command.
   The "Route Control Engineering - ..." dialog box opens.
3. Select the menu command **Options > Export/Import CSV > CSV Export/Import Wizard ...**.
   The "Wizard: CSV file data exchange (Export/Import)" opens.
4. Check the path in the "Directory" input box.
5. In the "Direction" group, activate the check box "RC project engineering >> CSV file(s) (Export).
6. Click "Continue".
7. Select all check boxes.
8. Click "Continue".
9. Click "Finish".
   The files are exported.

Additional information

- Manual *Process Control System PCS 7; SIMATIC Route Control*

3.2.5.3 How to restore data from a backup

Introduction

You restore partial routes from SIMATIC Route Control from a backup file.

Importing a backup

1. Select the multiproject/project in the SIMATIC Manager.
2. Select the **Options > SIMATIC Route Control> Engineering** menu command.
   The "Route Control Engineering - ..." dialog box opens.
3. Select the menu command **Options > Export/Import CSV > CSV Export/Import Wizard ...**.
   The "Wizard: CSV file data exchange (Export/Import)" opens.
4. The dialog box "Wizard: CSV file data exchange (Export/Import)" opens.
5. Check the default path set in the "Directory" input box.
6. In the "Direction" group, activate the check box "CSV file(s) >> RC project engineering (Import).
7. Click "Continue".
8. Select all check boxes.
9. Click "Continue".
10. Click "Finish".
    The project engineering data are imported.

Additional information

- Manual *Process Control System PCS 7; SIMATIC Route Control*

3.2.6 Creating an image

3.2.6.1 Backing up data by generating an image file

Introduction

It is advisable to generate an image file of the installation in order to backup partitions and hard disk data (e.g. after reinstallation).

Image file

An image file maps all of the data on the backed-up medium (hard disk, logical drives). It is used to back up data on partitions or hard disks. Many of the software packages that can be used to generate image files also offer data compression.

Boot partitions are included in the backup. This enables you to save all the PC settings including the Windows system settings.

All the data of a PC can usually be restored from an image file within a short amount of time (e.g., 2 GB data takes approx. 10 minutes). In the event of a fault, you can restore the complete PC installation.

Rules

- You must use the **same hardware** to restore data.
- Note the following settings of the hard disk for the image file
  (you can find additional information on this in the section "Managing the operating system (Page 119)"):
  - Partition size
  - Formatting of partition or hard disk (e.g., NTFS, FAT32)
- Authorizations and license keys cannot be included in the backup.
- The image software must be compatible with the current operating system.

Basic procedure

1. Move the authorizations and license keys to another medium (diskette, partition, etc.) before generating the image.
2. Follow the instructions of the manufacturer of the image software when creating an image.

Additional information

- Documentation relating to the image software used

3.2.7 Comparing project versions

3.2.7.1 Comparing project versions with VXC

Version Cross Manager (VXM)

The Version Cross Manager is a separate application you can order as an option. You use the Version Cross Manager to compare two user programs for download-relevant differences quickly and reliably. This allows you to detect whether changes have been made to the user program, and what those changes are.

Overview

Comparison of	Detailed information	Called with	Additional information
Changes to different project versions in the user program	CFC charts SFC charts	In the Siemens SIMATIC programs Start menu: **STEP 7 > VXM - Compare Versions**	Configuration manual *Process Control System PCS 7; Engineering System* Online help *Version Cross Manager*
User programs based on XML files (for synchronizing process-control project data with planning data, for example)	CFC charts SFC charts	Version Cross Manager • XML file generated with **File > Export...**. • Compare XML files using **File > Compare With XML File...**.	Online help *Version Cross Manager*

3.3 Hardware update

3.3.1 Hardware updates

Introduction

In this section, a hardware update refers to changing the firmware in SIMATIC modules. Updating the firmware of a SIMATIC module is referred to as a "firmware update" in the following.

A firmware update includes the following:

- Function upgrades
- Operating system enhancements

Released modules

You can find the firmware versions for modules released of a particular PCS 7 version in the "PCS 7 - Released Modules" documentation that corresponds to the version in question.

Requirements for the firmware update

A firmware update for a SIMATIC module may be required if you wish to use new functions or correct errors.

Checking the latest product version or the firmware version of a module

You need to check the latest product version or the firmware version of a module in the following situations:

- When replacing a module (due to a defect, for example)
- When you wish to use new functions after you have change the configuration

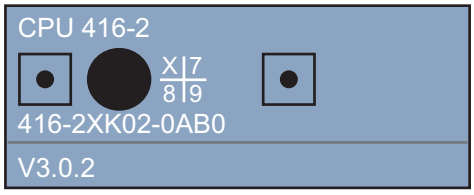
Compare the *PCS 7 - Released Modules* documentation for the older PCS 7 versions to find out which PCS 7 version first included the feature.

Determining the product version or the firmware version

Update-capable modules:

- You can find the following identifiers on update-capable modules:
  - The product version is indicated by a cross (in the following example: product version 6).
  - The original version of a firmware is indicated with text (in the following example: V3.0.2).

Example:

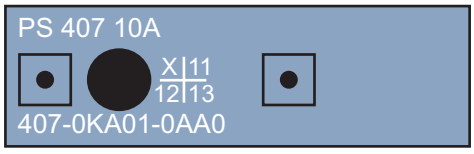


- When a firmware update is delivered you obtain a label showing the current firmware version which you can paste over the displayed label. After having completed the firmware update, replace the module label accordingly to identify the valid FW version. This will ensure uniformity in the plant documentation.

Modules that cannot be updated:

- If only the manufacturer can perform changes to a module, only the product version is shown on the housing of the module (indicated by a cross; in the following example: product version 10).

Example:



Recommendation for performing firmware updates

Perform these firmware updates at regular intervals when an opportunity presents itself (such as during a scheduled plant shutdown).

Supply sources for the latest firmware version

You can request the update files for the latest firmware versions from your Siemens contact partner, or download these from the Internet (http://support.automation.siemens.com). If you cannot access the Internet address, contact Technical Support.

Note

The update file may be supplied in an executable, self-extracting file (.exe). When you want to perform consecutive updates for different module types of module versions, you must unzip the update files in separate folders for the different CPUs as follows:

- Type of module
- Product version
- Firmware version

Overview

The sections below describe topics related to hardware updates:

- Adjustments after a hardware change (Page 38)
- Updating a SIMATIC S7 CPU (Page 38)
- Updating an interface module IM xxx (Page 42)
- Updating a CP xxx (Page 46)
- Working with GSD files (Page 52)

3.3.2 How to make adjustments after a hardware change

Basic procedure

A change to the hardware always requires a change to the software. Configure the hardware changes in HW Config. Compile the changes and then download the data to the CPU. You can then physically replace, remove or add the modified hardware.

Procedure

1. Open the project (the AS) in HW Config.
2. Drag the object (such as the CPU: Type, Firmware Version x.x) from the hardware catalog and drop it into the appropriate slot in the AS configuration table.
   The following message appears: "Do you want to exchange component ... with component ...?"
3. After verification, click "Yes" to confirm.
4. Select the menu command **Station > Save/Compile**.
   You can also perform the compiling during the subsequent work.

3.3.3 Updating the CPU

Preparation

Compare the type and manufacture date of the modules you are using with the information in the document *PCS 7 Released Modules.*

If replacement of the CPU is required, contact your Siemens representative.

Changing the quantity structure of the CPU for a SIMATIC S7-410

You can find information about this in the section "Upgrade of the System Expansion Card for a CPU 410-5H (Page 56)".

Firmware update for CPU S7-400H

Note

In a fault-tolerant PCS 7 system, the (S7-400H) CPUs must always have a uniform hardware version and the same firmware version.

Update capability of CPUs

The online update of the firmware can be performed using the procedure described below as of the following firmware versions:

- CPU S7-400H as of firmware version 4.5
  As of firmware version 4.5, the firmware can be updated in RUN mode.
- CPU S7-400 as of firmware version 5.0

You always need a memory card for a firmware update for older CPUs.

Components	Update CPU S7-400	Update CPU S7-400H
PC with external EPROM burner or programming device for programming the memory card	X	X
Memory Card Flash-EPROM; 8 MB	X	X
STEP 7	X	X
Files for the firmware update (available in the Internet).	X	X

3.3.3.1 How to perform a firmware update for the CPU (as of V5.0)

You are provided with several files (*.UPD) with the latest firmware to update the firmware of a CPU. Download these files to the CPU. You do not need a memory card for the online update. However, it is still possible to perform a firmware update with a memory card.

Preparation

Compare the type and manufacture date of the modules you are using with the information in the document *PCS 7 Released Modules.*

If replacement of the CPU is required, contact your Siemens representative.

Requirements

- STEP 7 V5.3 or higher is installed on the programming device or PC.
- The update file for the firmware update is available on the programming device / PC.
- The CPU, whose firmware is to be updated, must be accessible online, for example, via PROFIBUS, MPI or Industrial Ethernet. The files containing the latest version of the firmware are available in the file system of your programming device or PC. A folder may only contain the files for one firmware version.

Note

For CPUs with a PROFINET interface, you can update the firmware via Industrial Ethernet on the PROFINET interface. Updating via Industrial Ethernet is significantly faster than MPI or DP (depending on the configured baud rate).

You can update the firmware of the other CPUs via Industrial Ethernet, if the CPU is connected to Industrial Ethernet via a CP.

Procedure in HW Config

To update the firmware of a CPU, proceed as follows:

1. Open the station with the CPU to be updated in HW Config.
2. Select the CPU.
3. Select the menu command **PLC > Update Firmware**.
4. Select the path to the firmware update files (CPU_HD.UPD) by clicking the "Browse" button in "Update Firmware" dialog.
   Once you have selected a file, information about which modules and which firmware versions are suited for the file is displayed in the lower fields of "Update Firmware" dialog.
5. Click "Run".
   STEP 7 checks whether the selected file can be interpreted by the CPU and loads the file to the CPU if the result is positive. If the operating state of the CPU must be changed to do this, you are prompted by dialogs to take action.

Procedure in SIMATIC Manager

The procedure corresponds to the one in HW Config; the menu command here is also "PLC > Update Firmware". However, STEP 7 only checks if the module supports the function at the time it is executed.

Note

Protecting the update process

There a digital signature, which is checked during the update of the CPU to protect the firmware update. If an error is detected, the old firmware remains active and new firmware is discarded.

Values received after the update of the firmware are retained

Once the CPU memory has been reset, the following values are retained:

- The parameters of the MPI interface (MPI address and highest MPI address).
- The IP address of the CPU
- The device name (NameOfStation)
- The subnet mask
- The static SNMP parameters

Updating a CPU with an operating system update card

You can find information on this at the following Internet address:
http://www.siemens.automation.com/service (http://support.automation.siemens.com/WW/view/en/2774118)

3.3.3.2 How to perform a firmware update for the H-CPU (as of V4.5)

The firmware version can be changed using the online functionality as of firmware version V4.5.x.

- Firmware update of an H system in RUN
- It is not possible to downgrade in RUN

Performing the firmware update of a H-CPU in RUN as of V4.5

Generally, a firmware version can only be upgraded to the next higher firmware version when a firmware update in RUN is performed. It is not possible to downgrade in RUN. You should also read the information provided in the version-specific description.

To update the firmware of the CPU of an H system in RUN, follow these steps:

1. Make sure that the H system is in the redundant state without errors.
2. Select one of the CPUs in HW Config or SIMATIC Manager.
3. Select the menu command **PLC > Update Firmware**.
   The "Update Firmware" dialog box opens. Both CPUs are displayed with article number, current firmware version, name and mounting position.
4. Select the firmware file to be loaded to the CPUs.
5. After confirmation with the "Run" button, a dialog with the following content opens:
   "Caution ... all CPU data will be deleted. Do you want to continue?".
   Click "Yes".
6. You can activate "Automatically continue" in the next dialog.
   Click "Next". The firmware update starts in the "Run" state.
7. The firmware update is completed on both CPUs.
   Check the operating mode and the active firmware version of both CPUs.

Downgrading an H-CPU

If a CPU in your S7-400H fails, order a new CPU with the same article number. This comes with the latest firmware version. This firmware can be higher than the predecessor CPU. In this case, the new CPU must be set to the older firmware version.

1. Insert the new CPU into your automation system.

   Note

   Do not connect the fiber-optic cable to the CPU of an H system.

2. Select this CPU in HW Config or SIMATIC Manager.
3. Select the menu command **PLC > Update Firmware**.
   The "Update Firmware" dialog box opens.
4. Select the firmware file that corresponds to the version of the predecessor CPU.
5. Download this file to the CPU. The new CPU now has the same firmware version as the previously used CPU.
6. Now connect the fiber-optic cable for the CPU of an H system.
   Switch the system to the "Redundant" operating mode by starting this CPU.

You can then upgrade both CPUs of the H system to the latest firmware in the "Run" state.

Difference of the firmware update to a non-redundant system

Following the actual firmware update, a self-test starts automatically for the H-system. This function may take several minutes. This time period depends on the amount of load memory (size of the inserted memory card) and the amount of working memory.

Updating an H-CPU with an operating system update card

You can find additional information on this at the following Internet address:

http://www.automation.siemens.com/service

See also

Operating system update for S7-400H CPUs (http://support.automation.siemens.com/WW/view/en/6741018)

3.3.4 Updating an interface module

3.3.4.1 Updating an interface module (IM)

Introduction

The interface modules (IM) in PCS 7 provide the interfaces for a fieldbus between the central rack of the automation system and the distributed I/O.

Preparation

- Compare the type and version of the interface modules you are using with the information in the document *PCS 7 Released Modules.*
- If replacement of the interface module is required, contact your Siemens representative.
- A firmware update is possible for some interface modules. You will find the procedure in the section "How to perform a firmware update of an IM (Page 43)" below.

Update capability of interface modules or couplers downstream from interface modules

You can update the firmware of the following components (interface modules or couplers downstream from interface modules):

Components	As of article number	As of firmware version
IM 152-1	6ES7 152-1AA00-0AB0	V2.02
IM 153-2	6ES7 153-2Bx00-0XB0	
IM 153-4	6ES7 153-4BA00-0XB0	V4.x
Y coupler	6ES7 197-1LB00-0XA0	
Y-Link	6ES7 197-1LA01-0XA0	
DP/PA-Link	6ES7 157-0AA82-0XA0	V4.x

Firmware update for SIMATIC stations with redundant interface modules

Note

You can perform a firmware update of the interface modules for SIMATIC 400H station with redundant interface modules during runtime.

3.3.4.2 How to perform a firmware update of an interface module (IM)

Introduction

This section provides a description of the update of the firmware for interface modules (Interface Module (IM)) via Industrial Ethernet.

Requirements

The following is required to perform the update via Industrial Ethernet:

- STEP 7 V5.3 or higher is installed on the programming device or PC.
- The update file for the firmware update is available on the programming device / PC.
- Only for interface modules for PROFIBUS DP:
  The CP 443-1 is routing-capable (check in HW Config: Properties of the CP > brief description "Routing" is listed).
- The IM has been integrated in your PCS 7 project.

Procedure

1. Open SIMATIC Manager.
2. In the component view, select the SIMATIC station in which the IM is located.
3. Double-click the "Hardware" object in the detail window.
   HW Config opens.
4. Select the IM whose firmware you want to update.
5. Select the menu command **PLC > Update Firmware**.
   The "Update Firmware" dialog box opens.
6. Make the settings in accordance with the table below.
7. Click "Execute". The firmware is updated.

Settings in the "Update firmware" dialog box

Setting	Action
Location of the firmware file	In the "Firmware File" group, specify the folder where you placed the file for the firmware update. If you want to search, you can use "Browse" to open Explorer.
Activation of "new" firmware	Use the "Activate firmware after download" check box to specify when the "new" firmware is to be activated as follows: • Select the "Update firmware after download" check box if the IM is to perform an automatic RESET after the new firmware was successfully loaded. The new firmware is active following the restart. • Clear the "Update firmware after download" check box to prevent the IM from performing a RESET reset the new firmware was loaded. The "new" firmware becomes active only after the power supply has been switched off.

Firmware update in a redundant system with PROFIBUS DP

After the firmware update of the active IM, the "RESET" automatically triggers the switchover of the two IMs.

You can now update the second IM in the redundant system. Each IM must be updated separately.

Note

Direct firmware update of both IMs in a redundant system via PROFIBUS DP

With IM 153-2 firmware as of V4.x, it is possible to update the firmware of both IMs during ongoing operation in redundant mode. The update is supported by STEP 7 and has no effect on the running application. The firmware in a redundant system is updated (directly) from the programming device / PC via PROFIBUS DP.

Requirement

- Programming device / PC with PROFIBUS interface (e.g.: CP 5611)
- Programming device / PC is connected directly with PROFIBUS DP
- STEP 7 version on the programming device / PC: as of STEP 7 V5.4
- The update file for the firmware update is available on the programming device / PC.
- The H system is error-free and in redundant mode.

Procedure

1. In the SIMATIC Manager, select the menu command **Options > Set PG/PC Interface...**".
2. Select the PROFIBUS interface.
3. Click the "Properties" button and set the interface according to the configured bus parameters.
4. Select the menu command **PLC > Display Accessible Nodes...** in SIMATIC Manager.
5. Select the station containing the IM you want to update.
6. Select the shortcut menu command **Update Firmware**.
   The "Update Firmware" dialog box opens. Both IMs are displayed with order number, current firmware version and bus address.
7. Select the firmware file to be loaded to the IMs.
8. Click "Execute". The firmware is updated.

Note

There is a momentary loss of redundancy for the station following the update of the respective IMs due to their restart.

Updating the identifier

Note

After the firmware update of the IM has been successfully completed, update the identifier of the firmware version. You can find information on this in the section "Hardware Updates (Page 36)".

3.3.5 Updating a CP xxx

3.3.5.1 Updating a communication processor (CP)

Introduction

In PCS 7, communication modules (CPs) are used to connect a SIMATIC station to bus systems. By updating the firmware, you can enhance the CP properties without replacing the hardware.

Update capability of CPs

The specific properties of a module are retained when there is a firmware update. The CP type is not changed by a firmware update.

CP type	Update capability	Article number
CP 341	Can be updated in all versions	
CP 443-1	Can be updated in all versions	
CP 443-5 Extended	Can be updated in all versions	

Overview

The sections below describe procedures for updating firmware:

- CP 341 firmware update (Page 46)
- CP 443-1 firmware update (Page 48)
- CP 443-5 Extended firmware update (Page 50)

3.3.5.2 How to perform a firmware update of the CP 341

Introduction

This section explains how to update the CP 341 firmware (6ES7 341-1xH01-0AE0 Firmware V1.x).

NOTICE
Firmware as of V2.x As of firmware V2.x (6ES7 341-1xH02-0AE0) you execute the update in HW Config. Select the menu command "PLC > "Update firmware..." in HW Config. For more information, refer to the "S7-300 CP 341 Point-to-Point Communication, Installation and Parameter Assignment (http://support.automation.siemens.com/WW/view/en/1117397)" manual.

Preparations

- Compare the type and version of the modules you are using with the information in the document *PCS 7 Released Modules.*
- If you need to replace the CP, contact your Siemens representative.

Requirements for the firmware update

- STEP 7 V5.3 or higher is installed on the programming device or PC.
- The update file for the firmware update is available on the programming device / PC.
- The software package "Configuration package for point to point communication" as of V5.0 is installed (supplied with the CP).
- The valid parameter assignment is stored in HW Config and has been downloaded to the CPU.

Procedure

1. Open SIMATIC Manager.
2. In the component view, select the SIMATIC station in which the CP 341 is located.
3. Double-click the "Hardware" object in the detail window.
   HW Config opens.
4. Double-click on the CP whose firmware is to be updated.
   The "Properties" dialog box of the CP opens.
5. Select the "General" tab.
6. Click "Parameters ...".
   The dialog box for the parameterization interface opens.
7. Select the menu command **Options > Firmware Update ...**
   - If the CP is available, the firmware version of the current module firmware is indicated (Vx.y.z).
   - If there is no firmware on the CP, a message to that effect is displayed. This can occur, for example, if the firmware update was aborted. The old firmware is deleted in this case. You must download a firmware.
8. In the "Firmware File" group, specify the folder where you placed the file for the firmware update. To search for this, open an Explorer window by clicking "Browse".
   The version of the selected firmware is displayed under "Selected FW version".
9. Switch the CPU to STOP.
10. Click "Download Firmware" to start the download procedure to the CP.
11. Click "Download Firmware" to confirm the download procedure.
    If you click "Cancel", the download is aborted. The module will not be operational if this happens.
    Restart the firmware download to make the module operational again.

Note

Before deleting the older firmware, the CP checks if the order number of the firmware to be downloaded is permitted.

Result

The new firmware is installed in the operating system memory of the CP. The progress of the installation is indicated by a progress bar and a percentage under "Done". Once the firmware update is complete, the module is ready for immediate operation.

3.3.5.3 How to perform a firmware update of the CP 443-1

Preparation

- Compare the type and version of the modules you are using with the information in the document *PCS 7 Released Modules.*
- If you need to replace the CP, contact your Siemens representative.

Requirements for the firmware update

- STEP 7 V5.3 or higher is installed on the programming device or PC.
- The update file for the firmware update is available on the programming device / PC.
- Network adapter for Ethernet card (for example, CP 1613, standard network adapter)

Determining the MAC address of the CP 443-1

When updating firmware, you must know the current MAC address of the CP 443-1.

1. Open SIMATIC Manager.
2. In the component view, select the CP 443-1 for which the firmware is to be updated from below the SIMATIC station.
3. Select the **CPU > Diagnostics/Settings > Module Information**.
4. Click "Special Diagnostics".
   The NCM S7 diagnostics tool opens.

   Note

   If the NCM S7 diagnostics do not start, the connection between the programming device/ PC and the CP 443-1 is faulty. Correct the fault.

5. Note the MAC address setting of the CP 443-1 under "Industrial Ethernet".

Performing the firmware update

Note

Note the following:

- A warning message appears before the download operation begins if an incorrect CP type has been inadvertently addressed. The firmware can nevertheless be downloaded to an incorrect CP type if the message is acknowledged.
- With the next steps, all data on your CP are deleted and cannot be recovered!
- Do not cancel a download operation once it is started. The CP may no longer be usable if you do this and you will have to send it in for repair.

1. In the Siemens SIMATIC programs Start menu, select: **STEP 7 > NCM S7 Industrial Ethernet > Firmware Loader**.
   The dialog box of the firmware loader opens.
2. Click "Continue".
3. In the "Step 1" dialog box, set the path for the update file:
   – Click "Browse".
   – Use "Select file" to select the desired file ("<drive>:\TEMP\Cp4435ba.fwl", for example).
   – Click on the "Open" button.
4. Click "Continue".
5. In the "Step 2" dialog box, set the **MAC address**.
6. Click "Continue".
7. Check the following settings:
   – "Application access point"
   – "Interface parameter assignment used"
8. Make sure that the correct settings have been activated in the configuration console.

   Note

   The access point must be set to "S7ONLINE CP xxxx(ISO)".

9. Activate the firmware update by clicking "Download".
10. Check whether the open *.fwl file includes the required firmware update for the CP.

Procedure when a download error occurs

If the download operation was terminated by an error, no LED is lit on the CP.

1. Switch the power supply of the rack off and on again.
2. Repeat the load operation.

If the CP responds to the download start, but the download operation does not finish properly, it could be that:

- The same address has been assigned more than once on the plant bus.
- The load on the plant bus is too high.

Note

If a CP does not respond to a load procedure via the configured MAC address, load the CP again via the imprinted address.

3.3.5.4 How to perform a firmware update of the CP 443-5 Extended

Preparation

- Compare the type and version of the modules you are using with the information in the document *PCS 7 Released Modules.*
- If you need to replace the CP, contact your Siemens representative.

Requirements for the firmware update

- STEP 7 V5.3 or higher is installed on the programming device or PC.
- The update file for the firmware update is available on the programming device / PC.
- MPI cable

Note

Ensure the following for the firmware update of the CP 443-5 Extended:

- If you want to connect devices that operate with PROFIBUS standard DPV1 to your PCS 7 system after conversion, you might have to replace the hardware (e.g. CP type: 6GK7 443-5DX03-0XE0 with firmware V5.1 or higher).
- This hardware requires special device drivers.
  For information on generating the device drivers, refer to the *Process Control System SIMATIC PCS 7; Programming Instructions, Creating Blocks for PCS 7* documentation.

Preparing for the firmware update

1. Make sure that the required firmware update files are available on the programming device or PC.
   Files for the firmware update are available on the Internet. You can find information on this in the section "Hardware Updates".
2. Switch off the power supply (PS) of the rack where the CP is inserted.
3. Use an MPI cable to establish a direct connection between the MPI interface of your programming device or PC and the PROFIBUS interface of the CP.
4. Switch on the power supply of the rack and the programming device or PC.

5. In the Siemens SIMATIC programs Start menu select: **SIMATIC NET > Set PG/PC Interface**.
   You use this to establish the access path to the CP 443-5 Extended.
   Example: Make the following setting for the CP 5611 (FWL):·
   – Select "FWL_LOAD" as the "Application access point" to the CP 443-5 Extended.
   – Select the MPI interface with the supplement "(FWL)" as the interface.
6. Click "OK".
7. Make sure there are no active applications on your programming device.
8. Restart the interface.

Performing the firmware update

Note

Note the following:

- With the next steps, all data on your CP are deleted and cannot be recovered!
- Do not cancel a download operation once it is started. The CP may no longer be usable if you do this and you will have to send it in for repair.

1. In the Siemens SIMATIC programs Start menu, select: **STEP 7 > NCM S7 > Firmware Loader**.
   The dialog box of the firmware loader opens.
2. Click "Continue".
3. In the "Step 1" dialog box, set the path for the update file
   – Click the "Browse" button.
   – Use "Select file" to select the desired file ("<drive>:\TEMP\Cp4435ex.fwl", for example).
   – Click on the "Open" button.
4. Click "Next" to confirm the next three dialog boxes until you reach "Step 4: Perform Load Operation".
5. Read the information in the dialog box for "Step 4: Perform Load Operation".
   In the table below you will find the download operation states that are displayed.
6. Switch off the power supply of the rack.
7. Click "Cancel" to close the dialog box.
8. Reestablish the original PROFIBUS connection.
9. Switch on the power supply for the module.
   The CP performs a self-test and is then ready for operation.

States of the download operation

Where	Display	State
On the PG/PC in the Firmware Loader dialog box	The bar in the dialog box changes.	Download procedure is running.
On the PG/PC in the Firmware Loader dialog box	The message "Download completed successfully" is displayed.	Download procedure is complete.
CP 443-5 Extended	The CP RUN LED flashes.	Download procedure is running.
CP 443-5 Extended	The CP STOP LED is lit.	Download procedure is complete.

Procedure when a download error occurs

If the download operation was terminated by an error, no LED is lit on the CP.

1. Switch the power supply of the rack off and on again.
2. Repeat the load operation.

3.3.6 Working with GSD files

3.3.6.1 Working with GSD files

Introduction

STEP 7 Version 5 applies a more stringent test to the GSD files (GSD = **D**evice **M**aster data**F**file). Syntax errors or non-interpretable errors can occur with GSD files from an older project, however.

Improved help texts are provided for syntax errors and GSD problems starting with STEP 7 Version 5.1 SP2.

If the following measures are not successful, contact the device manufacturer and request a new GSD file. You can find solutions for some errors in this table:

Troubleshooting

When Error Occurs	Error message	Source of Error	Remedy
During insert operation	The 'SIMATIC 400(1) station' does not support the transmission rate of '187.5 kbps' of the "MBK-P' node.	The entry '187.5_supp = 1' is not present.	1. Contact the device manufacturer.
Install a new GSD	The path\file name of the GSD file contains a syntax error. File cannot be interpreted.	Vendor_Name: the number of characters between the quotation marks must not exceed 32; special characters are not allowed.	1. Create a backup copy of the file and open it with a text editor (such as WordPad) 2. Check Vendor_Name. 3. Make corrections to the name, save the file and link it again.
Determine the names of the GSD files and the path: via the object properties of the DP slave	The 'SIMATIC 400(1)' station does not support the transmission rate of '187.5 kbps' of the "MBK-P' node.	The decimal separator in the transmission rate must be entered as a period and not as a comma.	1. Create a copy of the file. 2. Open the original file with a text editor (such as WordPad). In transmission rate, change '187,5_supp = 1' to '187.5_supp = 1'). 3. Start HW Config, select menu command **Options Update catalog**. **Remarks:**If the entry '187.5_supp = 1' is not present, the transmission rate is not supported. Contact the device manufacturer.

3.4 Software update

3.4.1 Software updates

Information

- For additional information on the update of the PCS 7 software, refer to the
  - *Process Control System PCS 7; Software update without utilization of the new functions*
  - *Process Control System PCS 7; Software update with utilization of the new functions*
- For information on updating redundant operator stations in runtime, refer to the section "Guidelines for updating a redundant OS in runtime" in the manual *Process Control System PCS 7; Fault-Tolerant Process Control Systems*.
  A brief overview of this is provided in the "Updating the PCS 7 OS in runtime (Page 67)" section of this documentation.
- Information on installing hot fixes are included in the respective software package with the hot fix.

Information on software update

Note

Note the following:

- An update replaces existing software packages with newer versions of the software. Make sure that you select the latest software packages of the new version.
- You may have to operate the PC stations while updating the software packages:
  In some cases, you must confirm a restart of the PC during installation of the software.
- If you want to update a PCS 7 project of a previous PCS 7 version with a current PCS 7 version, proceed as described in the software update manuals:
  - *Process Control System PCS 7; Software update without utilization of the new functions*
  - *Process Control System PCS 7; Software update with utilization of the new functions*
- The benefits of new software versions may only be available with the corresponding hardware.
- You can find information on the recommended hardware for PC stations in the *Process Control System PCS 7; PCS 7 Readme (Internet version)* documentation.

Using the SIMATIC Management Console

The SIMATIC Management Console (hereafter referred to as Management Console) is a software from the SIMATIC PCS 7 product family for central administration of SIMATIC software products.

You can select the installation of the Management Console in the PCS 7 setup.

You can find information about this in the *Process Control System PCS 7; SIMATIC Management Console* documentation.

3.5 Licenses and license keys

3.5.1 Installing and updating license keys

You can find information on handling license keys for PCS 7 software in the *SIMATIC; Automation License Manager* documentation.

Upgrading the license keys of software packages

To upgrade the license key (Upgrade license key and PowerPack license key), the license keys to be updated must be available on the appropriate PC station.

Upgrading license keys for AS 410 (CPU 410-5H)

You can find information on this in the following sections:

- Section "Upgrade of the System Expansion Card for a CPU 410-5H (Page 56)"
- Section "Upgrade of process objects of a CPU 410-5H by replacing the System Expansion Card (Page 65)"

3.5.2 Upgrade of the System Expansion Card for a CPU 410-5H

3.5.2.1 Basic procedure

Validity

This documentation applies to upgrading the PO volume of a CPU 410-5H (as of firmware version 8.1). During the upgrade, the number of process objects on the System Expansion Card) of the CPU will be relicensed.

Procedure

1. **Order an upgrade**
   You need at least a CPU 410 Expansion Pack for the upgrade.
   You can find information about this in the section "Ordering an upgrade for a CPU 410-5H (Page 58)".
2. **Prepare upgrade**
   You can find information about this in the section "How to prepare for the upgrade of the System Expansion Card (Page 59)".

3. Send **PO-Activation-File via Support Request**
   You can find information about this in the section "How to send the PO-Activation-File (Page 60)"
4. **Performing an upgrade**
   You can find information about this in the section "How to perform the upgrade of the System Expansion Card (Page 62)".

System expansion card (SEC)

The CPU 410-5H is scaled according to the maximum loadable process objects with the System Expansion Card.

The System Expansion Card is plugged into a slot located on the back of the CPU.

CPU 410 Expansion Pack

This product entitles you to upgrade the System Expansion Card of a CPU 410-5H. A CPU 410 Expansion Pack includes the following:

- An upgrade license (COL)
- A data medium with the corresponding upgrade license key

In order to use the CPU 410 Expansion Pack, you need to prepare and perform an upgrade as described in the procedure.

PO-Activation-File

File containing all information for generating the PO-Release-File with the new PO volume that is needed for the upgrade. The PO-Activation-File is created by the Automation License Manager and must be sent to Siemens Customer Support.

Note

System Expansion Card and PO-Activation-File form one unit

The System Expansion Card and the PO-Activation-File form a unit once assigned. The upgrade is valid for this System Expansion Card.

Support Request

You need to create a Support Request and send the PO-Activation-File to Siemens Customer Support as an attachment. You will receive the PO-Release-File as an answer.

PO-Release-File

File for the upgrade to the requested PO volume. For the upgrade to take effect, the PO-Release-File must be assigned to the original System Expansion Card with the Automation License Manager.

You obtain the PO-Release-File from Customer Support after you send the PO-Activation-File to Siemens Customer Support.

3.5.2.2 Ordering an upgrade for a CPU 410-5H

Note

The information about upgrading process objects (PO) only applies to a CPU of the type "CPU 410-5H as of version V8.1".

Process objects of an automation system that require a license

Displaying the number of process objects of an automation system that require a license in SIMATIC Manager:

In the SIMATIC Manager, select the menu command **Options > PCS 7 License Information**. After selecting the "Process objects (AS RT PO)" option in the "PCS 7 License Information" dialog box, the objects that can be operated and monitored **and** generate messages are displayed.
Only these objects are subject to licensing for process mode and require the license key "AS RT PO".

Specifying the PO volume with the CPU 410 Expansion Pack

To upgrade the number of process objects of an automation system that require a license, you need at least a CPU 410 Expansion Pack.

- An upgrade of the System Expansion Card increases the PO volume of the CPU as follows: PO volume on the System Expansion Card + PO volume of all CPU 410 Expansion Packs
- Potential size of a single CPU 410 Expansion Pack:
  - 100 PO
  - 500 PO
- Observe the maximum PO volume of the CPU.
  Additional information is available in the section "Enabling expert mode (Page 65)".
- For a redundantly configured automation system, you must select the CPU 410 Expansion Packs in such a way that the PO volumes are evenly distributed between the System Expansion Cards after the update.
  Examples of the size of individual CPU 410 Expansion Packs when upgrading a redundantly configured automation system:

Expand AS by the PO volume	Possible size of the individual CPU 410 Expansion Packs	Not possible
300PO	6 x 100PO	1x 100PO + 1x 500PO
500PO	2 x 500PO or 10 x 100PO	1x 500PO + 5x 100PO

Ordering a CPU 410 Expansion Pack

The following options are available for ordering:

- Contact your Siemens representative:
  www.siemens.com/automation/partner (www.siemens.com/automation/partner)
- Order online:
  www.siemens.com/industrymall (www.siemens.com/industrymall)

3.5.2.3 How to prepare for the upgrade of the System Expansion Card

Requirements

- CPU 410-5H as of Firmware-Version 8.1
- The CPUs for which you want to upgrade the system expansion card are switched on and functional. Making the preparations does not depend on the CPU operating mode.
- CPU 410 Expansion Pack:
  The license keys of the CPU 410 Expansion Pack are stored on a drive that is available on the engineering station.
  You can find information on the PU 410 Expansion Pack in the section "Ordering an upgrade for a CPU 410-5H (Page 58)"
- You can access the CPU for which you want to perform the PO upgrade with the engineering station via a PCS 7 project.

Preparing for an upgrade (creating the PO-Activation-File)

1. Select the menu command **Edit > Connect target system > Connect/disconnect AS 410...** .
   The "Connect target system" dialog box displays the list of automation systems that are linked with the Automation License Manager.
2. If you want to connect an additional automation system, click the "Add" button.
   The project dialog is displayed.
   - In the PCS 7 project, select the automation system for which you want to perform the PO upgrade.
   - Click "Apply".
     A “SIMATIC PCS 7 AS 410” folder is created under “My Computer”. The automation system and the “Online” subfolder are visible in this folder. The current PO volume of the automation system is shown in the "Online" folder.
3. Using drag-and-drop, transfer the license keys of the CPU 410 Expansion Packs to the folder of the automation system for which you want to perform the PO upgrade.
   If you have selected the wrong automation system, you can move the license keys of the CPU 410 Expansion Packs.
4. Open the "Online" folder in the tree view of the automation system.

5. Select the license.
6. Select the menu command **Target system > Upgrade** for the automation system.

Note

System Expansion Card and selected CPU 410 Expansion Packs form a unit

Executing the subsequent menu command "CPU > Upgrade" confirms the order of the upgrade with the selected components (System Expansion Card und CPU 410 Expansion Packs).

The license keys of the selected CPU 410 Expansion Packs are deleted and a PO-Activation-File is displayed in the list.

The System Expansion Card and the PO-Activation-File form a unit once assigned. The upgrade is valid for this System Expansion Card.

You need to create a Support Request and send the PO-Activation-File to Siemens Customer Support as an attachment. You can find information about this in the section "How to send the PO-Activation-File (Page 60)".

Note

PO-Activation-File

- PO-Activation-Files are created automatically in the following directory on the engineering station:
  Documents > Siemens > Automation > PCS 7 > Activations
- Standard name of a PO-Activation-File:
  <Project name>..<Name of the automation system>..<Name of the CPU>..<Date_YYYYmmdd_hhmmss>.act
  Example: Proj..AS1..CPU410-20140922_173055.act

Additional information

You can find information on the expert mode in the following documents:

- Section "Enabling expert mode (Page 65)"
- Automation License Manager

See also

How to perform the upgrade of the System Expansion Card (Page 62)

3.5.2.4 How to send the PO-Activation-File

Requirement

- You have created a PO-Activation-File for a CPU 410-5H.
- The PO-Activation-File is available on a computer with Internet access.

Note

PO-Activation-Files are created automatically in the following directory on the engineering station:
Documents > Siemens > Automation > PCS 7 > Activations

Sending the PO-Activation-File via Support Request

1. Open the following web page in the Internet browser:
   http://www.siemens.com/automation/support-request
2. **Step 1: Select a product**
   - Enter the following in the "Product/Order number" input field: **CPU 410**
   - Click "Search"
     In the "Product range" list, you will find the entry "SIMATIC PCS7".
   - Select the "CPU 410" option box.
   - Select the check box "Problem with SIMATIC authorization/license".
   - Click "Next".
3. **Step 2: Select an application case**
   - Enter the following in the input field: **Upgrade CPU 410**
   - Click "Next".
4. **Step 3: Our solutions**
   - Click "Next".
5. **Step 4: Describe a problem**
   - Make the entries in the mandatory fields.
   - Enter the following in the "Details" input field: **Request PO-Activation-File**
   - In the "Attachment" area, click "Browse".
     Navigate to the PO-Activation-File on a computer.
     Select the PO-Activation-File and click "Open".
     The file is added to the Support Request as an attachment.
     You can send more than one PO-Activation-File with a Support Request.
   - Click "Next".
6. **Step 5: Specify contact data**
   - Make the entries in the mandatory fields.
   - Click "Next".
7. **Step 6: Summary & Send**
   - Check your entries. Make sure that all attachments are complete.
   - Click "Send".

- **Wait for response**
  You will receive the response mail within 48 hours. The email contains a file for each PO-Activation-File sent. This file is the PO-Release-File with which you perform the upgrade. You can find information on this in the section "Auto-Hotspot".

3.5.2.5 How to perform the upgrade of the System Expansion Card

Requirement

- You can access the automation system for which you want to perform the PO upgrade with the engineering station via a PCS 7 project.
- The System Expansion Card for which you sent the PO-Activation-File to Siemens is inserted in the automation system.
- You have obtained the PO-Release-File.

Perform upgrade with PO-Release-File

1. Transfer the PO-Release-Files you received to the following upgrade directory on the engineering station:
   Documents > Siemens > Automation > PCS 7 > Activations
2. Open the Automation License Manager.
3. Select the menu command **Edit > Connect target system > Connect/disconnect AS 410...** .
   The "Connect target system" dialog box displays the list of automation systems that are linked with the Automation License Manager.
4. Click "OK".
   The connected automation systems are displayed in the list.
5. In the tree view, open the automation system for which you have received the PO-Release-File.
6. Use drag-and-drop to transfer the PO-Release-File to the "Online" folder of the automation system.
   The upgrade is completed. The time needed for this depends on the load of the automation system.
7. After a successful upgrade, the utilized files in the upgrade directory (PO-Release-File and PO-Activation-File) are deleted.
   The Automation License Manager displays the new PO volume for the updated System Expansion Card.

Additional information

You can find information on the expert mode in the following documents:

- Section "Enabling expert mode (Page 65)"
- Automation License Manager

3.5.2.6 Upgrade of a redundantly configured automation system

Objective

The PO volume is to be increased for a redundantly configured automation system.

Requirements

- You can access the CPU for which you want to perform the PO upgrade with the engineering station via a PCS 7 project.
- The CPUs for which you want to upgrade the system expansion card are switched on and functional. Making the preparations does not depend on the CPU operating mode.
- The PO volume on the System Expansion Cards of the CPUs is evenly distributed.

Basic procedure

1. Using CPU 410 Expansion Packs, create the PO-Activation-File for both CPUs at the desired PO volume.
   You can find information on this in the following sections:
   - Section "Ordering an upgrade for a CPU 410-5H (Page 58)"
   - Section "How to prepare for the upgrade of the System Expansion Card (Page 59)"
2. Perform the upgrade for this automation system.
   You can find information about this in the section "How to perform the upgrade of the System Expansion Card (Page 62)".

3.5.2.7 Upgrade of a redundantly configured automation system for CPUs with different PO volumes

Example

In a redundantly configured automation system, a CPU 410-5H is irreparably damaged (due to water damage, for example).

You want to restore the system using new hardware.

Initial state:

- CPUs with different PO volumes are available (for example, 100 PO and 800 PO).
- Redundant operation of the automation system is not possible because different PO volumes are licensed on each of the System Expansion Cards of the CPUs.

Proceed as follows for upgrading the System Expansion Cards.

Recommendation

Avoid the situation in which different PO volumes are licensed on each of the System Expansion Cards of the CPUs.

- If the System Expansion Card is functioning when the CPU fails, insert the System Expansion Card of the failed CPU into a substitute CPU. The substitute CPU will then receive the license key and the PO volume of the System Expansion Card.
- If redundant operation is not possible due to different PO volumes, operate the CPU with the larger PO volume as the active CPU (MASTER).

Objective

Make the PO volumes in the redundant system uniform (e.g., equal to 800 PO) through a PO upgrade.

Requirements

- You can access the CPU for which you want to perform the PO upgrade with the engineering station via a PCS 7 project.
- The CPUs for which you want to upgrade the system expansion card are switched on and functional. Making the preparations does not depend on the CPU operating mode.

Basic procedure

1. Make PO volumes of both CPUs uniform:
   Using CPU 410 Expansion Packs, generate the PO-Activation-File for the CPU (with the lower PO volume), so that the system expansion cards of the redundantly configured automation system have the same PO volume after the upgrade. You must activate expert mode to create the PO-Activation-File in the "Connect target system" dialog box.
2. Run the upgrade for this CPU.

NOTICE
Active CPU with the lower PO volume (master) If the CPU with the lower PO volume is the active CPU (master) in the automation system, this CPU can go to STOP after multiple transfer errors when performing the upgrade.

Additional information

- Section "Ordering an upgrade for a CPU 410-5H (Page 58)"
- Section "How to prepare for the upgrade of the System Expansion Card (Page 59)"
- Section "How to perform the upgrade of the System Expansion Card (Page 62)"

3.5.2.8 Enabling expert mode

You can force an upgrade of the System Expansion Card of a CPU in some situations. To do this, you need to open the "Connect target systems" dialog box in the Automation License Manager.

You can select the "Enable expert mode" check box in the following situations if you accept the effects:

Situation	Effects
If you want to force the upgrade of the System Expansion Card of a CPU with a surplus PO volume.	• The upgrade cancels the limitation on the number of POs for this automation system. • **The surplus process objects are lost**.
If you want to run the upgrade in a redundant automation system with different PO volumes on the System Expansion Cards of the CPUs.	If the active CPU (master) in the automation system is the CPU with the lower PO volume, this CPU can go to **STOP** when transfer errors occur repeatedly.
If the transfer of a PO-Release-File fails and you are certain that it fits the System Expansion Card, you can attempt to force the upgrade.	• The PO-Release-File is transferred successfully without error. • If an error occurs again, the System Expansion Card must be synchronized again. Contact the license hotline. • If transfer errors occur repeatedly, the CPU can go to **STOP**.

3.5.3 Upgrade of process objects of a CPU 410-5H by replacing the System Expansion Card

You need to remove the CPU in order to replace the System Expansion Card (SEC).

Note

Removing the CPU deletes the user program on the CPU.

Note

Redundant operation

You need to replace both SECs for redundant operation. The new SECs must have the same number of POs.

3.6 Determining inventory data and installing software

Determining inventory data

Topic	Detailed Information	Called via	Additional information
Determining inventory data of PC stations	Determining hardware and software of PC stations in a PCS 7 plant	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required)	*Online help of the SIMATIC Management Console* Only PC stations on which the "SIMATIC Management Agent" service is installed can be managed.
Determining licensing	• Determining license keys – Installed – Used • Generating license reports		
Determining the components of the PCS 7 plant	Determining the configured and available components		*Online help of the SIMATIC Management Console* Connection to the engineering station required

Installing software remotely

Note

Only PC stations on which the "SIMATIC Management Agent" service is installed can be managed

- Install and updating SIMATIC software
- Assemble software packages for installation
- Install software packages

3.7 Updating the PCS 7 OS in runtime

Introduction

You have the option of updating a redundant PCS 7 OS configuration at runtime in order to adapt the "older" version of your current PCS 7 process control system to a "newer" PCS 7 version.

Updating the PCS 7 OS involves the following tasks:

- Preparatory measures
- Installation of the "new" software
- Commissioning measures required to adapt your existing PCS 7 process control system

Updating the PCS 7 OS during running operation offers the following benefits:

- Operation of the PCS 7 system is not disrupted.
- The AS does not enter STOP mode.
- The automation process can still be operator controlled and monitored.

Updating a redundant OS during operation

You can find more information about this in the documentation *Process Control System PCS 7; Fault-tolerant Process Control Systems,* Guide to Updating a Redundant OS During Operation.

Configuring diagnostics conditions

4

4.1 Requirements for diagnostics

Requirements

Several requirements must be fulfilled to ensure that the status of a PCS 7 system can be diagnosed effectively. The most important requirements are:

- Diagnostics are enabled for the components.
- Diagnostic options were activated during configuration

Information on configuring the diagnostic options

The primary configurations can be found in the following documentation:

- Configuration manual *Process Control System PCS 7; Engineering System*
- Configuration manual *Process Control System PCS 7; Operator Station*
- *Process Control System PCS 7; Maintenance Station* function manual
- Manual *SIMATIC; SIMATIC PDM (Process Device Manager)*

You can search for information in the index of these manuals by entering "Diagnostics ..." as a key word.

Checking PC components

- You check PC components using software tools of PCS 7 (such as a Maintenance Station or PC DiagMonitor) and the operating system.
- The following configuration actions assist you in diagnosing PC components:

Configured element	Reference
Lifebeat monitoring	Configuration manual *Process Control System PCS 7; Operator Station*
Diagnostic screen for PC diagnostics	Configuration manual *Process Control System PCS 7; Operator Station*
WinCC "System Info" channel	Online help for *WinCC Information System*, "Communication > System Info"
Diagnostics for systems with redundant OS PCs	Configuration manual *Process Control System PCS 7; Operator Station*

Checking module properties

1. Open the project in the SIMATIC Manager.
2. In the component view, select the SIMATIC station.

3. Double-click the "Hardware" object in the detail window.
   HW Config opens.
4. Double-click the module you wish to check.
   The properties dialog box for the selected module opens.
5. Browse the individual tabs for appropriate options.
   Activate the diagnostic properties depending on the module type.
   Available diagnostic options can be found in the following tabs:
   - Diagnostics"
   - Inputs"
   - Outputs"
   - Options"

SIMATIC modules with diagnostic properties

The following components are available in PCS 7 diagnostic-capable modules:

- S7-400
- S7 300 modules
- ET 200M
- ET 200S
- ET 200iSP
- ET 200pro
- DP slaves
- DP/AS-i link
- Diagnostic repeaters
- Network components (SCALANCE)

Additional information

- Online help *PC DiagMon*

Message concept of PCS 7

5

5.1 Servicing a system - message concept

Introduction

The message system and diagnostic options of PCS 7 help you to assess the system status. You can find information about the PCS 7 message concept in the following sections:

- PCS 7 message system (Page 73)
- Origin of a message (Page 75)
- Determining the source of a message (Page 76)
- Evaluating and understanding messages (Page 77)

Basic terms

Some basic terms used in the PCS 7 message concept are defined in the following:

Term	Definition
Events	Events lead to a change in the data status in the automation system. For example, an event can be the following: A bit is modified in an automation system by a change to a process value, or after a specified limit value is reached. The configuration determines which events trigger a message.
Messages	Messages are triggered by events or by a message frame. There are the following message types: • Operator input messages • Process messages • Operating messages • Process control messages and system messages
Error and fault	In PCS 7, the PCS 7 Operator Station operator control and monitoring system is also used to display errors and faults in the process. • **Error:** component (object) status that does not disturb the process (for example, defective display lamps). • **Fault:**component (object) status that interferes with the process (for example, a defective motor).

Additional information

You can find detailed information about the message system as follows:

- In the *WinCC Information System*:
  In the Start menu under the SIEMENS SIMATIC products, select the menu command **WinCC Information System**, under "System Overview > How WinCC Works >
  - Message system of a PCS 7 OS
  - Archive system of a PCS 7 OS
  - Reports system of a PCS 7 OS
- In the configuration manual *PCS 7 Process Control System; Operator Station*, in the section "Settings for the alarm system"
- In the online help for *SIMATIC BATCH*, you will find the following information under "Batch Data Management":
  - Batch reports
  - Archiving batches
- In the *SIMATIC Route Control* online help, you will find the following information under "Operator Control and Monitoring":
  - Route log

5.2 PCS 7 message system

PCS 7 message system

PCS 7 acquires data on the status of your process and process control system using blocks assigned with appropriate parameters. You can influence the response to an event with a suitable program.

The most important message systems of PCS 7 are:

- WinCC operator control and monitoring system
- SIMATIC BATCH batch data management

Both message systems are available on the PCS 7 OS in process mode (runtime).

Configuration of messages in the message lists of PCS 7 OS

Every process message displayed on a PCS 7 OS always includes the following information:

- Date
- Time
- Origin
- Event
- Message Class

You can use the "Alarm Logging" editor of the PCS 7 OS to modify the selection of message information to be displayed in WinCC.

Note

Configuring the PCS 7 message system

- When configuring messages, you can specify the status with which an event is reported.
- As of PCS 7 V8.0 SP1, you can configure the PCS 7 message system. This allows you to configure the importance and display of message classes for process messages project-by-project.

Message accuracy for signal transitions

Note

Be aware of the accuracy of the message system.

If events are recorded within one scan cycle, they can appear in the wrong order in the message list.

Remedy: You can find information about this in the function manual *Process Control System PCS 7; High-precision Time Stamping*.

Additional information

You can find detailed information on configuring messages in the following manuals:

- Configuration manual *Process Control System PCS 7; Engineering System*
- Configuration manual *Process Control System PCS 7; Operator Station*
- Online help in the SIMATIC Manager for the menu item **Configure PCS 7 message system**

5.3 Origin of a message

Message path

Messages can originate in different locations in PCS 7 depending on the configuration. Each message is given a time stamp. The event which causes a time stamp to be assigned to a message depends on the place where the message has originated. Irrespective of where they originate, all messages are handled in the same way regarding how they are displayed and archived on the PCS 7 OS.

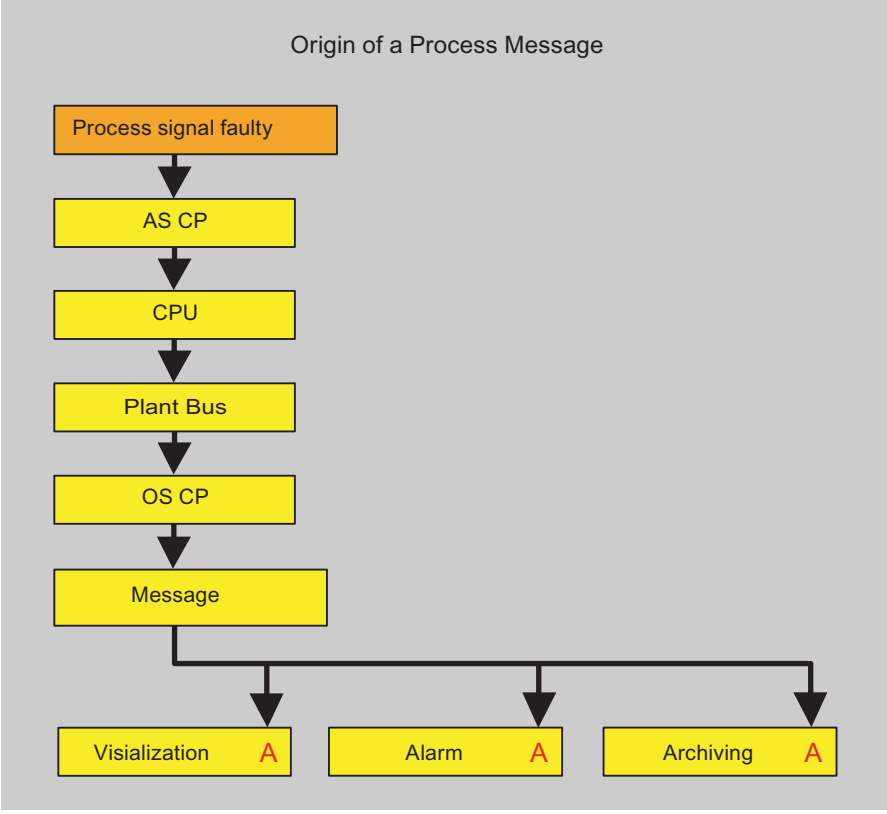


Figure 5-1 The letter "A" in the picture symbolizes an alarm message in PCS 7.

Additional information

You can find information on configuring messages in the following documentation:

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

For information on configuring messages with enhanced time stamp accuracy, refer to the *PCS 7 Process Control System; 10 ms Time Stamping* function manual.

5.4 How to determine the source of a message

Procedure

1. Enable the message list by clicking
   
2. "Activate/Deactivate Autoscroll".
3. In the message list, select the message for which you need additional information.
4. Click "Open Infotext".
   
5. Note the message number and use "Alarm Logging" to determine the source of the message.

5.5 Understanding messages

5.5.1 Introduction

Overview

You can find important information for understanding the PCS 7 message concept in the following sections:

- Message types in message lists and archives (Page 78)
- Target groups of messages (Page 79)
- Message lists in process mode (Page 79)
- Overflow of message buffer (Page 81)
- Message priorities (Page 81)
- Influencing messages (Page 82)

5.5.2 Message types in message lists and archives

Message types in message lists and archives

Messages are divided into the following classes:

Term	Definition
Operator Input messages	Operator Input messages are generated when an operator controls process variables, for example, changes the operating mode of a controller. • PCS 7 generates operator input messages automatically if you use faceplates prepared from the libraries. • If you are using faceplates in the PCS 7 project that were created according to the *"PCS 7 Process Control System; Programming Instructions for Blocks"* documentation, these faceplates can generate PCS 7-compliant Operator Input messages.
Process messages	Process messages signal process events that take place in the automated process, such as limit value violations and operating messages. • Process messages are predefined for the blocks and therefore do not need to be configured. Message texts and message priority can be modified as needed in the object properties for the CFC blocks. These modifications can also be made centrally in the process object view or by means of import/export operations. • Operating messages are a subgroup of process messages. They signal process values that can be used to evaluate a process-related component, such as an operating hours counter.
Process control messages	Process control messages are generated when PCS 7 detects and signals errors in components within its own system. Such errors range from failure of a component to a wire break message for a connected I/O signal. Process control messages are generated by the driver blocks in PCS 7 and do not need to be configured.

System messages

System messages are messages that are triggered by self-diagnostics of a device. System messages are usually included in the process control messages or process messages (operating messages).

5.5.3 Target groups of messages

Target Groups

Message type	Target group: Process management	Target group: Operations management and recording	Target group: System specialist and maintenance specialist
Operator Input messages	X	X	X
Process messages	X	X	X
Operating messages	X	X	X
Process control messages		X	X
System messages			X

5.5.4 Message lists in process mode

Message lists

PCS 7 places incoming messages in message lists. The message is available in different alarm lists, depending on the event source and on the alarm status.

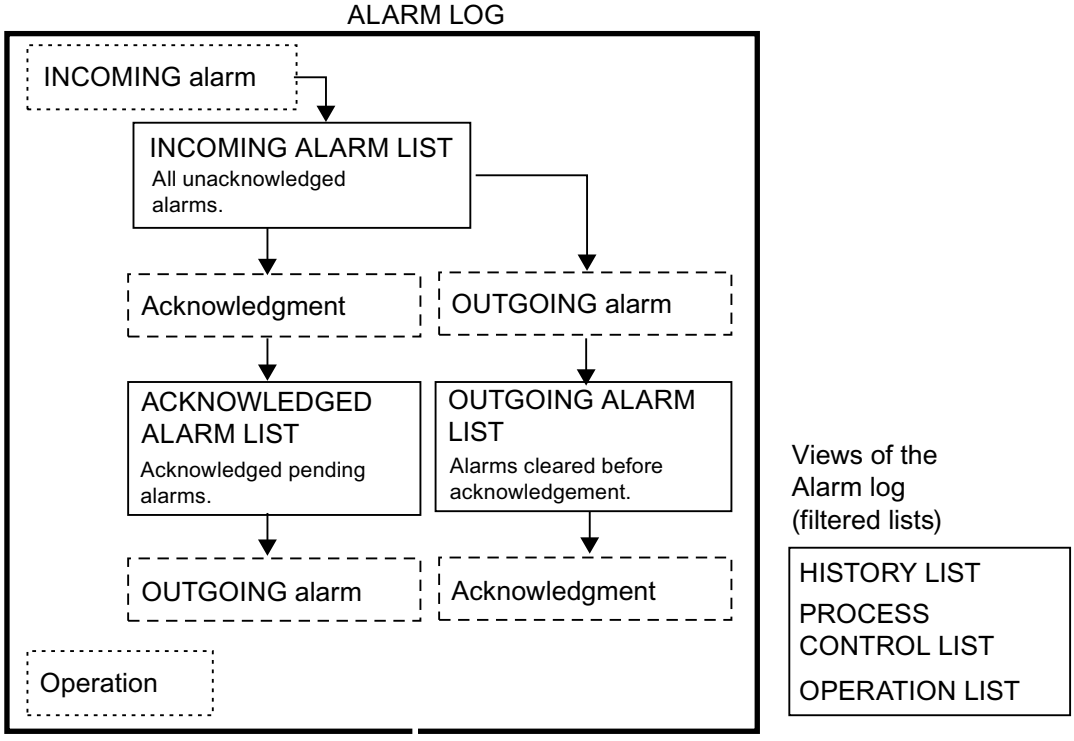
The following messages lists are available by default. You can modify these standard message lists or create additional message lists.

Default message lists

List	Content
Incoming alarm list	The incoming alarm list contains the alarms which require acknowledgment, however, which are still pending acknowledgment or deactivation.
Acknowledged alarm list	The acknowledged alarm list contains the acknowledged process alarms.
Outgoing alarm list	The outgoing alarm list contains the alarms flagged as "Outgoing". Those alarms are no longer active, but are not yet acknowledged.
History list	The history list provides a view of the alarm log which contains all alarms, except the operator log.

List	Content
Process control list	The process control list provides a view of the alarm log, filtered according to process alarms (and comparable ones). Example: Rack failure Process alarms are also displayed in the following lists: • Incoming alarm list • Acknowledged alarm list • Outgoing alarm list • History list
Operation list	The operation list provides a view of the alarm log. The operation list contains the operator log. Examples: • The operator has set the controller setpoint to 5 bar • The operator has activated the drive

The following figure illustrates the path a message takes through the message lists.



Alarm log

All alarms, operator information and status changes are saved to the alarm log. You can use the filters to read specific information from the alarm log.

5.5.5 Overflow of message buffer

Overflow of message buffer

Each component of the overall PCS 7 system can process only a limited number of messages. If more alarms are generated in a component (for example, an AS) within a particular time frame than the component can process, some of these alarms will be lost. If this case, the AS sets an overflow flag and the following event is reported at the PCS 7 OS: "NRMS7 Messages Lost".

Note

If events that trigger messages change status in very quick succession, this can trigger a message surge. The overview of the plant status can no longer be sufficiently ensured.

Additional information

You can prevent a message surge by activating the "Messaging Triggered by Acknowledgment" function. You can find information on configuring in the configuration manual *Process Control System PCS 7; Engineering System.*

5.5.6 Message priorities

Changing message priorities

In PCS 7, a priority can be assigned to each message. 0 is the lowest priority and 16 the highest priority. When a signaling block is newly generated, its messages initially have the lowest priority (0).

You can change the message priority in a variety of ways:

- In the object properties for the block
- In the process object view
- Via an import operation

Rules

- Message priorities can only be specified if you defined the message number range as "Unique for Entire CPU".
- In PCS 7 OS, the unacknowledged message with the highest priority is always displayed in the message row above the overview. If multiple messages have the same priority, the most recent message is displayed here.
- You can filter the list according to priority.

Additional information

You can find information about configuring message priorities in the configuration manual *Process Control System PCS 7; Operator Station.*

5.5.7 Influencing messages

Options

PCS 7 offers the following options for influencing messages:

- Message suppression
  - You can suppress individual block messages with the CFC configuration.
  - In process mode, you can suppress individual messages directly in the faceplate using the "Suppress message" check box.
- Locking and releasing messages for blocks and OS areas
  Locking (and releasing) messages for blocks and OS areas is used when the plant operator wants to lock all messages of an interrupt-capable block or OS area.
- Hiding and displaying messages
  You hide individual messages to reduce the number of messages displayed in process mode. The messages are entered in a history list. The following variations are used to hide and display messages in PCS 7:
  - Manual hiding and showing of messages in process mode
  - Automatic hiding and displaying of messages in process mode

Additional information

- Configuration manual *Process Control System PCS 7; Operator Station*
- Configuration manual *Process Control System PCS 7; Engineering System*
- Manual *Process Control System PCS 7 OS Process Management*

Failure - What next? 6

6.1 Activities in the event of a fault

Basic procedure in the event of a fault

1. Evaluate the messages with regard to the following aspects:
   - Time
   - Sequence
   - Source
2. Determine the location and area of the fault.

   Note

   If the components you are using do not have diagnostics capability, only secondary faults are signaled.

   - Use diagnostic tools to analyze the fault. You can achieve the following with the diagnostic tools:
     You can find the cause of a fault.
     or
     You can verify the presumed cause of a fault.
   - You can find the following information in the section "Diagnostics for PCS 7" for support:
     The diagnostic tools available for PCS 7
     Applications for the various diagnostic tools according to subsystem

     Note

     Make use of skilled experts if you cannot find a solution to your problem based on available information. For information on this topic, refer to the section "Additional support (Page 13)" of this documentation.

3. Determine the actions to be taken.
   In a running plant: check if a stop is necessary.

   Note

   Please note the following:

   - The following actions may only be carried out by qualified personnel and in compliance with valid statutory provisions and plant-specific rules:
     - Changes to the configuration
     - Replacement of and changes to components
   - Bear in mind that uncharacteristic situations can occur in the plant after activation. Make sure the activation of components and secondary systems is carefully directed.

Examples of causes

Fault	Possible causes	Initial diagnostics
CPU fault	• Fault due to internal error • Fault due to external error	CPU diagnostics
CP fault	• Fault due to internal error • Fault due to external error	**Module Diagnostics > Special Diagnostics > NCM S7 Diagnostics CP... >** Information from: • Module" folder • Operating mode" folder • Diagnostic buffer" folder
I/O module fault	• Fault due to SIMATIC station component • Fault due to external influences (such as a short circuit on the module terminals)	**Module diagnostics > Status information** and, if available, diagnostics information
PC component fault	If the PC is running: • Fault due to events • Faulty connections	If the PC is defective: • Repair/replace • Restore data

6.2 Preparing for expert support

6.2.1 Information on cause of fault

Introduction

Topic area	Information
Supporting service experts	• **WHAT?:**Actions for making essential information available to experts for fault analysis. • **WHEN?:**If expert support is needed in the event of a fault, you facilitate the work of the experts by providing them essential information on the plant or the faulty components. • **HOW?:** You can find information on this in this section.

Overview

You support the work of service experts by providing them with information:

- Service experts need information about your plant and the faulty system in order to provide quick support.
  For additional information, refer to the "Plant documentation (Page 85)" section below.
- Service experts need information from the diagnostic buffer of the CPU in order to analyze the cause of a CPU fault.
  For additional information, refer to the "How to read the CPU diagnostic buffer (Page 86)" section below.
- A memory dump facilitates the analysis of the cause of the CPU fault.
  For additional information, refer to the "CPU fault - preparing diagnostics (Page 87)" section below.
- Backing up the diagnostics files facilitates the analysis of an OS fault.
  For additional information, refer to the "How to back up the diagnostic data of the PCS 7 OS (Page 88)" section below.
- You can take all measures necessary to enable remote diagnostics via "remote access".
  For additional information, refer to the "Remote diagnostics of a PCS 7 system (Page 89)" section below.

6.2.2 Plant documentation

Maintaining system information

Information on the components of your system is among the most important information needed for successful repair.

You need this information in the following situations:

- When you are planning maintenance
- When you contact the hotline for assistance

Continual maintenance of this information shortens downtimes in case of a fault. Therefore, always keep up-to-date lists (in a database or in a table, for example) containing the following data:

- Plant
- Unit
- Location in plant
- Components
- Versions
  - Hardware (version, in case of replacement)
  - Firmware
  - Software
  - Libraries used in the S7 program

6.2.3 How to read the CPU diagnostic buffer

Saving diagnostic data

You can make it easier for service engineers to perform initial diagnostics on a faulty CPU by saving and having ready the contents of the diagnostic buffer as service data (as of firmware version V4.0) or in the following formats:

- HEX format
- TXT format

Requirement

The CPU is in STOP mode.

Procedure

1. Select the faulty CPU in the SIMATIC Manager.
2. As of firmware version V4.0:
   Select the menu command **CPU > Save service data**.
   Specify the storage location and name. Save the files.
3. Select the menu command **PLC > Diagnostics/Settings > Module Information**.
   The "Module Information - Online" dialog box opens.

4. Select the "Stacks" tab and read out the following system memory:
   – Block stack (B stack)
   – Interrupt stack (I stack)
5. Provide these data to the service engineers.

6.2.4 CPU fault - preparing diagnostics

Introduction

The following information is important for analyzing a CPU fault:

- Information on the affected CPU
- Information or actions in the event of a fault

Rules

⚠ WARNING

Note the following:

- Only trained service employees should be authorized to work on the process control system.
- Always observe the plant-specific rules and government regulations when making changes to a system.
- Observe the plant-specific boundary conditions and adjust the work accordingly.
- Always bear in mind that changes in a system can impact other sections of the system.

Information on the affected CPU

The following information is needed when a CPU fault occurs:

- Order number
- Firmware version
- Hardware version

If you can access the CPU from the engineering station, you can query this information via the module information. For additional information, refer to the "Module information (Page 141)" section.

Note

A constantly updated list of all module information facilitates troubleshooting in the event of a fault and reduces the time needed for correcting the fault.

Information in the event of a fault

The following information is needed if a fault occurs:

- Operations and actions/event history leading to the fault
- Status indicated by LED displays on the front of the CPU (such as RUN)

Only the RUN LED is lit

The SIMATIC station is functioning without errors.

RUN LED and additional red LED is lit

Faults have occurred in the SIMATIC station. Use the diagnostic tools for analysis. For additional information, refer to the "Diagnostics for the CPU (Page 104)" section.

STOP LED is lit

- If the **STOP LED is lit**, read out the diagnostic buffer. For additional information on procedures, refer to the "How to read the CPU diagnostic buffer (Page 86)" section Save the diagnostics buffer to a HEX file and to a TXT file!
- These data can be analyzed by trained service engineers. They contain information about the cause, for example:
  - I/O error
  - Synchronization error with an H-CPU
- If the possibility exists that a hardware error in the I/O caused the CPU to switch to STOP mode, save the diagnostic buffer of the relevant module and the associated bus interface module (for example, CP 443-5).
- Generate a memory dump.

All LEDs are off or are flashing

You recognize the "CPU defective" status by the following LED displays on the front of the CPU:

- All LEDs are flashing.
- All LEDs are off, even though the power supply is switched on.

For additional support, contact your Siemens representative or Technical Support. Have the "information in the event of a fault" indicated above ready.

6.2.5 How to back up the diagnostic data of the PCS 7 OS

Basic procedure

We recommend that you back up the diagnostic files for analysis of the cause of the OS fault by experts.

Back up the diagnostic folder

1. Close WinCC.
2. Back up all diagnostic folders of WinCC
   (default: [Installation path]\Siemens\WinCC\Diagnostics).
3. Give this information to the service employees.
   You can back up the diagnostic files using the shortcut menu command **Save to > Compressed (zipped) Folder**.

Note

Once the diagnostic files are backed up (not in diagnostic folder), you can delete the content of the diagnostic folder. In this way, you avoid keeping old information in the new diagnostic files.

If the same error occurs the next time you start WinCC, make an additional backup to help the experts. Only a few messages will need to be analyzed in this backup.

6.2.6 Remote diagnostics of a PCS 7 system

Security requirements

If you want to run remote diagnostics in a PCS 7 system, you need to protect this plant against unauthorized access.
You need to take several measures to implement a security concept. Only the entirety of all security measures provides optimum protection for a system.
You can find additional information on this in the whitepaper Safety Concept in PCS 7 and WinCC - Basic Document.

Transmission paths

The data can be transmitted along the following routes:

- Telephone line (modem)
- Network connection (e.g. internal TCP/IP connection of the plant)

Options of remote diagnostics and remote administration of a PCS 7 plant

On PC stations, it is recommended to use the following tools for remote diagnostics and administrative access to PCS 7 plants:

- **VNC**
  The "RealVNC" Enterprise Edition software is approved for remote service access as of PCS 7 V8.0.
- **RDP**
  The use of the Remote Desktop Protocol (RDP) is solely permitted for remote maintenance of PCS 7 clients. Moreover, no server services (e.g. WebNavigator server, DataMonitor server, OPC server) may be run on these computers.

You can find additional information on this in the installation manual *Process Control System PCS 7; PCS 7 - PC Configuration*.

Additional information

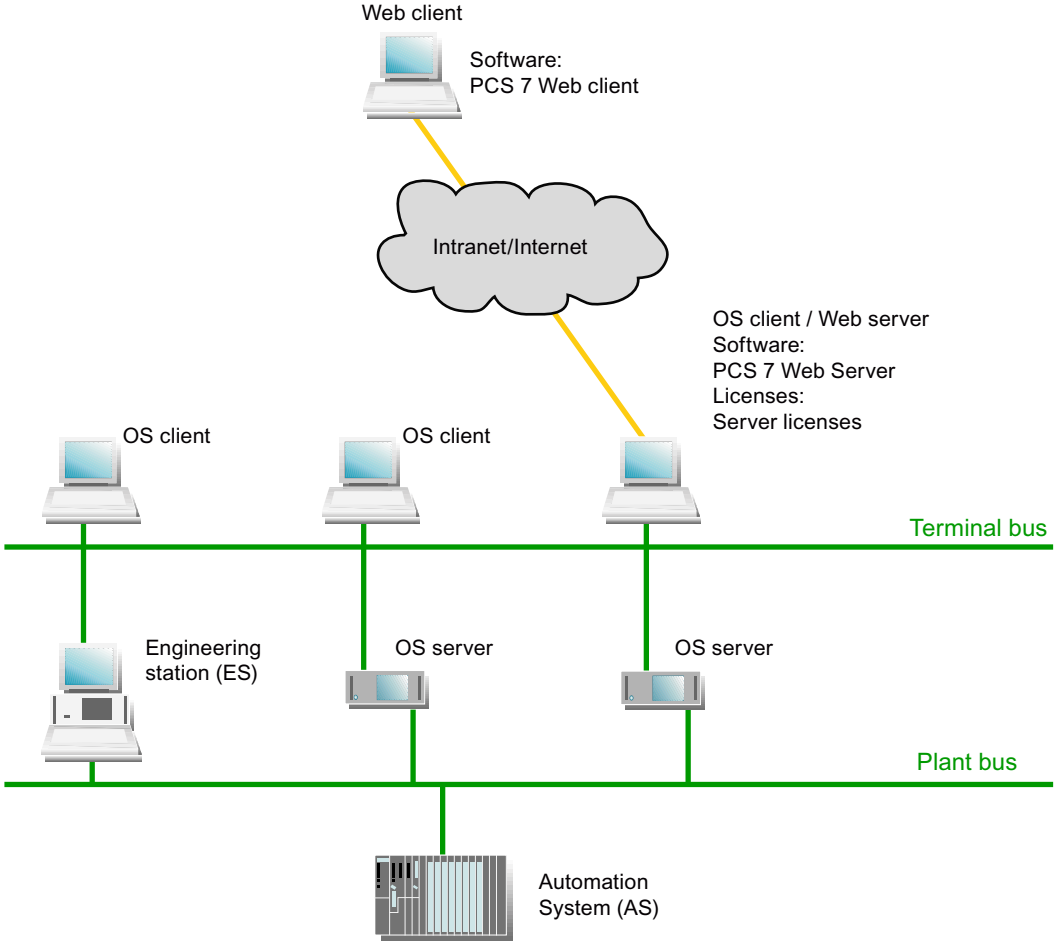
- Whitepaper *Security Concept PCS 7 and WinCC - Basic Document*, section "Security requirement".
- Installation manual *Process Control System PCS 7; PCS 7 - PC Configuration*

6.2.7 Interactive operator control and monitoring with the OS Web Option

Interactive operator control and monitoring of a PCS 7 plant using the OS Web Option

Use the OS Web Option for interactive control and monitoring of a PCS 7 plant.
For additional information, refer to the *Process Control System PCS 7; OS Web Option* manual.

The figure below shows how the OS Web Option (OS Web server, Web client) can be used in a PCS 7 plant.



Transmission paths

The data can be transmitted along the following routes:

- Telephone line (modem)
- TCP/IP connection (system-internal network connection)
- Internet

Security requirements

If you use the OS Web Option in a PCS 7 plant, you must protect this plant against unauthorized access.

Several measures are required to realize a security concept. Optimal protection is only provided with all security measures as a whole.

For additional information, refer to the whitepaper *Safety concept in PCS 7 and WinCC - Base document.*

Diagnostics in PCS 7

7

7.1 Diagnostic capabilities in PCS 7 subsystems

Disclaimer of liability

Note

Siemens assumes no responsibility for inappropriate use of the instructions provided in this documentation or any consequences that might result for the customer.

Note

Note the following:

- Only trained service employees should be authorized to work on the process control system.
- Always observe the plant-specific rules and government regulations when making changes to your system.
- Observe the plant-specific boundary conditions and adjust the work accordingly.
- Always bear in mind that changes in a system can impact other sections of the system.

Introduction

The message system and diagnostic tools of PCS 7 help you to assess the status of your system. You can find information about the diagnostic tools In the following sections.

This description illustrates the capabilities of the diagnostic tools so that you can apply them to your individual requirements.

- You will also find information on the fields of application for diagnostic tools.
- You will learn how to call up a diagnostic tool.
- Since malfunctions can have a variety of causes and because procedures for using the diagnostic tools are already available in the online help, a detailed description is not provided here.

Assessing the status of your process control system

Topic	Questions Answered
Diagnostics in PCS 7	Where can I perform a specific diagnostics operation?
Diagnostic tools	• Which diagnostic procedures can be performed with a diagnostic tool? • How is the diagnostic tool activated? • Where can I find a description of the diagnostic tool or diagnostic capability?

Diagnostics

Diagnostics refers to all activities intended to:

- Ascertain the status of a system
- Find errors and faults as early as possible and identify their cause

Diagnostic messages

Diagnostic capabilities are used to analyze the system status and to determine the causes of faults.

Overview of diagnostic tools

You can find information on using diagnostic tools, grouped according to areas of application, in the following sections:

- Full Diagnostics Using the Maintenance Station (Page 95)
- Diagnostics for PC user settings (Page 98)
- Diagnostics for PC Components (Page 99)
- Diagnostics for Network Connections (Page 101)
- Diagnostics during Configuration (Page 103)
- Diagnostics for the CPU (Page 104)
- Diagnostics for Modules (Page 105)
- Diagnostics for PROFIBUS DP (Page 106)
- Diagnostics on PROFIBUS PA (Page 108)
- Diagnostics on PROFINET (Page 107)
- Diagnostics on FOUNDATION Fieldbus (Page 109)
- Diagnostics for the OS (Page 110)
- Diagnostics for the BATCH station (Page 111)
- Diagnostics for the Route Control station (Page 112)
- Diagnostics for the time of day (Page 113)

For many components, you will find displays on the front panel indicating the status of the component and any errors. Analyzing these displays enables you to obtain information without intervening in the system. The additional product manuals you will need for this analysis can be found in the section "Diagnostics for Hardware Displays (Page 114)".

7.2 Diagnostics with the maintenance station (asset management)

Introduction

With PCS 7 V6.1 and higher, a PCS 7 system can be fully diagnosed with the help of the Maintenance Station. The Maintenance Station is an operator station that is specially configured and assigned parameters for use in diagnostic and maintenance functions.

We particularly recommend the use of a Maintenance Station in medium and large PCS 7 systems.

Maintenance Station

With the Maintenance Station, PCS 7 enables you to call up information on the states of all PCS 7 components on diagnostics screens which are hierarchically structured. As part of this process, the data of a component are analyzed using the available online functions of the associated tools. You can access ES data from the diagnostics screens (can be controlled via access protection mechanisms).

Screens for process-control diagnostics can be generated automatically for the entire PCS 7 system and made available on the Maintenance Station. The top level forms an overview screen for the entire system.

Note

Disabling lifebeat monitoring

If you are running a Maintenance Station in the plant, the sign-of-life with "Lifebeat Monitoring" must be disabled.

Diagnostics options

You can find information on the states of individual PCS 7 components with diagnostic capability on the Maintenance Station's special diagnostics screens.

Area	Diagnostics for ...
Automation systems	• CPU • SIMATIC PCS 7 BOX • Distributed I/O, such as ET 200M, ET 200S, ET 200iSP, ET 200pro, input and output modules • Field devices (HART, PROFIBUS PA, ...) • Redundancy – Master/standby configuration – Status of redundant partners
PC stations	• Operator stations • BATCH stations • Route Control stations • Archive server • SIMATIC PCS 7 BOX • SIMATIC Industrial PCs • Standard PCs (also WebNavigator client or WebNavigator diagnostic client via IP address) • Connection status (bi-directional between OS server and OS client) • Redundancy for PC stations from PCS 7 – Master/standby configuration – Status of redundant partners
Ethernet components	• Switches, e.g.: – SCALANCE X • Network objects (via profile file) – Bridges – Router • Network components, which enable diagnostics using the "NIB II" profile (for example, printers and other SNMP-capable devices)
PROFIBUS components	• PROFIBUS DP – Interface modules (IM) – Couplers – Link modules – Diagnostic repeaters • PROFIBUS PA – Interfaces – Couplers

Area	Diagnostics for ...
PROFINET components	• Interface modules (IM) • IE/PB-Link – Couplers
Intelligent field devices	• HART field devices • Field devices on the following fieldbus systems: – PROFIBUS DP – PROFINET – PROFIBUS PA – FOUNDATION Fieldbus • Devices of different product groups e.g. – SIPART – SITRANS

Additional information

- You can find a description of how to configure a Maintenance Station in the function manual *Process Control System PCS 7; Maintenance Station*.
- You can find a description of how to use the Maintenance Station in process mode in the configuration manual *Process Control System PCS 7; PCS 7 OS Process Control*.
- You can find information on the configuration of a PCS 7 plant with a Web Diagnostics server and Web Diagnostics client in the function manual *Process Control System PCS 7; PCS 7 OS Web Option*.
- You can find additional information on the Maintenance Station for field device diagnostics in the function manual *Process Control System PCS 7; Maintenance Station*.
- You can find information on using SIMATIC PDM for field device diagnostics in the section "SIMATIC PDM (Page 143)".
- Section "Lifebeat monitoring (Page 129)"

7.3 Diagnostics for PC user settings

Overview

Diagnostics for	Diagnostics tool	Called via
Defining users, setting authorizations for access to files and folders (Windows users and user groups)	Windows User Management (Page 121)	**Control Panel > System and Security > Administrative Tools > Computer Management > System Tools > Local Users and Groups**
WinCC users	User administrator (Page 132)	Open WinCC Explorer by selecting the menu command **Editors > User Administrator > Open**
PCS 7 users (user roles and rights in PCS 7 applications)		In the Start menu, Siemens SIMATIC programs: **SIMATIC Logon > Configure SIMATIC Logon**
Shares	Shares for drives, folders and files (Page 120)	**Control Panel > System and Security > Administrative Tools > Computer Management > System Tools > Shared Folders > Shares**

7.4 Diagnostics for PC components

Overview

Diagnostics for	Diagnostics tool	Called via
Status of PC stations, redundancy	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
PCS 7 plant • Administrative tasks • Acquisition of inventory data • Installed SIMATIC software • Installed license keys	SIMATIC Management Console (Page 66)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required)
PC configuration	Windows System Information (Page 118)	Enter the following in the "Run" dialog of the Start menu: **msinfo32"** Note: You can save the system information to a file. 1. Select in the Start menu under **Options > System Programs > System Information**. 2. Select the menu command **File > Save**.
Functions of drivers, logs, and services	Managing the operating system (Page 119)	**Control Panel > System and Security > Administrative Tools > Computer Management > System Tools > Event Viewer** Note: Only blue icons = "all correct"
Function of standard network modules	Set PC station (Page 122)	In the Start menu, Siemens SIMATIC programs: **SIMATIC NET > Settings > Set PC Station** In the tree view, select **PC Station > "Network Module" modules > Softnet IE**. Click "Test".
Online verification of operating capability of redundant OS components	Displaying the redundancy state (Page 135)	Picture must be configured and downloaded to the OS. Additional information is available in the configuration manual *Process Control System PCS 7; Operator Station*
Networks and network connections		You can find information on this in the section "Diagnostics for network connections (Page 101)"
Security settings and patches	MBSA (Page 129)	Enter the following in the "Run" dialog of the Start menu: **"Mbscali.exe"**
Printers and print jobs	Printers and print jobs (Page 124)	In the Start menu in the settings for **Printers and Faxes** To obtain information about a print job, click on the printer executing the job.

Diagnostics for	Diagnostics tool	Called via
Installed versions of the PCS 7 software	Installed SIMATIC software (Page 125)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > Product Information > Installed Software** Language version of the PCS 7 software • European language version: __SIMATIC PCS 7 EU__ • Asian language version: __SIMATIC PCS 7 CHS__
PCS 7 bundle PCs	PC DiagMonitor (Page 124)	PC DiagMonitor is started automatically on bundle PCs when the PC starts up.
Monitoring RAID disks (PCS 7 Bundle PC only)	PC DiagMonitor (Page 124)	PC DiagMonitor is started automatically on bundle PCs when the PC starts up. Note: Manufacturers of RAID systems often provide diagnostic programs along with the RAID system. Check the information of the RAID manufacturer.

7.5 Diagnostics for network connections

Overview

Diagnostics for	Diagnostics tool	Called via
Connections with diagnostic capability	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*.
Determining inventory data of network components	SIMATIC Management Console (Page 66)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Plant view >** Shortcut menu command **"Determine inventory data"** Additional information is available in the online help for *SIMATIC Management Console*.
Network configuration	NetPro (Page 125)	**Network > Check Consistency**
Established connections to SIMATIC stations	NetPro (Page 125)	Select CPU: **PLC > Activate Connection Status**
Status of network cards on Industrial Ethernet	Windows "Network Connections" dialog (Page 127)	**Control Panel > Network and Internet > Network Connections > Change Adapter Settings** Note: Select the "Details" view.
Connections to other stations; IP address, MAC address	Command line input (Page 122)	Enter the following in the "Run" dialog of the Start menu: "cmd" In the DOS window, enter the **ping <IP address>**
Determining MAC addresses and TCP/IP addresses	Command line input (Page 122)	Enter the following in the "Run" dialog of the Start menu: "cmd" In the DOS window, enter **ipconfig –all**.
Infrastructure server (DHCP, WINS, DNS)	Command line input (Page 122)	Enter the following in the "Run" dialog of the Start menu: "cmd" In the DOS window, enter **ipconfig –all**.
PC station	Set PC Station (Page 122)	In the Start menu, Siemens SIMATIC programs: **SIMATIC NET > Set PC Station**
Redundant switches: • SCALANCE X-300 • SCALANCE X-400	Observer function (Page 127)	Enter the following in the "Run" dialog of the Start menu: "cmd" In the DOS window, enter **TELNET** . Additional information in the *Configuration Manual SIMATIC NET; Industrial Ethernet Switches SCALANCE X-300 / X-400*
Loop detection in the network	Loop detection (Page 127)	Can be configured via Web Based Management of the SCALANCE X200/X300 and X400 switches

Diagnostics for	Diagnostics tool	Called via
Status of network components, status of a WinCC application	Station Configuration Editor (Page 123)	Configuration with HW Config and loading of PC station required Call: in the taskbar via the button: 
Connections to intelligent field devices	SIMATIC PDM (Page 143)	In SIMATIC Manager: **Options > Set PG/PC Interface**
PC Ethernet modules	NCM S7 Industrial Ethernet (Page 126)	In the Start menu, Siemens SIMATIC programs: **STEP 7 > NCM S7 Industrial Ethernet > Diagnostics**
Status of configured channels and their connections to the SIMATIC station	WinCC - Channel Diagnosis (Page 132)	In the Start menu, Siemens SIMATIC programs: **WinCC > Tools > Channel Diagnostics** > "Channels/Connections" tab
Connections to the OS: faulty or established	Lifebeat Monitoring (Page 129)	Call picture (@CONFIG.PDL) in process mode. Lifebeat Monitoring must have been set up.
Status of process interface	Status of connections (Page 134)	In the WinCC Explorer: **Options > Status of Connections**
Client-server connections	Status of multi-user operation (Page 133)	In the WinCC Explorer: **Options > Status of Multi-User Operation**
Determine stations Find IP address and MAC address Message frames Collisions	BANY (add-on product) (Page 145)	If you have installed BANYnet, call the program with the menu command **Start menu > Programs > BANYnet**.
PROFIBUS DP connections		You can find additional information in the section "Diagnostics on PROFIBUS DP (Page 106)"
PROFIBUS PA connections		You can find additional information in the section "Diagnostics on PROFIBUS PA (Page 108)".
Status of devices which support SNMP (e.g., network switches)	PC DiagMonitor (Page 124)	In the Start menu, Siemens SIMATIC programs: **PC DiagMonitor > Management Station**

7.6 Diagnostics during configuration

Overview

Diagnostics for	Diagnostics tool	Called with
Consistency of hardware configuration	HW Config (Page 140)	Menu command **Station > Check Consistency**
Consistency of PC station configuration	Station Configuration Editor (Page 123)	Click the following icon in the taskbar:  Analyze "Status" column table entry
Block consistency in a SIMATIC station	SIMATIC Manager (Page 138)	Select SIMATIC Station > S7 Program > Blocks Menu command **Edit > Check Block Consistency**
Chart consistency in a SIMATIC station	SIMATIC Manager (Page 138)	Select SIMATIC Station > S7 Program > Charts Menu command **Edit > Check Consistency**
Connection error	Module Information (Page 141)	Select the SIMATIC station in SIMATIC Manager or the CPU in HW Config.
Open signal interconnections in PCS 7 Operator Station	PCS 7 operator station (WinCC)	Convert pictures
Connection functions for a PC station	Set PC Station (Page 122)	In the Siemens SIMATIC programs Start menu: **SIMATIC NET > Settings > Set PC Station**

7.7 Diagnostics for the CPU

Overview

Diagnostics for	Diagnostics tool	Called via
CPU module information, redundancy, connections	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the manual *Process Control System PCS 7; Maintenance Station*
Determining inventory data of automation systems	SIMATIC Management Console (Page 66)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Plant view >** Shortcut menu command **"Determine inventory data"** Additional information is available in the online help for *SIMATIC Management Console*.
CPU	HW Config (Page 140)	Select CPU: Menu command **Station > Online**
CPU	Module Information (Page 141)	Select the SIMATIC station in SIMATIC Manager or Select the CPU in HW Config. Select the menu command **PLC > Module Information**
Module displays	Evaluating the Module Display (Page 114)	Notes on the manuals: Diagnostics for hardware displays (Page 114)
CPU fault - preparing diagnostics	Only to support experts	CPU fault - preparing diagnostics (Page 87)

7.8 Diagnostics for modules

Overview

Diagnostics for	Diagnostics tool	Called via
Diagnostics of all diagnostic-capable modules	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the manual *Process Control System PCS 7; Maintenance Station*
Determining inventory data of automation systems	SIMATIC Management Console (Page 66)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Plant view >** Shortcut menu command **"Determine inventory data"** Additional information is available in the online help for *SIMATIC Management Console*.
Modules and CPs with diagnostics capability	HW Config (Page 140)	**Station > Open Online**
I/O modules and CPs with diagnostics capability	Module Information (Page 141)	Select the SIMATIC station in SIMATIC Manager or the CPU in HW Config. Select the menu command **PLC > Module Information**
Module displays	Evaluating the Module Display (Page 114)	Notes on the manuals: Diagnostics for Hardware Displays (Page 114)

7.9 Diagnostics for PROFIBUS DP

Overview

Diagnostics for	Diagnostics tool	Called via
Devices and connections with diagnostic capability	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
Determining inventory data of field devices	SIMATIC Management Console (Page 66)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Plant view >** Shortcut menu command **"Determine inventory data"** Additional information is available in the online help for *SIMATIC Management Console*.
Internal PROFIBUS DP interface of the CPU	Module Information (Page 141)	Diagnostics via **HW Config > Module Information**
PROFIBUS DP error	PROFIBUS DP Diagnostics With Diagnostic Repeater (Page 142)	Diagnostics via **HW Config > Module Information**
Status of PROFIBUS nodes	NetPro (Page 125)	In the Start menu, Siemens SIMATIC programs: **STEP 7 > NetPro** Select the menu command **View > With DP Slaves** to display the DP slaves in the network view
Status of stations	NCM S7 (Page 128)	In the Start menu, Siemens SIMATIC programs: **STEP 7 > NCM S7 > Diagnostics**
Station failure Fault indication with detailed information about cause of error Name and comment from HW Config Order number, addresses, slot types	SYSTEM Process Control Diagnostics (add-on product) (Page 147)	Picture must be configured and downloaded to the OS. Additional information is available in the configuration manual *Process Control System PCS 7; Operator Station*

7.10 Diagnostics on PROFINET

Overview

Diagnostics for	Diagnostics tool	Called via
Devices and connections with diagnostic capability	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
Determining inventory data of field devices	SIMATIC Management Console (Page 66)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Plant view >** Shortcut menu command **"Determine inventory data"** Additional information is available in the online help for *SIMATIC Management Console*.
Internal PROFINET interface of the CPU (only for CPU 41x- PNIO	Module information (Page 141)	Diagnostics via **HW Config > Module Information**
Status of PROFINET stations	Topology Editor (Page 128)	Diagnostics via **Edit > PROFINET IO > Topology**.
Status of PROFINET stations	NetPro (Page 125)	In the Start menu, Siemens SIMATIC programs: **STEP 7 > NetPro** Select the menu command **View > With DP Slaves** to display the DP slaves in the network view
Status of stations	NCM S7 (Page 128)	In the Start menu, Siemens SIMATIC programs: **STEP 7 > NCM S7 > Diagnostics**
Fieldbus diagnostics	BANY (Page 145)	In the **Programs > BANY PNIO** Start menu

7.11 Diagnostics for PROFIBUS PA

Overview

Diagnostics for	Diagnostics tool	Called via
Devices and connections with diagnostic capability	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
Determining inventory data of field devices	SIMATIC Management Console (Page 95)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Plant view >** Shortcut menu command **"Determine inventory data"** Additional information is available in the online help for *SIMATIC Management Console*.
Devices and connections on the PROFIBUS PA with diagnostic capability	SIMATIC PDM (Page 143)	SIMATIC Manager: **View > Process Device Network View**
Status of devices on the PROFIBUS PA with diagnostic capability	NCM S7 (Page 128)	In the Start menu, Siemens SIMATIC programs: **STEP 7 > NCM S7 > Diagnostics**
Station failure Fault indication with detailed information about cause of error Name and comment from HW Config Order number, addresses, slot types	SYSTEM Process Control Diagnostics (add-on product) (Page 147)	Picture must be configured and downloaded to the OS. Additional information is available in the configuration manual *Process Control System PCS 7; Operator Station*

See also

Determining inventory data and installing software (Page 66)

7.12 Diagnostics on FOUNDATION Fieldbus

Overview

Diagnostics for	Diagnostics tool	Called via
Devices and connections with diagnostic capability	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
Determining inventory data of field devices	SIMATIC Management Console (Page 66)	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Plant view >** Shortcut menu command **"Determine inventory data"** Additional information is available in the online help for *SIMATIC Management Console*.
Diagnostics of the FF Link (IM 153-2 FF and FDC 157)	Module information (Page 141)	Diagnostics via **HW Config > Module Information**
Devices and connections on FOUNDATION Fieldbus with diagnostic capability	SIMATIC PDM (Page 143)	SIMATIC Manager: **View > Process Device Network View**

7.13 Diagnostics for the OS

Overview

Diagnostics for	Diagnostics tool	Called via
Operating capability of all OS components and communication connections	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
WinCC projects and the assigned SIMATIC stations	Lifebeat monitoring (Page 129)	Call picture (@CONFIG.PDL) in process mode. Lifebeat Monitoring must have been set up.
Connections between OS components	Simatic Shell (Page 130)	Windows Explorer (workstation): Select PC station > "Simatic Shell" folder > in the shortcut menu **Properties**
Connection between WinCC and AS	Status of connections (Page 134)	In WinCC: **Options > Status of Connections**
Connection between OS server and OS client	Status of multi-user operation (Page 133)	In WinCC: **Options > Status of Multi-User Operation**
Status of channels and connections to the AS	WinCC Channel Diagnostics (Page 132)	In the Start menu, Siemens SIMATIC programs: **WinCC > Tools > Channel Diagnostics**
Displaying the status of the connected OS servers on the OS client	Area overview (Page 134)	In WinCC: Area overview > "Status of the connected server" icon OS is in process mode
Operating capability of redundant OS components	Displaying the redundancy state (Page 135)	Picture must be configured and downloaded to the OS. You can find information about this in the configuration manual *Process Control System PCS 7; Operator Station*
Time master role of the redundant OS server	Time master role of the OS server (status) (Page 135)	The tags "@TimeSyncDevice1State" and "@TimeSyncDevice2State" need to be configured on a faceplate. The OS must be loaded.
General system information of an OS server	WinCC "System Info" channel (Page 131)	Picture must be configured and downloaded to the OS. You can find information about this in the configuration manual *Process Control System PCS 7; Operator Station*
OS fault - preparing diagnostics	Only to support experts	You can find information on this in the section "OS fault - preparing diagnostics (Page 88)".
Status PCS 7 Web Server		Internet Explorer: http://<server_address>.status.html

7.14 Diagnostics for the BATCH Stations

Overview

Diagnostics for	Diagnostics tool	Called via
Operating capability of all BATCH components and communication connections	Maintenance station (Page 95)	The maintenance station is an operator station that is specially configured for use in diagnostics. The maintenance station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
Status of the BATCH server	Status icons in the BATCH server taskbar (Page 136)	Taskbar
Status of master	Status icons in the BATCH server taskbar (Page 136)	Taskbar
Status of the standby server (partner server)	Status icons in the BATCH server taskbar (Page 136)	Taskbar
Status of the batches	Status display at order folder (Page 137)	Order folder Additional information is available in the documentation *Process Control System PCS 7; SIMATIC BATCH*

7.15 Diagnostics for the Route Control stations

Overview

Diagnostics for	Diagnostics tool	Called via
Operating capability of all SIMATIC Route Control components and communication connections	Maintenance Station (Page 95)	The Maintenance Station is an operator station that is specially configured for use in diagnostics. The Maintenance Station has to be configured. Additional information is available in the documentation *Process Control System PCS 7; Maintenance Station*
Status of redundant servers	Status icons in the Route Control server taskbar (Page 138)	Taskbar
Established connections to SIMATIC stations	NetPro (Page 125)	NetPro: Online view > Select CPU: **PLC > Activate Connection Status**

7.16 Diagnostics for time of day

Overview

Diagnostics for	Diagnostics tool	Called via
AS-CPU time	SIMATIC Manager (Page 138)	Select CPU: **PLC > Set Time of Day**
AS-CPU time	Module Information (Page 141)	**Station > Open Online** Select CPU: **PLC > Set Time of Day**
PC time	Managing the operating system (Page 119)	**Control Panel > Clock, Language and Region > Date and Time.** Do not change these settings.
Activated time services	Windows System Utilities	**Control Panel > System and Security > Administrative Tools > Services**"Windows timer"
Synchronization status on the terminal bus	Set PG/PC Interface (Page 123)	In the Start menu, Siemens SIMATIC programs: **SIMATIC NET > Set PG/PC Interface** Select interface > Click "Diagnostics" > In the "Time" group
Configuration of time displayed in operator control and monitoring systems	WinCC Editor "Time Synchronization"	Open WinCC Explorer with the menu command **Editors > Time Synchronization > Open**

7.17 Diagnostics for hardware displays

Overview

Many components have displays indicating the component status and errors. Analyzing these displays enables you to obtain information without intervening in the system.

Components	You can find information about diagnostic options in the following manuals and sections:
Power supply module	Reference manual *SIMATIC; S7-400 Programmable Controller; Module Specifications* • Backup battery (optional) • Error messages by means of LED displays • Operator control and display elements
Central module for S7-400 CPU	Reference manual *SIMATIC; S7-400 Programmable Controller; CPU Specifications* • Monitoring functions of the CPU • Status and error displays • Operating mode switch
CP 441	Manual *SIMATIC; CP 441 Point-to-Point Communication - Installation and Parameter Assignment* • Diagnostics for CP 441
CP 443-1	Device manual *S7 CPs/Part B4; Description of CP 443-1* • Displays and operating mode switch
CP 443-5 Extended	Device manual *S7 CPs/Part B4; Description of CP 443-5 Extended* • Displays and operating mode switch
S7-300 I/O modules	Reference manual *SIMATIC; S7-300 Programmable Controller; Module Specifications* • Diagnostic data for the signal modules Additional information is available in the ET 200M Signal Modules for Process Automation (http://support.automation.siemens.com/WW/view/en/7215812) manual or in the ET 200M distributed I/O device HART analog modules (http://support.automation.siemens.com/WW/view/en/22063748) manual.
S7-300 fail-safe signal modules	Manual *SIMATIC; Programmable Controller S7-300; Fail-safe Signal Modules* • Diagnostics of F-SM errors • Properties, front view, connection and block diagram
S7-300 Ex I/O modules	Manual *SIMATIC; Programmable Controller S7-300, ET 200M; Ex I/O modules* • Digital input module: Properties • Diagnostics for analog modules • Module view and block diagram

Components	You can find information about diagnostic options in the following manuals and sections:
ET 200M	Manual *SIMATIC;* *ET 200M Distributed I/O;* Commissioning and Diagnostics • Diagnostics by means of LED display IM 153-1, IM 153-2 • Diagnostics with STEP 7
ET 200iSP	Manual *SIMATIC;* *ET 200iSP Distributed I/O; Commissioning and Diagnostics* • Status and error LEDs on IM 151-2 • Insertion and removal of modules • Line break of the NAMUR encoder on the digital input module • Diagnostics with STEP 7
ET 200pro	Manual *SIMATIC;* *ET 200pro Distributed I/O System; Commissioning and diagnostics* • LED display ... • Insertion and removal of modules • Diagnostics with STEP 7
ET 200S	Manual *SIMATIC;* *ET 200S Distributed I/O; Commissioning and Diagnostics* • Diagnostics by means of LED displays • Diagnostic messages for electronic modules
DP/PA Coupler	Manual *SIMATIC;* *Bus couplers DP/PA- Link and Y-Link* Diagnostics by means of LED displays • LED displays of the IM 157 • LED displays of the DP/PA coupler • LED displays of the Y coupler
Y-Link	Information under DP/PA Coupler
FF Link	Manual *SIMATIC;* *Bus couplers FF- Link*
AFD (use on fieldbus - PROFIBUS PA or FOUNDATION Fieldbus)	Manual *SIMATIC;* *SIMATIC NET; PROFIBUS PA* • Diagnostics by means of LED displays • Diagnostic messages for electronic modules
AFS (use on fieldbus - PROFIBUS PA or FOUNDATION Fieldbus)	Manual *SIMATIC;* *SIMATIC NET; PROFIBUS PA* • Diagnostics by means of LED displays • Diagnostic messages for electronic modules

Components	You can find information about diagnostic options in the following manuals and sections:
Diagnostic repeaters	Manual *SIMATIC;* *Diagnostic Repeater for PROFIBUS DP* • LED diagnostics
Switch for Ethernet	Operating Instructions *SIMATIC NET;* *Industrial Ethernet Switches SCALANCE X-400* • LED Commissioning manual *SIMATIC NET; Industrial Ethernet, SCALANCE X-100 and SCALANCE X-200 Product Line* • SCALANCE X<…> displays (SCALANCE X208 displays, for example)

Status LEDs for PROFINET IO and PROFIBUS DP

Comparison of LEDs for diagnostics

The following table includes information on the LEDs available for an initial diagnostics and the meaning of the LED.

LED	Meaning for PROFINET IO	Meaning for PROFIBUS DP
BUSF	Lit up in red:	Lit up in red:
	Bus error (no physical connection to a subnet/switch)	Bus error at interface (e.g. bus short-circuit)
	Incorrect transmission rate	
	Full duplex transmission is not activated	
	Flashing:	Flashing:
	The PROFINET device is a controller:	The module is a DP master:
	Failure of a connected IO device	Failure of a connected station
	At least one of the assigned IO devices cannot be addressed	At least one of the assigned slaves cannot be addressed
	Incorrect configuration	Incorrect configuration
	The PROFINET device is an IO device:	The module is a DP slave:
	The watchdog time has expired.	The watchdog time has expired.
	Bus communication via PROFINET is interrupted.	Bus communication via PROFIBUS DP is interrupted.
	IP address is incorrect.	PROFIBUS address is incorrect.
	Incorrect configuration	Incorrect configuration
	Incorrect parameter assignment	
	Incorrect or missing device name	
	IO controller not available/turned off, but Ethernet connection exists.	
RX	Lit up in yellow:	Not available
	Data is received via the interface.	
	The LED flickers when low data volumes are transferred.	

LED	Meaning for PROFINET IO	Meaning for PROFIBUS DP
TX	Lit up in yellow:	Not available
	Data is sent via the interface.	
	The LED flickers when low data volumes are transferred.	
LINK	Lit up in green:	Not available
	Another device (most often a switch) is connected and the physical connection exists.	
FO	Lit up in yellow:	Not available
	The respective transmission path has to be inspected.	End of form

7.18 Diagnostic tools

7.18.1 Diagnostics tools of PCS 7

Disclaimer of liability

⚠ WARNING

Siemens assumes no liability for improper use of the instructions provided in this documentation and for any consequences that might result for the customer.

⚠ WARNING

Note the following:

- All work must be performed by trained service personnel.
- Always observe the plant-specific rules and government regulations when making changes to your system.
- Observe the plant-specific boundary conditions and adjust the work accordingly.
- Always bear in mind that changes in a system can impact other parts of the system.

7.18.2 Diagnostics for the PCs

7.18.2.1 Windows System Information

Calling

Enter the following in the "Run" dialog of the Start menu: "**msinfo32**".

Overview

Topic	Detailed information	Called via	Additional information
PC configuration	Operating system Operating system version PC NAME Processor BIOS data Users currently logged on Time zone Size of the work memory Information on the swap file	**System Overview**	Online help of the operating system
Graphics card	Type of graphics card	**Control Panel > System and Security > System Tools > Device Manager** **Graphics card**	Online help of the operating system
Graphics settings	Set resolution of graphics card	**Shortcut menu on the desktop** or **Control Panel > Appearance and Personalization > Display** **Adjust resolution**	Online help of the operating system
Printer	Display of existing printers	**Start > Devices and Printers**	Online help of the operating system
Drives	Recognized internal and external drives or storage media Partitioning of hard disks	**Control Panel > System and Security > Administrative Tools** **Computer Management > Storage > Disk Management**	Online help of the operating system

7.18.2.2 Managing the operating system

Calling

Called via **Computer Management:**

Start > Control Panel > Administrative Tools > Computer Management

Overview

Topic	Detailed information	Called via	Additional information
Event display	Icons indicate status (specialist knowledge required for analysis)	**System Tools > Event Viewer**	Select folder, press "F1" - blue icons only = "everything OK"
Removable memory	Recognized external drives or storage media	**Data Memory > Removable Media**	
Hard disks	Drive names, formats, size, segmentation, partitions, status	**Data Memory > Storage Media Management**	
Network adapters and PC cards	Network adapter type access levels, users, servers, network addresses (IP/MAC address)	**System Tools > System Information > Components > Network > Adapter**	
Network-wide analysis of connected PCs	Active users in network, Active PCs	**System Tools > Shared Folders > Shares**	
Management of users and user groups	• Creation and modification of local user accounts • Creation and modification of user profiles • Creation, addition and deletion of local groups	**System Tools > Local Users and Groups**	Online help of the operating system

7.18.2.3 Shares for drives, folders and files

Calling

Called via **Computer Management > System**

Overview

Topic	Detailed information	Called via	Additional information
Drives and folders	Granting or changing of shares for drives and folders	In the tree view Select **Shared Folders > Share**	Select the folder, press "F1" key
Drives and folders	Granting or changing of shares for drives and folders	• Open Windows Explorer • In the tree view, select the drive/folder • Menu command: **File > Properties > "Shares" tab**	Online help of the operating system
Files	Granting or changing of shares for files	• Select the file in Windows Explorer • Menu command: **File > Properties** • Select the "Security" tab and make the required settings in the "Permissions" group.	Online help of the operating system

7.18.2.4 System tools - Local Users and Groups

Overview

Topic	Detailed information	Called via	Additional information
Managing users and groups in the operating system	• Creation and modification of local user accounts • Creation and modification of user profiles • Creation, addition and deletion of local groups	**Control Panel > Administrative Tools > Computer Management > System Tools > Local Users and Groups**	Online help of the operating system
Application permissions	• Standard users, language and password changes • Selection of the computer from which the user data are to be obtained • Selection of the device via which component logon is to be checked • Setting a delay time for logging off from SIMATIC Logon	In the Start menu, Siemens SIMATIC programs: **SIMATIC Logon > Configure SIMATIC Logon**	Online help for *SIMATIC Logon*

7.18.2.5 Command line commands

Calling

Enter the following in the "Run" dialog of the Start menu: "**cmd**"

You can find additional information on the Windows commands named here by searching the Microsoft "Help and Support Center".

Overview

Topic	Detailed information	Called via	Additional information
Connections (network adapter function)	Verification of own network adapter	Enter "ping localhost" or "ping 127.0.0.0".	Help and Support Center
Connections (network adapter function)	Verification of a connection to another Ethernet node	Enter "ping - {PC-name}" or "ping - {IP-address}"	Help and Support Center
Connections (network adapter function)	Identification of own network adapter	Enter "ipconfig"	Help and Support Center
Connections (network adapter function)	Identification of network adapter of servers and network services	Enter "ipconfig -all"	Help and Support Center
Connections (network adapter function)	Active connections, computer connections, Ethernet statistics	Enter "netstat"	Help and Support Center

7.18.2.6 Set PC station

Call

In the Siemens SIMATIC programs Start menu: **SIMATIC NET > Configuration Settings**

Overview

Topic	Detailed information	Called via	Additional information
Configuration	Detected modules	**SIMATIC NET Configuration Settings** folder	Online help for *Configuration Settings;* see "Set PC Station" topic
Diagnostic options	Available options vary for each module	**SIMATIC NET Configuration Settings >** Select module	Online help for *Configuration Settings;* see "Set PC Station" topic

7.18.2.7 Set PG/PC interface

Call

Options:

- In the Siemens SIMATIC programs Start menu: **SIMATIC NET > Set PG/PC Interface**
- SIMATIC Manager via menu command **Options > Set PG/PC Interface**

Overview

Topic	Detailed information	Called via	Additional information
Time synchronization	Status of the synchronization of a PC on the plant bus (requirement: PC with communications processor: • CP 1613 • CP 1623 • CP 1628)	Select interface > Click "Diagnostics" > In the "Time" group	Online help for Configuration Settings; see "Set PC Station" topic

7.18.2.8 Station Configuration Editor

Calling

Call this on the Windows taskbar by clicking the following icon:

Requirement

The components in the configuration list must be entered in the same order as in the component image you created with HW Config. If the configuration deviates, it cannot be downloaded to the PC station. You can find additional information on this in the section "Preparing the PC stations" of the manual *Process Control System PCS 7; PCS 7 - PC Configuration*.

Note

Making changes to the configuration list when the PC station is running causes the entire PC communication to be closed and restarted.

In this case, you will receive a corresponding warning message.

Overview

Topic	Detailed information	Called via	Additional information
Hardware configuration and configuration of the PC station	The status display in the configuration list indicates the following: • Whether or not the created component matches the current hardware configuration • Whether or not the configuration matches a downloaded configuration	Components" tab	Online help Topic: "Status Symbols for Components"
Check module	Verification of accessibility of modules following configuration.	After completing the configuration, you can click "Ring" to check whether modules can be accessed.	Provided the module supports this function, a display on the module will indicate whether the module can be accessed.
PC station	Diagnostics for a PC station	Diagnostics" tab > Export Save file	Requires expert knowledge. Consult an expert if you encounter problems with the content of a log file

7.18.2.9 Printers and print jobs

Overview

Topic	Detailed information	Called via	Additional information
Devices and Printers	Display of existing printers	**Start > Devices and Printers**	Online help via F1
Pending print jobs	Display of print jobs Deletion of print jobs	**Start > Devices and Printers** Double-click the name of the printer.	Online help via F1

7.18.2.10 PC DiagMonitor

Overview of DiagMonitor

Note

PC Diagmonitor is only approved for use with PCS 7 Bundle PCs.

Topic	Detailed Information	Called via	Additional information
Preparing the PC station	CPU temperature, fan speed, hard disks, RAID disks operating hours BIOS data	In the Start menu, Siemens SIMATIC programs: **PC DiagMonitor > Management Explorer**	Online help Only a SIMATIC PC can be used as a monitored computer. DiagMonitor requires device drivers for specific types.

7.18.2.11 Installed SIMATIC software

Overview

Topic	Detailed information	Called via	Additional information
Installed versions of the PCS 7 software	Installed software and versions, language version of the PCS 7 software	In the Start menu, Siemens SIMATIC programs: **SIMATIC > Product Information > Installed Software**	Online help
Installed versions of the SIMATIC software	Information on SIMATIC software installed on the computers	In the Start menu, Siemens SIMATIC programs: **SIMATIC > SIMATIC Management Console** (License required) **Network view** > Shortcut menu command **"Determine inventory data"**	Additional information is available in the online help for *SIMATIC Management Console*.

7.18.3 Diagnostics in the network

7.18.3.1 NetPro

Calling

In SIMATIC Manager or HW Config, select the menu command **Options > Configure Network**.

Overview

Topic	Detailed information	Called with	Additional information
Consistency of configuration	Nodes that are not networked (exception: MPI nodes that are not networked) inconsistent connections in subnets with only one node	**Network > Check Consistency**	Online help for *STEP 7* "Checking the consistency of the network" topic
Connection status	Established connections to SIMATIC stations	Select CPU: **PLC > Activate Connection Status**	
Connection status	Established connections to PC stations	Select PC stations: **PLC > Activate Connection Status**	
Faults on PROFIBUS	Only when a diagnostic repeater is used	**CPU > PROFIBUS > Display Network Topology**	
Status of DP slaves	Display DP slaves in the network view	**View > With DP Slaves**	

7.18.3.2 NCM S7 Industrial Ethernet

Calling

In the Siemens SIMATIC programs Start menu: **STEP 7 > NCM S7 Industrial Ethernet > Diagnostics**

Overview

Topic	Detailed information	Called with	Additional information
CP status	Dynamic information about the operating mode of the communication functions of CPs connected online	**Diagnostics > Online > Open Connection**	Online help for *STEP 7*, topic: "Hardware diagnostics" Manual *SIMATIC NET; NCM S7 for Industrial Ethernet*
General CP diagnostics and statistics functions	Operating mode Scan event messages recorded in the Ethernet CP	**Diagnostics > Online > Open Connection**	
Diagnostics functions depending on CP type and operating mode	ISO transport connections ISO-on-TCP connections TCP connections UDP connections E-mail connections	**Diagnostics > Online > Open Connection**	

7.18.3.3 SCALANCE X-300/X-400 “Observer function”

Call

Called via Web Based Management or **TELNET**

Overview

Topic	Detailed Information	Called via	Additional information
Status redundancy manager	The observer function provides error diagnostics and error protection for ring structures (ring redundancy in plant bus/terminal bus)	Enter the following in the "Run" dialog of the Start menu: "cmd" In the DOS window, enter **TELNET** . Additional information in the documentation *SIMATIC NET; Industrial Ethernet SwitchesSCALANCE X-300 / X-400*	Documentation *SIMATIC NET; Industrial Ethernet Switches* *SCALANCE X-300 / X-400*

7.18.3.4 SCALANCE X-200/X-300/X-400 “Loop detection”

Calling

Called via Web Based Management.

Overview

Information on	Detailed information	Called via	Additional information
Loop detection	The "Loop detection" function allows you to specify the ports for which loop detection should be enabled.	Web Based Management	Manual "Industrial Ethernet Switches PH SCALANCE X - 200" Manual "Industrial Ethernet Switches SCALANCE X - 300/X - 400"

7.18.3.5 "Network Connections" Windows dialog box

Overview

Topic	Detailed information	Called with	Additional information
Status of network cards on Industrial Ethernet	Dynamic display of the status of physical and virtual network adapters	In the Start menu via the **Network Connections**	Online help of the operating system

7.18.3.6 NCM S7

Calling

In the Siemens SIMATIC programs Start menu: **STEP 7 > NCM S7 > Diagnostics**

Overview

Topic	Detailed information	Called via	Additional information
General CP diagnostics and statistics functions	Operating mode Connected stations Station-related statistics functions Station overview	General" tab	• Online help *NCM Diagnostics,* Topic "General diagnostic functions" • Manual SIMATIC NET; NCM S7 for PROFIBUS
Mode-specific diagnostics	Dynamic information about the operating mode of the communication functions of CPs connected online		
FMS connections	DP master diagnostics Communication status of slaves and call of data for DP slave diagnostics DP slave diagnostics (non-passive slaves)		
PROFIBUS connections	DP master DP slave FDL connection FMS connection		
PROFIBUS connections	Faults and inconsistencies in FMS connections of the CP		
PROFINET connections			

7.18.3.7 Topology Editor (PROFINET)

Calling

Select the PROFINET IO system (e.g. in HW Config) and call the following menu command: **Edit > PROFINET IO > Topology**.

Overview

Topic	Detailed information	Called via	Additional information
Devices and interconnections	Checking the configured devices and interconnections	• "Table view" tab > "Online" button • "Graphic view" tab > "Online" button	Online help for Topology Editor > "Table view" tab
Devices and interconnections	Offline/online comparison	• "Offline/online comparison" tab > "Start" button	Online help for Topology Editor > "Offline/online comparison" tab

7.18.3.8 MBSA

Introduction

The Microsoft Baseline Security Analyzer (MBSA) is a tool for administrators that enables them to check a Windows network for security vulnerability.

Overview

Topic	Detailed information	Additional information
Security vulnerability	Configuration, passwords, utilities, creation of security reports, required updates	• Whitepaper *Security concept PCS 7 and WinCC* • MBSA description from Microsoft®

7.18.4 Operator station diagnostics

7.18.4.1 Lifebeat monitoring

Overview

Topic	Detailed information	Called via	Additional information
Monitoring of components of WinCC projects and their associated SIMATIC stations	Configured components are displayed graphically in a plant picture. Faulty components have a red line running through them in the graphic.	Configure lifebeat monitoring and call the picture in process mode	Online help for *WinCC Information System,* "Lifebeat Monitoring" Information about configuration in the configuration manual *Process Control System PCS 7; Operator Station*

Note

Lifebeat monitoring and Maintenance Station

If you are running a Maintenance Station in the plant, configuration of lifebeat monitoring with "Lifebeat Monitoring" is prohibited.

7.18.4.2 Simatic Shell

Calling

1. Select "My Computer" in the tree view of Windows Explorer.
2. Select the "Simatic Shell" folder.
3. Select the menu command **Settings** from the shortcut menu.

Overview

Topic	Detailed information	Called via	Additional information
Network adapter	• Network adapters of the local computer • "IP" column current TCP/IP addresses and MAC addresses of the local network adapters	Network adapters" list	Online help of Simatic Shell
Multicast service life (TTL)	Maximum number of route jumps between subnets ("TTL" IP parameter)	Multicast service life (TTL)" input line	Online help of Simatic Shell
Multicast proxy	IP address of a computer in another subnet, which is to be used as a substitute for distributing Multicast packets	Multicast proxy" input line	Online help of Simatic Shell
Compatibility	Compatibility mode for communication between different versions of WinCC	Compatibility" check box	Online help of Simatic Shell

Topic	Detailed information	Called via	Additional information
Computer status change	When the status of a computer changes, a message is sent to all station, for example: • When a computer has archived a project • When a computer shuts down • When a computer boots up, thus becoming part of a network/station group.		Online Help for *WinCC Information System*
Communication settings	• Settings for time encryption • Migration mode	"Settings..." menu	Documentation *Process Control System PCS 7; PC Configuration*

7.18.4.3 WinCC "System Info" channel

Introduction

The WinCC "System Info" channel is used to evaluate system information from server PCs.

This channel does not require hardware because it directly accesses the system information on the server PC on which it is installed.

Note

Only system information from a single server can be represented or evaluated on a client.

Overview

Topic	Detailed information	Called with	Additional information
Time information	Display of time of day, date and day of the week in process pictures	Display in configured picture	Online help for *WinCC Information System*, topic: "Communication > System Info"
CPU load	CPU load in a trend display	Display in configured picture	
Drive capacities - Storage space	• Display and monitoring of available drive capacities of different servers on a multi-client system • Monitoring of available drive capacity and message triggering	Display in configured picture	

Topic	Detailed information	Called with	Additional information
Timers and counters	Using timers and counters (to count operating hours, for example)	Display in configured picture	
Event triggering	Triggering of events through evaluation of system information in scripts	Display in configured picture	

Configuration

Online help for *WinCC Information System*, "Communication > System Info > Channel Configuration > How to Configure the Channel System Info".

7.18.4.4 User Administrator

Call

In the Start menu under the SIEMENS SIMATIC products, select the menu command **WinCC Explorer**.

Overview

Topic	Detailed information	Called via	Additional information
For the OS Creating users Setting access permissions	Assignment and verification of access permissions for users of the PCS 7 Operator Station: • For process mode • For configuration system editors	In the tree view of WinCC Explorer, select: **Editors > User Administrator > Open**	Online help for *WinCC Information System*, see topics "User administrator functionality" and "Preventing unauthorized operation"

7.18.4.5 WinCC Channel Diagnostics

Calling

In the Siemens SIMATIC programs Start menu: **WinCC > Tools > Channel Diagnosis**

Overview

Topic	Detailed information	Called with	Additional information
Connections	Overview of the status of the configured channels and their connections to the SIMATIC station, directly or by network connection through Internet Explorer	Channels/Connections" tab	Online Help for *WinCC Information System*, "How to Test the Channel and the Connection"
Trace mode	Trace mode can be activated in process mode (this affects runtimes)	Only to support experts	Online Help for *WinCC Information System*, "How to Configure the Trace Function of a Channel"

Additional information

Online help for *WinCC Information System,* "Channel Diagnostics Using Channel Diagnosis*"*

7.18.4.6 Status of multi-user operation

Calling

Diagnostics on the connection between OS server and an OS client

Only when WinCC is in process mode: in the menu of the WinCC Explorer.

Overview

Topic	Detailed information	Called with	Additional information
Connection status	Status - logical connections, current status of the server-client interface	**Options > Status of Multi-User Operation**	Online help for *WinCC Information System*, topic: "Options Status of multi-user operation"
Connection status on the server	Current status of connections in multi-user operation	"Process Data Server" tab	
Connection status on the client	Current status of the client on which the scan is started	"Process Data Clients" tab	

7.18.4.7 Status of connections

Overview

Topic	Detailed information	Called with	Additional information
Connection status (OS-AS)	Connection between WinCC and an automation system Status - logical connections, current status of the process interface	Only when OS is in process mode: in the menu of the WinCC Explorer. **Options > Status of Connections**	Online help for *WinCC Information System*, topic: "Checking the status of the connection"
OS connections (server - client)	Collective status of the connection diagnostics of the local client	See the section titled "Status of multi-user operation (Page 133)"	

7.18.4.8 Area overview

Overview

Topic	Detailed information	Called via	Additional information
Displaying the status of the connected OS servers on the OS client	Optical representation of the redundancy monitoring, see following table: Meaning of the icon color in the area overview	Click the "Status of the connected servers" button in the area overview in process mode	Function manual *Process Control System PCS 7; OS Process Control*

Meaning of the icon color in the area overview

Icon color	Meaning
green	The monitored servers are in process mode and have the status "OK".
red	One server or multiple servers have the state: Server "faulty".
red (flashing)	The fault state has not yet been acknowledged.
yellow	One server or multiple servers have the state: Server "faulty" with disrupted redundancy.
yellow (flashing)	The fault state has not yet been acknowledged.
(no icon)	• The process "CCEmergencyWatchRTServer.exe" is missing in the startup list on the OS client. • No server data is loaded on the client.

Note

Redundant single-station systems

Changes to the redundancy status generate a process control message.

7.18.4.9 Displaying the redundancy state

Overview

It is important to always have an overview of the redundancy state for diagnostics in plants with redundant PCs. The redundancy state represents the status of the individual master and standby computers. A display for the redundancy state can be configured in a process picture for this.

- The status of the redundant server pair and the non-redundant server assigned to the OS client are displayed on the OS clients.
- The server status is displayed on the OS servers.

Topic	Detailed information	Called via	Additional information
Redundant OS components Status	Master; standby Standalone Connection • Not initialized • Initialized • No connection • Fault	Create a picture the OS server in the WinCC project. Insert a control Graphics Designer: Object palette > "Default" tab > in the "Smart Objects" tree view > drag the control to the picture > in the "Insert control" dialog box > Select "PCS 7 Redundancy State Control"	For additional information on configuring, refer to the configuration manual *Process Control System PCS 7; Operator Station*

State of redundant OS servers in diagnostic pictures

When using a Maintenance Station, the block icons show the redundancy state of the redundant OS servers in the diagnostic area.

You can find information on the block icons displayed for redundant components in the documentation *Process Control System PCS 7; Maintenance Station*.

7.18.4.10 Time master role of the OS server (status)

Overview

The status of the time master OS server on the plant bus can be displayed in a plant picture. A BCE network adapter or up to two communication processors (for example, CP 1623) can be used as the access point for time synchronization.

You can determine the status of the access points in the process mode when the following internal text tags are configured on a faceplate:

- Network adapter 1 : @TimeSyncDevice1State
- Network adapter 2 : @TimeSyncDevice2State

Information on	Detailed information	Called with	Additional information
Time master for OS server (status)	Status information • Active master • Standby master • Slave • Deactivated	Process picture on the OS • Configured text tags on the faceplate	You can find information on configuration in the online help of the WinCC Information System

7.18.5 Diagnostics for the BATCH station

7.18.5.1 Status icons in the BATCH server taskbar

Overview

Information on	Detailed information	Called with	Additional information
Status server Status of redundant servers	BATCH Launch Coordinator in the BATCH server taskbar	You can open the BATCH Launch Coordinator from the shortcut menu.	Online help for SIMATIC BATCH

Monitoring a BATCH Launch Coordinator from a BATCH client

You can monitor the status of any Batch plant by running the BATCH Launch Coordinator on a BATCH client without BATCH server installation. A dialog with all the loaded Batch plants opens for this purpose when the Launch Coordinator starts. After selecting a Batch plant, the symbol of the Launch Coordinator appears with the plant status in the status bar of the BATCH client.

Status symbols of the BATCH Launch Coordinator

The symbol includes a status display for SIMATIC BATCH. The possible states are listed in the table below.

Symbol	Meaning
	Without status symbol. No connection to the BATCH project. The BATCH project is not loaded and SIMATIC BATCH is waiting for BATCH data. Or BATCH data has been loaded, but the server applications have not yet started.
	SIMATIC BATCH is ready (Ready). The BATCH project is loaded and started.
	Intermediate state. A status change is in progress (Processing).
	Intermediate state. Preparing to transition to the "Running" state (Running Prepared).

Symbol	Meaning
	SIMATIC BATCH is running (Running) on the BATCH master or BATCH single-station system. The BATCH project is loaded, started and BATCH Runtime has started.
	SIMATIC BATCH is running (Listening) on the BATCH standby. The BATCH project is loaded, started and BATCH Runtime has started.
	Intermediate state. Preparing to transition to the "Listening" state (Listening Prepared).
	Intermediate state, switching to BATCH master (Switch up). Status change from Listening to Running.
	Intermediate state, switching to BATCH standby Switch down. Status change from Running to Listening.
	Error in SIMATIC BATCH (Fault).

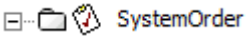
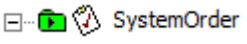
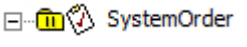
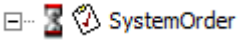
Note

Combined states with Processing, Switch up, Running Prepared, Switch down, Listening Prepared are temporary, for example, during a redundancy switchover of the BATCH server.

7.18.5.2 Status display at order folder

In addition to the symbol for the batch order folder, a symbol shows the combined status of all batches contained in the order folder. Extended batch information is shown dynamically overlaying this symbol.

Possible displays

Symbol	Combined batch status
 "Inactive" status	The batches contained in the folder have one of the following statuses: • Planned • Completed • Held • Aborted • Released • Canceled • Unknown
 "Active" status	At least one batch of the order has the "Waiting" or "Running" status.
 "Held" status	At least one batch of the order has the "Holding/Pausing" or "Held/Paused" status. All other batches are inactive or Completed/Aborted/Stopped.
 "Unknown" status	The symbol indicates that a time period is required to determine the status information of all order folders. This is a transitional status which results in one of the three statuses above.

Symbol overlaying the order folder	Extended combined batch status
 Operator action	Manual input by an operator is required for at least one batch of the order.
 Error	There is an error in at least one batch of the order.

7.18.6 Diagnostics for the Route Control station

7.18.6.1 Status icons in the Route Control server taskbar

Overview

With SIMATIC Route Control, status icons in the Route Control server taskbar indicate the redundancy status.

Information on	Detailed information		Called with	Additional information
Status of redundant servers	Status display of the server in process mode:		Double-click a status icon to display a field containing information about the server status.	For information on redundant Route Control servers, refer to the *SIMATIC Route Control* manual.
		Icon in the taskbar of the Master server		
		Icon in the taskbar of the Standby server		

7.18.7 Diagnostics for the SIMATIC station

7.18.7.1 SIMATIC Manager

Calling

In the Siemens SIMATIC programs Start menu: **SIMATIC Manager**

Overview

Topic	Detailed information	Called via	Additional information
Diagnosing hardware	Quick view: icons indicate operating status or module status.	**PLC > Diagnostics/Setting > Hardware Diagnostics** Then, Module Information > Update: F5-key	Online help for *STEP 7*, topic: "Hardware diagnostics and troubleshooting" You can find information on this in the section "Module information (Page 141)". Additional information: Double-click on the icon
Module Information	Use this menu command to read out information on the selected module.	Select CPU or CP: **PLC > Module information**	Online help for *STEP 7*, topic: "Hardware diagnostics and troubleshooting" You can find information on this in the section "Module information (Page 141)".
Operating mode	Displays the operating mode of the current module (RUN, STOP). This requires an online connection to the CPU.	Select CPU or CP: **PLC > Module information**	
Time	Checks/sets time of day	Select CPU: **PLC > Diagnostics/Setting > Set Time of Day**	Online help for *STEP 7*, topics "CPU Clocks with Time Zone Setting and Summer/Winter Time" and "Using the Clock Functions"
Faults on PROFIBUS	• Faulty bus segment • Distance of an error location from the diagnostics repeater	Select master system: **PLC > PROFIBUS Node Diagnostics, Monitor/Modify Node**	Online help for *STEP 7*, topic "Topology display using diagnostics repeaters"
All installed licenses (license keys and authorization versions of installed components)	• Products (name, version, release) • Components (name, version, release) • Firmware updates • DLLs (STEP 7-DLLs, Windows DLLs)	**Help > About >** "Display" button	Online help for *STEP 7*, topic "Installed SIMATIC software"

Topic	Detailed information	Called via	Additional information
Field devices • PA devices • FF devices • HART devices	Requirements: SIMATIC PDM is installed. • Icons provide information about the status of these devices	**View > Process Device Plant View** Select device. Select shortcut menu command **Open Object**.	Online help for SIMATIC PDM > Configuring networks and process devices Icons: ...> Device icons in the process device plant view
Language version of the PCS 7 software	**Language version** European language version; Asian language version	**Help > About >** Click "Display". **"Products" tab**	__SIMATIC PCS 7 EU__ = European language version __SIMATIC PCS 7 CHS__ = Asian language version

7.18.7.2 HW Config

Calling

In the Siemens SIMATIC programs Start menu: **SIMATIC Manager.** In the tree view, click on "SIMATIC Station" and double-click "Hardware" in the selection list.

Overview

Topic	Detailed information	Called via	Additional information
Components accessible online	Icon indicates the operating mode of modules (= system diagnostics).	**Station > Open Online**	The <F5> key refreshes the display. Double-click the icon to obtain additional information.
Time	Check/set	**Station > Open Online** Select CPU: **PLC > Set Time of Day**	Online help for *STEP 7*, topics "CPU-xxx clocks with time zone setting", "Daylight-saving/standard time" and "Using the clock functions"
Module information	Use this menu command to read information on the selected module.	Select module: **PLC > Module information**	You can find information on this in the section "Module information (Page 141)".

Additional information is available in the online help for *STEP 7*.

- Diagnostic icons in the online view
- Information functions in the quick view
- Basic procedure for determining the cause of a STOP (CPU)
- Hardware diagnostics and troubleshooting
- Operating mode and operating mode transitions

7.18.7.3 Module information

Calling up quick information

1. Call up the quick information in SIMATIC Manager by selecting the menu command **Component View > View > Online**.
2. Select the SIMATIC station with the menu command **CPU > Diagnostics/Settings > Hardware Diagnostics**.

Additional diagnostics: select module and click "Module Information"

Calling up module diagnostics

1. Open HW Config.
2. Select the menu command **Station > Open Online**.
3. Select the module.
4. Select the menu command **PLC > Module Information.**

Diagnostics for the CPU

Extensive diagnostic checks are performed on a CPU.

Additional information:
Help on *STEP 7*, "Diagnostics, hardware diagnostics and troubleshooting"

Topic	Detailed information	Called using	Additional information
Module data	Data for identifying the selected module Examples: • Type • Order number • Firmware • Version • Status • Slot in the rack	General" tab	Comparison of configured and inserted modules
Events in the diagnostic buffer and detailed information about the selected event	Analysis of the cause of a CPU STOP, history of events at the selected module. Diagnostic data for the selected module	Diagnostic Buffer" tab	Check of events in the diagnostic buffer and detailed information about the selected event
DP slave diagnostics	Diagnostic data for the selected DP slave (in accordance with EN 50170)	"DP Slave Diagnostics" tab	To determine the cause of a DP slave error
Target system	Current time, operating hours and information about clock synchronization (synchronization intervals)	Time System" tab	

Topic	Detailed information	Called using	Additional information
Performance data	Operand areas and the available blocks of the selected (CPU/FM) module	Performance Data" tab For checking the user program to determine whether the CPU meets the appropriate requirements to execute a user program, for example, with regard to process image size	
Performance data	Display of all module types available in the functional scope of the selected module. List of OB, SFB and SFC that can be used in the module.	Used to check the standard blocks contained and called in the user program.	

Diagnostics for DP slaves

Topic	Detailed information	Called using	Additional information
Module data	Data for identifying the selected module Examples: • Type • Order number • Firmware • Version • Status • Slot in the rack	General" tab	Comparison of configured and inserted modules
DP slave diagnostics	Diagnostic data for the selected DP slave (in accordance with EN 50170)	"DP Slave Diagnostics" tab	To determine the cause of a DP slave error

7.18.7.4 PROFIBUS diagnostics with diagnostic repeater

Requirements

- The diagnostic repeater must be installed.
- The cable diagnostics must be prepared.

Calling

Select the diagnose repeater in HW Config.
Select menu command **PLC > Diagnostics/Setting > Module Information**

Additional information:
Help on *STEP 7*, topic "Diagnostics, hardware diagnostics and troubleshooting"

Overview

Topic	Detailed information	Called using	Additional information
Quick overview Error on bus segment	Icons indicate the status of the PROFIBUS master systems	Module Information" dialog box • Status • Icons in front of the tab names (DP1, DP2, DP3, PG)	Online help for *STEP 7*, topic: "Hardware diagnostics and troubleshooting" Comparison of configured and inserted modules
DP slave diagnostics	Diagnostic data for the selected DP slave (in accordance with EN 50170)	"DP Slave Diagnostics" tab	To determine the cause of DP slave errors
Location of error	Graphical representation of the error location		

7.18.7.5 SIMATIC PDM

Introduction

SIMATIC PDM is a software package for configuration, parameter assignment, commissioning, and maintenance of field devices (for example, transducers).

Overview

Topic	Detailed information	Called via	Additional information
Quick information; Display configuration	Icons provide an overview of the configuration and device status (then: see device status below)	In the SIMATIC Manager: **View > Process Device Plant View**	Online help for *SIMATIC PDM;* "Configuring networks and devices" Icons: ...> Functions > Diagnostics > Overview of device icons
Device information	• Type • EDD/DLL (type file) • Manufacturer • Versions	Open project in the Process Device Plant View > Select device > **Edit > Object properties** > "Device" tab	Online help for *SIMATIC PDM*
Device status	• Communication • Maintenance status • Process errors • Configuration error • Overall status • Device-specific message texts	Open project in the Process Device Plant View > **Select Device > Edit > Object Properties >** "Diagnostics" tab > "Device status" list	Online help for *SIMATIC PDM*, if available through manufacturer files

Topic	Detailed information	Called via	Additional information
Document Manager	Call documents assigned to a device	Open project in the Process Device Plant View > Select device > **Edit > Object properties** > "Document Manager" tab	Online help for *SIMATIC PDM*
Determine field devices online (LifeList, as of SIMATIC PDM V8.0 SP1)	LifeList – determine available devices (PROFIBUS / FOUNDATION Fieldbus)	In the Siemens SIMATIC programs Start menu: **Start SIMATIC PDM > View > LifeList**	Operating manual *SIMATIC;* *Help for SIMATIC PDM*
Remote access to field devices	Device information	Open the Web interface of SIMATIC PDM via Internet Explorer	Operating manual *SIMATIC;* *Help for SIMATIC PDM*

7.18.8 Additional diagnostic options

7.18.8.1 Additional diagnostic options for PCS 7

Disclaimer of liability

NOTICE
Disclaimer of liability
Siemens assumes no liability for improper use of the instructions provided in this documentation or for any consequences that might result for the customer.

NOTICE
Note the following:
• Only trained service employees should be authorized to work on the process control system. • Always observe the plant-specific rules and government regulations when making changes to your system. • Observe the plant-specific boundary conditions and adjust the work accordingly. • Always bear in mind that changes in a system can impact other sections of the system.

Overview

The components and tools listed below are not part of PCS 7 and are used for advanced testing and diagnostics. Below you will find some of the diagnostics applications suitable for PCS 7:

- SIMATIC PCS 7 Condition Monitoring Library (Page 145)
- BANY (add-on product) (Page 145)
- SYSTEM Process Control Diagnostics (add-on product) (Page 147)

7.18.8.2 SIMATIC PCS 7 Condition Monitoring Library

The SIMATIC PCS 7 Condition Monitoring Library is an additional block library based on the blocks of the PCS 7 Advanced Process Library. The library is used for diagnostics and maintenance of mechanical assets (e.g., pumps and valves).

The included blocks provide cost-efficient monitoring and analysis of the mechanical assets.

They are supported to increase the efficiency and availability of the plant and detect possible damages at an early stage.

7.18.8.3 BANY (add-on product)

Overview

BANY is a Microsoft Windows-based tool used for documentation, diagnostics, recording, and analysis of your PCS 7 Ethernet, PROFINET and PROFIBUS networks.

The program packages below can be supplied separately or as a bundle:

Program packages	Application	Program call after installation via the Start menu:
BANYnet	Diagnostics tool for Ethernet networks	**Programs > BANYnet**.
BANY PROFIBUS	Diagnostics tool for PROFIBUS networks	**Programs > BANY PROFIBUS**.
BANY PNIO	Diagnostics tool for PROFINET networks	**Programs > BANY PNIO**.

Requirements

- The PC to be used for analyzing PROFIBUS with BANY PROFIBUS must be equipped with a PROFIBUS network adapter (CP 5512).
- If you wish to analyze the terminal bus and plant bus at the same time, the PC must be equipped with two Ethernet network adapters.

BANYnet

The table below lists the options for diagnosing Ethernet networks using BANYnet:

Topic	Detailed information	Called via	Additional information
System configuration	Comparison of target/actual configuration, graphical overview, lifebeat monitoring	In the Start window via the "Plant Manager" button	Online help
Message frame traffic	Interpretation (including PCS 7), statistics, batch analysis	In the Start window via the "Bus Analysis" button	Online help
Bus recording	Parallel recording, special trigger, filter	Called via menu in the "Bus Analysis" dialog box	Online help

BANY PROFIBUS

The table below lists the options for diagnosing PROFIBUS networks using BANY PROFIBUS :

Topic	Detailed information	Called via	Additional information
System configuration	Comparison of the target and actual configuration, graphical overview, master/slave monitoring, lifebeat monitoring Display, parameter assignment	In the Start window via the "Plant Manager" button	Online help
Bus analysis, transmission rates of 9.6 kbps to 12 Mbps	Bus load measurement, interpretation (including PCS 7), statistics, batch analysis, bus bottlenecks, available reserves, redundancy analysis	In the Start window via the "Bus Analysis" button	Online help
Bus recording	Parallel recording, special trigger, filter The recording can be started and finished automatically with the help of triggers.	Called via menu in the "Bus Analysis" dialog	Online help

BANY PNIO

The table below lists the options for diagnosing PROFINET networks using BANY PNIO :

Topic	Detailed information	Called via	Additional information
System configuration	Comparison of the target and actual configuration, graphical overview, master/slave monitoring, lifebeat monitoring Display, parameter assignment	In the Start window via the "Plant Manager" button	Online help
Bus analysis transmission rates up to 100 Mbps	Bus load measurement, interpretation (including PCS 7), statistics, batch analysis, bus bottlenecks, available reserves, redundancy analysis, analysis in RUN and in real time	In the Start window via the "Bus Analysis" button	Online help
Bus recording	Parallel recording, special trigger, filter, synchronous check The recording can be started and finished automatically with the help of triggers.	Called via menu in the "Bus Analysis" dialog	Online help

7.18.8.4 SYSTEM Process Control Diagnostics (add-on product)

Introduction

Display of PROFIBUS diagnostics information on the operator station

Online help: *SYSTEM DIAGNOSTICS help*

Overview

Topic	Detailed information	Called via	Additional information
PROFIBUS DP – General	Station failure Display from HW Config	Picture in the OS	Configuration: see Online help [1]
PROFIBUS DP fault	Fault indication with detailed information about cause of error	Picture in the OS	Configuration: see Online help [1]
From HW Config Information	"Name and comments"	Picture in the OS	Configuration: see Online help [1]
Configuration information	Order number, addresses, slot types	Picture in the OS	Configuration: see Online help [1]

[1] Online help *SYSTEM DIAGNOSTICS - Help* > section "PROFIBUS DP/PA DIAGNOSTICS".

Failure, replacement and return 8

8.1 Failure, replacement and return - guide to documentation

Guide to documentation

You can find information on component response and the procedure to be followed in the event of failure, exchange and return in the following documentation:

Scenario	Information can be found in ...	Section ...
I/O		
Failure and malfunction on modules	Manual *Automation System S7-400 CPU Specifications*	• Monitoring functions of the CPU
Failure and malfunction of SIMATIC ET 200M	Manual *SIMATIC Distributed I/O device ET 200M*	• Commissioning and diagnostics
Failure and malfunction of SIMATIC ET 200iSP	Manual *SIMATIC Distributed I/O device ET 200iSP*	• Commissioning and diagnostics
Failure and malfunction of SIMATIC ET 200S	Manual *SIMATIC Distributed I/O device ET 200S*	• Commissioning • Wiring and fitting • Fault-tolerant operation
Failure and malfunction of SIMATIC ET 200pro	Manual *SIMATIC Distributed I/O device ET 200pro*	• Alarm, error, and system messages
Failure and malfunction on *ex I/O modules*	Manual *Programmable Controller S7-300, ET 200M Ex I/O modules*	• SIMATIC S7 ex digital modules • Diagnostics for analog modules
Failure and malfunction of redundant I/O modules	Configuration manual *Process Control System PCS 7; Fault-Tolerant Process Control Systems*	• Failure of Redundant I/O Modules • How to Set the CPU in Respect of the Response of the I/O Modules in the Event of Channel Errors
Failure and malfunction of components of distributed I/O components	Manual *Programmable Controller S7-400H; Fault-Tolerant Systems* :	• Failure and Replacement of a PROFIBUS DP Master • Failure and Replacement of a Redundant PROFIBUS DP Interface Module • Failure and Replacement of a Redundant PROFIBUS DP Slave • Failure and Replacement of Redundant PROFIBUS DP Lines
Failure of devices configured using PDM	Manual *SIMATIC; The Process Device Manager*	• Device Replacement

Scenario	Information can be found in ...	Section ...
Automation systems		
Failure of a CPU in a redundant AS	Configuration manual *Process Control System PCS 7; Fault-Tolerant Process Control Systems*	• Failure of the Master CPU
Failure of synchronization between the CPUs in a redundant AS	Configuration manual *Process Control System PCS 7; Fault-Tolerant Process Control Systems*	• Failure of a Fiber-Optic Cable
Communication		
Failure and malfunction: *SCALANCE X-400*	Operating instructions *SIMATIC NET;* *Industrial Ethernet Switches SCALANCE X-400*	• Installation and Commissioning – Installation and removal – Displaying LEDs – Replacing the C-PLUG
Failure and malfunction: *SCALANCE X-200*	Commissioning manual *SIMATIC NET;* *Industrial Ethernet* *SCALANCE X-100 and SCALANCE X-200 product line*	• Installation and Maintenance • Configuration / Diagnostics via Remote Mechanisms • SCALANCE X2<...> Display
Disrupted network connections	Configuration manual *PCS 7 Process Control System; Fault-Tolerant Process Control Systems*	• Failure, Failover and Restarting of Redundant OS Servers – Disrupted network connection to the OS partner server – Disrupted Network Connection Between the OS Client and the OS Server – Disrupted Network Connection Between the OS and AS
Fault on PROFIBUS DP	Manual *SIMATIC; Diagnostic Repeater for PROFIBUS DP*	• Mounting • Commissioning • Diagnostics
Faults on PROFINET	Manual *SIMATIC; PROFINET System Description*	• Diagnostics for PROFINET IO • Diagnostics for PROFINET CBA
Operator control and monitoring stations		
Failure of a redundant OS server	Configuration manual *PCS 7 Process Control System; Fault-Tolerant Process Control Systems*	• Failure of a redundant OS server
Switchover response of OS clients in the event of an OS server failure	Configuration manual *PCS 7 Process Control System; Fault-Tolerant Process Control Systems*	• Switchover response of OS clients in the event of an OS server failure
Failure of BATCH servers	Manual *Process Control System PCS 7; SIMATIC BATCH*	• Failure of BATCH servers

Scenario	Information can be found in ...	Section ...
Switchover response of BATCH clients in the event of a BATCH server failure	Manual *Process Control System PCS 7; SIMATIC BATCH*	• Switchover response of BATCH clients in the event of a BATCH server failure
Reaction of Route Control Servers to Failures	Manual *Process Control System PCS 7; SIMATIC Route Control*	• Reaction of Route Control Servers to Failures
Switchover response of Route Control clients in the event of a Route Control server failure	Manual *Process Control System PCS 7; SIMATIC Route Control*	• Switchover response of Route Control clients in the event of a Route Control server failure

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