SIEMENS

SIMATIC HMI

WinCC flexible 2008
Communication Part 1

User's Manual

This user manual is part of the documentation package with the order number 6AV6691-1CA01-3AB0.

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Safety Guidelines

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

⚠DANGER

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

⚠WARNING

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

⚠CAUTION

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

CAUTION

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

NOTICE

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

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

Prescribed Usage

Note the following:

⚠WARNING

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

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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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℗ 07/2008

Preface

Preface

This user manual is part of the WinCC flexible documentation.

The purpose of the "WinCC flexible Communication" user manual is to explain:

- which communications protocols can be used for communication between a SIEMENS HMI device and a controller,
- which SIEMENS HMI devices can be used for communication,
- which controllers can be connected to a selected SIEMENS HMI device,
- which settings are required in the controller program for the connection, and
- which user data areas must be set up for communication.

Separate sections therefore explain the size, structure, and function of the user data areas and the assigned area pointers.

The manual is intended for newcomers, operators and configuration engineers involved in configuration, commissioning, installation and service with WinCC flexible.

The help integrated in WinCC flexible, the WinCC flexible Information System, contains detailed information. The information system contains instructions, examples and reference information in electronic form.

Basic Knowledge Requirements

General knowledge in the field of automation engineering is required to understand this manual.

You should also have experience of using PCs running under the Windows 2000 or Windows XP operating systems. A knowledge of VBA or VBS is required for advanced configuration by using scripts.

Scope of the manual

This manual is valid for the WinCC flexible 2008 software package.

Position in the information scheme

This manual is part of the SIMATIC HMI documentation. The information below presents an overview of the information landscape of SIMATIC HMI.

User manual

- WinCC flexible Micro
  - describes the engineering basics based on the WinCC flexible Micro engineering system (ES)
- WinCC flexible Compact/ Standard/ Advanced
  - describes the engineering basics based on the WinCC flexible Compact, WinCC flexible Standard and WinCC flexible Advanced engineering systems (ES)
- WinCC flexible Runtime:
  - Describes how to commission and operate your Runtime project on a PC.
- WinCC flexible Migration:
  - Describes how to convert an existing ProTool project to WinCC flexible.
  - Describes how to convert an existing WinCC project to WinCC flexible.
  - Describes how to migrate ProTool projects with an HMI migration from OP3 to OP 73 or OP 73 micro.
  - Describes how to migrate ProTool projects with an HMI migration from OP7 to OP 77B or OP 77A.
  - Describes how to migrate ProTool projects with an HMI migration from OP17 to OP 177B.
  - describes how to migrate ProTool projects with HMI migration from RMOS graphic devices to Windows CE devices.
- Communication:
  - Communication Part 1 describes the connection of the HMI device to SIMATIC PLCs.
  - Communication Part 2 describes the connection of the HMI device to third-party PLCs.

Operating Instructions

- Operating instructions for SIMATIC HMI devices:
  - OP 73, OP 77A, OP 77B
  - TP 170micro, TP 170A, TP 170B, OP 170B
  - OP 73micro, TP 177micro
  - TP 177A, TP 177B, OP 177B
  - TP 270, OP 270
  - TP 277, OP 277
  - MP 270B
  - MP 370
  - MP 377

- Operating instructions for mobile SIMATIC HMI devices:
  – Mobile Panel 170
  – Mobile Panel 277
  – Mobile Panel 277F IWLAN
  – Mobile Panel 277 IWLAN
- Operating instructions (compact) for SIMATIC HMI devices:
  – OP 77B
  – Mobile Panel 170

Getting Started

- WinCC flexible for first time users:
  – Based on a sample project, this is a step-by-step introduction to the basics of configuring screens, alarms, and recipes, and screen navigation.
- WinCC flexible for advanced users:
  – Based on a sample project, this is a step-by-step introduction to the basics of configuring logs, project reports, scripts, user management, and multilingual projects, and integration into STEP 7.
- WinCC flexible options:
  – Based on a sample project, this is a step-by-step introduction to the basics of configuring the WinCC flexible Audit, Sm@rtServices, Sm@rtAccess and OPC Server options.

Online availability

The following link actively guides you to technical documentation for SIMATIC products and systems in different languages.

- SIMATIC Guide Technical Documentation:

"http://www.automation.siemens.com/simatic/portal/html_76/techdoku.htm"

Guide

The user manual consists of Parts 1 and 2. Part 1 is organized as follows:

- Basics on communication - Chapter 1
- Connecting to the SIMATIC S7 - Chapter 2
- Connecting via the SIMATIC HMI HTTP protocol - Chapter 3
- Connecting via OPC - Chapter 4
- Connecting to the SIMOTION - Chapter 5
- Connecting to the WinAC - Chapter 6
- Connecting to the SIMATIC S5 - Chapter 7
- Connecting to the SIMATIC 500/505 - Chapter 8

Conventions

A distinction is made in the naming conventions for the configuration and runtime software:

- "WinCC flexible 2008" refers to the configuration software.
- "Runtime" designates the runtime software running on the HMI devices.
- "WinCC flexible Runtime" designates the visualization product for use on standard PCs or panel PCs.

The term "WinCC flexible" is used in the general context. A version name such as "WinCC flexible 2008" is used whenever it is necessary to distinguish it from other versions.

The following formatting is used to facilitate reading of the manual:

Notation	Scope
"Add screen"	• Terminology that occurs in the user interface, e.g., dialog names, tabs, buttons, menu commands. • Inputs required, e.g., limit values, tag values • Path information
"File > Edit"	Operational sequences, e.g., menu commands/shortcut menu commands.
<F1>, <Alt>+<P>	Keyboard inputs

Please pay particular attention to such notices:

Note

Notes containing important information about the product and its use or a specific section of the documentation to which you should pay particular attention.

Trademarks

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SIMATIC®
SIMATIC HMI®
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SIMATIC WinCC®
SIMATIC WinCC flexible®

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Additional support

Representatives and offices

If you have questions concerning the use of the described product which are not answered in this manual, please contact the Siemens representative in your area.

Find your contact partner at:

"http://www.siemens.com/automation/partner"

A guide to the technical documentation for the various SIMATIC products and systems is available at:

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

The online catalog and the online ordering system is available at:

"http://mall.automation.siemens.com"

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To familiarize you with automation systems, we offer a variety of courses. Please contact your regional training center or the central training center in D-90327 Nuremberg, Germany.

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- Relevant documentation for your application, which you can access via the search function in our service & support database.
- A forum where users and experts from all over ther world exchange ideas.
- You local Automation & Drives representative.
- Information about on-site service, repairs, spare parts. And lots more under "Services".

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Working with connections 1

1.1 Basics

1.1.1 Communication basics

Introduction

The data exchange between two communication partners is known as communication. The communication partners can be interconnected via direct cable connection or network.

Communication partners

A communication partner can be any node which is capable of communicating and exchanging data with other nodes on the network. In the WinCC flexible environment, the following nodes can be communication partners:

- Central modules and communication modules in the automation system
- can be HMI devices and communication processors in the PC.

Data transferred between the communication partners may serve different purposes:

- process control
- process data acquisition
- reporting states in a process
- process data logging

1.1.2 Principles of communication

Introduction

WinCC flexible controls communication between the HMI and the PLC by means of tags and area pointers.

Communication using tags

In WinCC flexible, tags are centrally managed in the "Tag" editor. There are external and internal tags. External tags are used for communication, and represent the image of defined memory locations on the PLC. The HMI and the PLC both have read and write access to this storage location. Those read and write operations may cyclic or event-triggered.

In your configuration, create tags that point to specific PLC addresses. The HMI reads the value from the defined address, and then displays it. The operator may also enter values on the HMI device which will be written to the relevant PLC address.

Communication using area pointers

Area pointers are used to exchange data of specific user data areas. Area pointers are parameter fields. WinCC flexible receives from these parameter fields in runtime the information about the location and size of data areas in the PLC. During communication, the PLC and the HMI device alternately access those data areas for read and write operations. Based on the evaluation of data stored in the data areas, the PLC and HMI device trigger defined actions.

WinCC flexible uses the following area pointers:

- Control request
- Project ID
- Screen number
- Data record
- Date/time
- Date/time PLC
- Coordination

The availability of the various area pointers is determined by the HMI used.

Communication between WinCC flexible and automation systems

Industrial communication using WinCC flexible means that data are exchanged using tags and area pointers. To acquire the data, the HMI sends request messages to the automation system using a communication driver. The automation system (AS) returns the requested data to the HMI in a response frame.

Communication drivers

A communication driver is a software component that develops a connection between an automation system and an HMI device. The communication driver hence enables the tags in WinCC flexible to be supplied with process values. WinCC flexible supports the interconnection of different automation systems with various communication drivers.

Users can select the interface, the profile and the transmission speed for each specific communication partner.

Communication between HMIs

The SIMATIC HMI HTTP Protocol is available for the communication between HMIs. This protocol is a component of the "Sm@rtAccess" option. The protocol can be used on PCs with WinCC flexible Runtime and on Panels as of the 270 series. For detailed information, refer to the SIMATIC HMI HTTP Protocol documentation.

Communication via uniform and manufacturer-independent interface

WinCC flexible provides a uniform and manufacturer-independent software interface using OPC (OLE for Process Control). This interface allows a standardized data exchange between applications for industry, office, and production. For detailed information, refer to the OPC documentation.

1.2 Elements and basic settings

1.2.1 Connections Editor

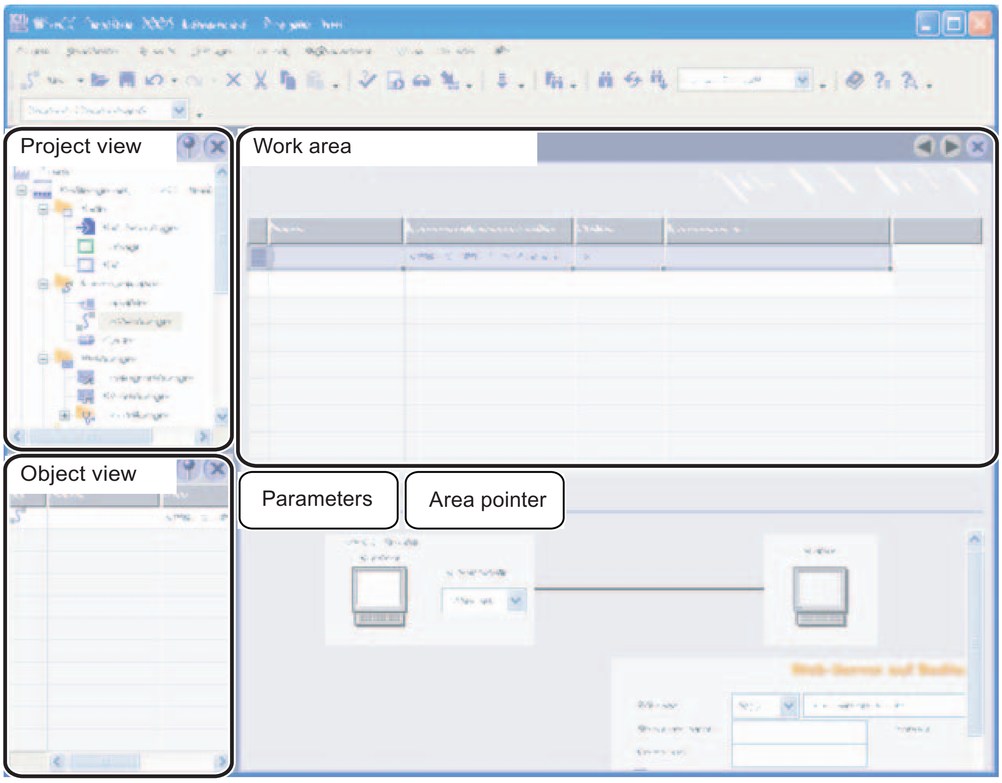
Introduction

In the "Connections" editor, you create and configure connections.

Open

Select "Connections" from the project view, and then open the shortcut menu. Select "New connection" from in this shortcut menu. The new connection will be created and opened in the work area.

Structure



Menu bar

The menu bar contains all commands required for operating WinCC flexible. Available key combinations are indicated next to the menu command.

Toolbars

The toolbars contain the most frequently used buttons.

Select "View > Toolbars" to show or hide the specific toolbars. The ▾ button of a toolbar can be used to show or hide specific buttons of this toolbar.

Work area

All connections are visualized in the work area in tabular format. You select the communication drivers from the table cells, and edit the relevant connection properties. To sort the table by its column entries, simply click the column header.

"Parameters" tab

Using the "Parameters" tab you can configure the settings for the communication drivers selected in the table. Select the settings for the HMI, the network and for the PLC.

"Area pointer" tab

Using the "Area pointers" tab you can configure the area pointers of the connections.

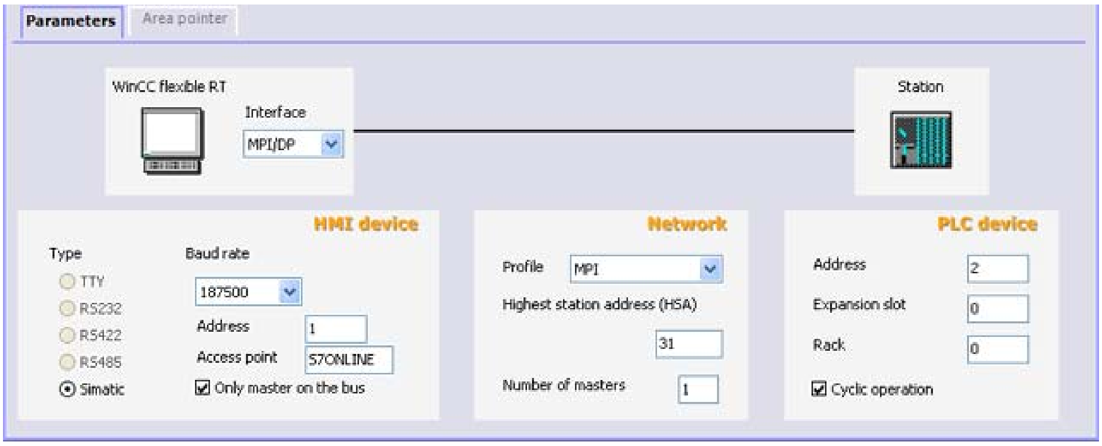
1.2.2 Parameters for connections

Introduction

Select the "Parameters" tab of the "Connections" editor to configure the properties of a connection between the HMI and the communication partner.

Structure

The communication partners are visualized schematically on the "Parameters" tab. This tab provides the "HMI device", "Network" and "PLC" areas where you can declare the parameters of the relevant interface used.



Interface: MPI/DP

HMI device
Type: ○ TTY ○ RS232 ○ RS422 ○ RS485 ● Simatic
Baud rate: 187500
Address: 1
Access point: S7ONLINE
☑ Only master on the bus

Network
Profile: MPI
Highest station address (HSA): 31
Number of masters: 1

PLC device
Address: 2
Expansion slot: 0
Rack: 0
☑ Cyclic operation

The system sets default parameters. Always ensure consistency on the network whenever you edit parameters. For detailed information on configurable parameters, refer to the description of the supported protocols.

1.2.3 Area pointers for connections

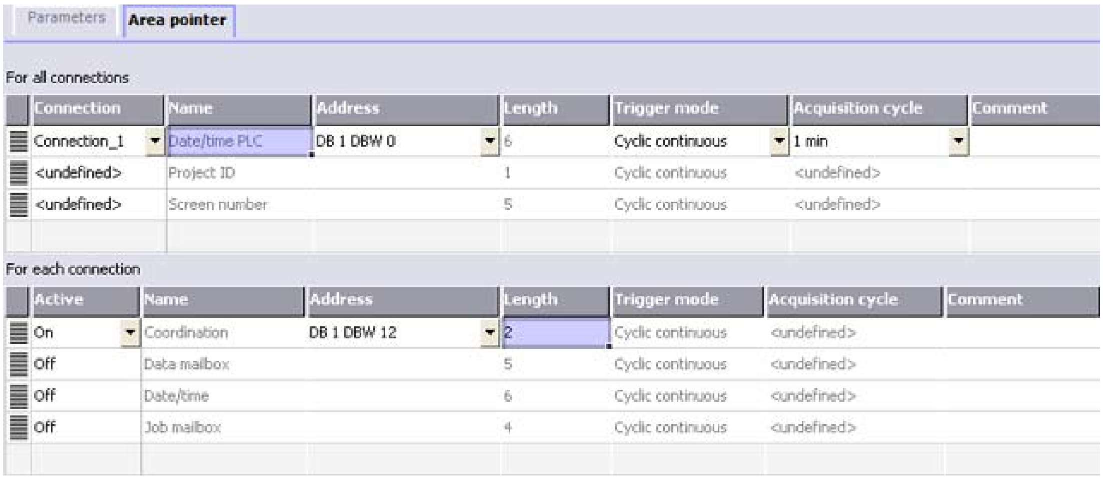
Introduction

Using the "Area pointer" tab of the "Connections" editor, you can configure the usage of the available area pointers.

Structure

The "Area pointer" tab contains two tables of area pointers. The "For all connections" table contains those area pointers which are created only once in the project and can be used for only one connection.

The "For each connection" table contains the area pointers you can set separately for each available connection.



For all connections

Connection	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
Connection_1	Date/time PLC	DB 1 DBW 0	6	Cyclic continuous	1 min	
<undefined>	Project ID		1	Cyclic continuous	<undefined>	
<undefined>	Screen number		5	Cyclic continuous	<undefined>	

For each connection

Active	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
On	Coordination	DB 1 DBW 12	2	Cyclic continuous	<undefined>	
Off	Data mailbox		5	Cyclic continuous	<undefined>	
Off	Date/time		6	Cyclic continuous	<undefined>	
Off	Job mailbox		4	Cyclic continuous	<undefined>	

The availability of the various area pointers is determined by the HMI device used. For detailed information on area pointers and their configuration, refer to the description of the supported protocols.

1.3 Configuring the connection

Introduction

You create a new connection using the Connections editor.

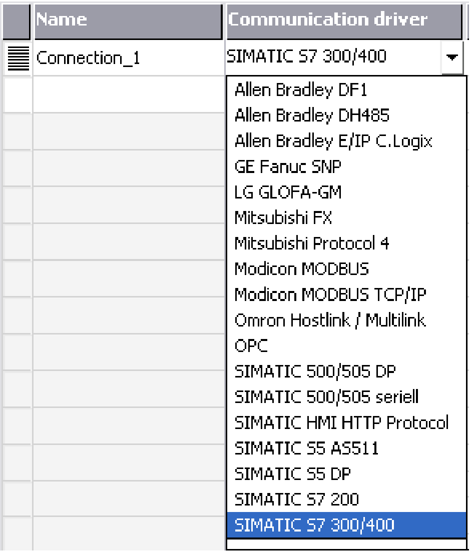
Requirements

A project is open.

Procedure

1. In the project view, open the "Communication" group.
2. Select "New connection" from the "Connections" shortcut menu.

   The "Connections" editor opens and shows a new connection.
3. Rename the connection in the "Name" column as required.
4. From the "Communication driver" column, select a communication driver that is suitable for the PLC being used.

Name	Communication driver
Connection_1	SIMATIC S7 300/400

   Only those drivers that are supported by the selected HMI device will be displayed.
5. The system automatically sets suitable values for the communication partner in the "Parameters" tab.
6. Check the parameters, and edit these as required.
7. Save the project.

Alternative procedure

Select "Insert > New item > Connection" from the menu bar. The "Connections" editor opens and shows a new connection. Edit the connection as described in steps 2 through 7.

You can drag-and-drop existing connections directly from HMI_1 or via an interim station in the library to HMI_2. The output view shows the following information: "The interface used for the connection has been adapted to the device". A device change is performed for this connection. The system does not verify whether or not the HMI_2 supports the communications driver.

Open the "Connections" editor on HMI_2 to check the connections. Faulty entries are marked in orange.

Result

A new connection was created. The connection parameters are configured.

1.4 Connections and protocols

HMI functionality

The HMI is used to read, save and record alarms and tags. In addition, the HMI can be used to intervene in the process.

> ⚠ CAUTION
>
> **Ethernet communication**
>
> In Ethernet-based communication, such as PROFINET IO, HTTP, Sm@rtAccess, Sm@rtService and OPC, it is the end user who is responsible for the security of his data network. The proper functioning of the device cannot be guaranteed in all circumstances; targeted attacks, for example, can lead to an overloading of the device.

Data exchange

The prerequisite for the operating and monitoring functions is the connection of the HMI device to a PLC. Data exchange between the HMI and the PLC is controlled by a connection-specific protocol. Each connection requires a separate protocol.

Criteria for selecting the connection

Criteria for selecting the connection between the HMI and the PLC are, for example:

- PLC type
- CPU in the PLC
- HMI device type
- Number of HMI devices per PLC
- Structure and any bus systems of an existing plant
- Amount of components additionally required

Protocols

Protocols are available for the following PLCs:

PLC	Protocol
SIMATIC S7	• PPI • MPI [1)] • PROFIBUS DP • TCP/IP (Ethernet)
SIMATIC S5	• AS 511 • PROFIBUS DP
SIMATIC 500/505	• NITP • PROFIBUS DP
SIMATIC HMI HTTP Protocol	• HTTP/HTTPS (Ethernet)
SIMOTION	• MPI • PROFIBUS DP • TCP/IP (Ethernet)
OPC	• DCOM
Allen-Bradley	PLC series SLC500, SLC501, SLC502, SLC503, SLC504, SLC505, MicroLogix and PLC5/11, PLC5/20, PLC5/30, PLC5/40, PLC5/60, PLC5/80 • DF1 [2)] • DH+ via KF2 module [3)] • DH485 via KF3 module [4)] • DH485 [4)] PLC series ControlLogix 5500 (with 1756-ENBT) and CompactLogix 5300 (1769-L32E and 1769-L35E) • Ethernet
GE Fanuc Automation	SPS series 90–30, 90–70, VersaMax Micro • SNP
LG Industrial Systems (Lucky Goldstar) / IMO	PLC series GLOFA GM (GM4, GM6 and GM7) / Series G4, G6 and G7 • Dedicated communication
Mitsubishi Electric	PLC series MELSEC FX and MELSEC FX0 • FX (Mitsubishi PG)
Mitsubishi Electric	PLC series MELSEC FX0, FX1n, FX2n, AnA, AnN, AnS, AnU, QnA and QnAS • Protocol 4
OMRON	PLC series SYSMAC C, SYSMAC CV, SYSMAC CS1, SYSMAC alpha, CJ and CP • Hostlink/Multilink (SYSMAC Way)
Modicon (Schneider Automation)	PLC series Modicon 984, TSX Quantum and TSX Compact • Modbus RTU SPS series Quantum, Momentum, Premium and Micro SPS series Compact and 984 via Ethernet bridge • Modbus TCP/IP (Ethernet)

PLC	Protocol
Telemecanique	PLC series TSX 7 with P47 411, TSX 7 with P47/67/87/107 420, TSX 7 with P47/67/87/107 425, module TSX SCM 21.6 with the specified TSX 7 CPUs, TSX 17 with module SCG 1161, TSX 37 (Micro), TSX 57 (Premium) • Uni-Telway

[1)] Not possible when connected to S7-212.

[2)] Applies to controllers SLC503, SLC504, SLC505, PLC5, MicroLogix

[3)] Applies to controllers SLC504, PLC5 over DF1

[4)] Applies to controllers SLC500 to SLC 505 and MicroLogix

1.5 Device-based dependency

1.5.1 Device-dependency of the protocols

Availability of the communication protocols

Communication between the HMI and the PLC is controlled using a network-specific protocol. The following tables show the availability of the communication protocols on the HMI devices.

Overview

Micro Panels

	OP 73micro 1)	TP 170micro 1)	TP 177micro 1)
SIMATIC S7 - PPI 1)	Yes	Yes	Yes
SIMATIC S7 - MPI 1)	Yes	Yes	Yes
SIMATIC S7 - PROFIBUS-DP 1)	Yes	Yes	Yes
SIMATIC S7 - PROFINET	No	No	No
SIMATIC S5 - AS511	No	No	No
SIMATIC S5 - PROFIBUS DP	No	No	No
SIMATIC 500/505 - NITP	No	No	No
SIMATIC 500/505 - PROFIBUS DP	No	No	No
SIMATIC HMI HTTP Protocol	No	No	No
OPC	No	No	No
SIMOTION	No	No	No
Allen-Bradley DF1	No	No	No
Allen-Bradley DH 485	No	No	No

	OP 73micro [1]	TP 170micro [1]	TP 177micro [1]
Allen-Bradley Ethernet IP	No	No	No
GE Fanuc	No	No	No
LG GLOFA-GM	No	No	No
Mitsubishi FX	No	No	No
Mitsubishi P4	No	No	No
Modicon Modbus RTU	No	No	No
Modicon Modbus TCP/IP	No	No	No
Omron	No	No	No
Telemecanique	No	No	No

Mobile Panels

	Mobile Panel 170	Mobile Panel 177 DP	Mobile Panel 177 PN	Mobile Panel 277 [4]	Mobile Panel 277 IWLAN Mobile Panel 277F IWLAN
SIMATIC S7 - PPI [1]	Yes	Yes	No	Yes	No
SIMATIC S7 - MPI	Yes	Yes	No	Yes	No
SIMATIC S7 - PROFIBUS DP	Yes	Yes	No	Yes	No
SIMATIC S7 - PROFINET	No	No	Yes	Yes	Yes
SIMATIC S5 - AS511	Yes	No	No	yes [3]	No
SIMATIC S5 - PROFIBUS DP	Yes	Yes	No	Yes	No
SIMATIC 500/505 - NITP	Yes	Yes	No	Yes	No
SIMATIC 500/505 - PROFIBUS DP	Yes	Yes	No	Yes	No
SIMATIC HMI HTTP Protocol	No	No	Yes	Yes	Yes
OPC	No	No	No	Yes	Yes
SIMOTION	Yes	Yes	Yes	Yes	No
Allen-Bradley DF1	Yes	Yes [7] [8]	No	Yes [7] [8]	No
Allen-Bradley DH 485	Yes	Yes [7] [8]	No	Yes [7] [8]	No
Allen-Bradley Ethernet IP	No	No	Yes [7]	Yes [7] [8]	Yes [7]
GE Fanuc	Yes	Yes [7] [8]	No	Yes [7] [8]	No
LG GLOFA-GM	Yes	Yes [7] [8]	No	Yes [7] [8]	No
Mitsubishi FX	Yes	Yes [7] [8]	No	Yes [7] [8]	No
Mitsubishi P4	Yes	Yes [7] [8]	No	Yes [7] [8]	No
Modicon Modbus RTU	Yes	Yes [7] [8]	No	Yes [7] [8]	No
Modicon Modbus TCP/IP	No	No	Yes [7]	Yes [7] [8]	No
Omron	Yes	Yes [7] [8]	No	Yes [7] [8]	No
Telemecanique	Yes	Yes [7] [8]	No	Yes [7] [8]	No

Basic Panels

	KTP400 Basic PN	KTP600 Basic DP	KTP600 Basic PN [11]	KTP1000 Basic DP	KTP1000 Basic PN	TP1500 Basic PN
SIMATIC S7 - PPI [1]	No	Yes	No	Yes	No	No
SIMATIC S7 - MPI	No	Yes	No	Yes	No	No
SIMATIC S7 - PROFIBUS DP	No	Yes	No	Yes	No	No
SIMATIC S7 - PROFINET	Yes	No	Yes	No	Yes	Yes
SIMATIC S5 - AS511	No	No	No	No	No	No
SIMATIC S5 - PROFIBUS DP	No	No	No	No	No	No
SIMATIC 500/505 - NITP	No	No	No	No	No	No
SIMATIC 500/505 - PROFIBUS DP	No	No	No	No	No	No
SIMATIC HMI HTTP Protocol	No	No	No	No	No	No
OPC	No	No	No	No	No	No
SIMOTION	No	No	No	No	No	No
Allen-Bradley DF1	No	Yes [10]	No	Yes [10]	No	No
Allen-Bradley DH 485	No	No	No	No	No	No
Allen-Bradley Ethernet IP	No	No	No	No	No	No
GE Fanuc	No	No	No	No	No	No
LG GLOFA-GM	No	No	No	No	No	No
Mitsubishi FX	No	No	No	No	No	No
Mitsubishi P4	No	No	No	No	No	No
Modicon Modbus RTU	No	Yes [5]	No	Yes [5]	No	No
Modicon Modbus TCP/IP	No	No	No	No	No	No
Omron	No	No	No	No	No	No
Telemecanique	No	No	No	No	No	No

Panels

	OP 73	OP 77A	OP 77B [9]	TP 170A [9]	TP 170B OP 170B	TP 177A	TP 177B [9] OP 177B [9]	TP 270 OP 270	TP 277 [9] OP 277 [9]
SIMATIC S7 - PPI [1]	Yes	Yes	Yes [8]	Yes	Yes	Yes	Yes	Yes	Yes
SIMATIC S7 - MPI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIMATIC S7 - PROFIBUS DP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIMATIC S7 - PROFINET	No	No	No	No	Yes	No	Yes [6]	Yes	Yes

	OP 73	OP 77A	OP 77B [9]	TP 170A [9]	TP 170B OP 170B	TP 177A	TP 177B [9] OP 177B [9]	TP 270 OP 270	TP 277 [9] OP 277 [9]
SIMATIC S5 - AS511	No	No	Yes	Yes	Yes	No	No	Yes	No
SIMATIC S5 - PROFIBUS DP	No	No	Yes	No	Yes	No	Yes	Yes	Yes
SIMATIC 500/505 - NITP	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
SIMATIC 500/505 - PROFIBUS DP	No	No	Yes	No	Yes	No	Yes	Yes	Yes
SIMATIC HMI HTTP Protocol	No	No	No	No	No	No	Yes [6]	Yes	Yes
OPC	No	No	No	No	No	No	No	No	No
SIMOTION	No	No	No	No	Yes	No	Yes	Yes	Yes
Allen-Bradley DF1	No	Yes [10]	Yes [9]	Yes [9]	Yes	Yes [10]	Yes [7] [9] [10]	Yes	Yes [7] [9] [10]
Allen-Bradley DH 485	No	No	Yes [9]	Yes [9]	Yes	No	Yes [7] [9]	Yes	Yes [7] [9]
Allen-Bradley Ethernet IP	No	No	No	No	No	No	Yes [6] [7]	No	Yes [7]
GE Fanuc	No	No	Yes [9]	Yes [9]	Yes	No	Yes [7] [9]	Yes	Yes [7] [9]
LG GLOFA-GM	No	No	Yes [9]	Yes [9]	Yes	No	Yes [7] [9]	Yes	Yes [7] [9]
Mitsubishi FX	No	No	Yes [9]	Yes [9]	Yes	No	Yes [7] [9]	Yes	Yes [7] [9]
Mitsubishi P4	No	No	Yes [9]	Yes [9]	Yes	No	Yes [7] [9]	Yes	Yes [7] [9]
Modicon Modbus RTU	No	Yes [5]	Yes [9]	Yes [9]	Yes	Yes [5]	Yes [5] [7] [9]	Yes	Yes [5] [7] [9]
Modicon Modbus TCP/IP	No	No	No	No	No	No	Yes [6] [7]	Yes	Yes [7]
Omron	No	No	Yes [9]	Yes [9]	Yes	No	Yes [7] [9]	Yes	Yes [7] [9]
Telemecanique	No	No	Yes [9]	Yes [9]	Yes	No	Yes [7] [9]	Yes	Yes [7] [9]

Multi Panels

	MP 177 9)	MP 270B	MP 277 9)	MP 370	MP377 9)
SIMATIC S7 - PPI 1)	Yes	Yes	Yes	Yes	Yes
SIMATIC S7 - MPI	Yes	Yes	Yes	Yes	Yes
SIMATIC S7 - PROFIBUS DP	Yes	Yes	Yes	Yes	Yes
SIMATIC S7 - PROFINET	Yes	Yes	Yes	Yes	Yes
SIMATIC S5 - AS511	No	Yes	No	Yes	No
SIMATIC S5 - PROFIBUS DP	Yes	Yes	Yes	Yes	Yes
SIMATIC 500/505 - NITP	Yes	Yes	Yes	Yes	Yes
SIMATIC 500/505 - PROFIBUS DP	Yes	Yes	Yes	Yes	Yes
SIMATIC HMI HTTP Protocol	Yes	Yes	Yes	Yes	Yes
OPC	No	Yes	Yes	Yes	Yes
SIMOTION	No	Yes	Yes	Yes	Yes
Allen-Bradley DF1	Yes 7) 9) 10)	Yes	Yes 7) 9) 10)	Yes	Yes 7) 9) 10)
Allen-Bradley DH 485	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
Allen-Bradley Ethernet IP	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
GE Fanuc	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
LG GLOFA-GM	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
Mitsubishi FX	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
Mitsubishi P4	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
Modicon Modbus RTU	Yes 5) 7) 9)	Yes	Yes 5) 7) 9)	Yes	Yes 5) 7) 9)
Modicon Modbus TCP/IP	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
Omron	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)
Telemecanique	Yes 7) 9)	Yes	Yes 7) 9)	Yes	Yes 7) 9)

WinCC flexible Runtime

	WinCC flexible Runtime
SIMATIC S7 - PPI 1)	Yes
SIMATIC S7 - MPI	Yes
SIMATIC S7 - PROFIBUS DP	Yes
SIMATIC S7 - PROFINET	Yes
SIMATIC S5 - AS511	Yes
SIMATIC S5 - PROFIBUS DP	Yes
SIMATIC 500/505 - NITP	Yes
SIMATIC 500/505 - PROFIBUS DP	Yes
SIMATIC HMI HTTP Protocol	Yes
OPC	Yes
SIMOTION	Yes
Allen-Bradley DF1	Yes
Allen-Bradley DH 485	Yes
Allen-Bradley Ethernet IP	Yes

	WinCC flexible Runtime
GE Fanuc	Yes
LG GLOFA-GM	Yes
Mitsubishi FX	Yes
Mitsubishi P4	Yes
Modicon Modbus RTU	Yes
Modicon Modbus TCP/IP	Yes
Omron	Yes
Telemecanique	No

[1] only with SIMATIC S7-200

[2] only MP 270B

[3] only with RS 232/TTY adapter 6ES5 734-1BD20 (option)

[4] Depends on which connection box is used

[5] only with converter RS 422-RS 232 6AV6 671-8XE00-0AX0 (option)

[6] Applies only to TP 177B PN/DP and OP 177B PN/DP.

[7] PROFINET IO Enabled must be deactivated

[8] Up to four SIMATIC S7-200 connections via PPI network

[9] For a series communication in the menu "File > Transfer > Options", clear "Remote Control" from "Channel 1".

[10] Direct communication with PLC5 or KF2 module, otherwise approved only with converter RS 422-RS232 6AV6 671-8XE00-0AX0 (option)

[11] KTP600 Basic PN color and KTP600 Basic PN mono.

1.5.2 Device-based dependency of the interfaces

Introduction

The PLC and HMI device use a communication connection for data exchange. You must ensure the interfaces are in concordance. Among others, the following parameters must be noted:

- The PLC and communication drivers must be in concordance
- The HMI device must support the required communication protocol
- Using the interface supported by the HMI device

The "Connections" editor is used to configure the parameters for the communication drivers.

Supported interfaces

The following tables show the hardware interfaces that are to be used on the HMI devices.

Overview

Micro Panels

	OP 73micro [1)]	TP 170micro [1)]	TP 177micro [1)]
SIMATIC S7 – PPI [1)]	IF1B	IF1B	IF1B
SIMATIC S7 - MPI [1)]	IF1B	IF1B	IF1B
SIMATIC S7 - PROFIBUS DP [1)]	IF1B	IF1B	IF1B
SIMATIC S7 - PROFINET	—	—	—
SIMATIC S5 - AS511	—	—	—
SIMATIC S5 - PROFIBUS DP	—	—	—
SIMATIC 500/505 - NITP	—	—	—
SIMATIC 500/505 - PROFIBUS DP	—	—	—
SIMATIC HMI HTTP Protocol	—	—	—
OPC	—	—	—
Allen-Bradley DF1	—	—	—
Allen-Bradley DH 485	—	—	—
Allen-Bradley Ethernet IP	—	—	—
GE Fanuc	—	—	—
LG GLOFA-GM	—	—	—
Mitsubishi FX	—	—	—
Mitsubishi P4	—	—	—
Modicon Modbus RTU	—	—	—
Modicon Modbus TCP/IP	—	—	—
Omron	—	—	—
Telemecanique	—	—	—

Mobile Panels

	Mobile Panel 170	Mobile Panel 177 DP [8)]	Mobile Panel 177 PN	Mobile Panel 277 [4) 8)]	Mobile Panel 277 IWLAN Mobile Panel 277F IWLAN
SIMATIC S7 - PPI [1)]	IF1B	IF1B	—	IF1B	—
SIMATIC S7 - MPI	IF1B	IF1B	—	IF1B	—
SIMATIC S7 - PROFIBUS DP	IF1B	IF1B	—	IF1B	—
SIMATIC S7 - PROFINET	—	—	Ethernet	Ethernet	Ethernet/Wireless
SIMATIC S5 - AS511	IF1A (connection box) [3)]	—	—	—	—
SIMATIC S5 - PROFIBUS DP	IF1A (connection box)	IF1B	—	IF1A (connection box)	—

	Mobile Panel 170	Mobile Panel 177 DP [8]	Mobile Panel 177 PN	Mobile Panel 277 [4] [8]	Mobile Panel 277 IWLAN Mobile Panel 277F IWLAN
SIMATIC 500/505 - NITP	IF1A (RS232) IF1B (RS422) IF2 (RS232)	IF1A (RS232) IF1B (RS422)	—	IF1A (RS232) IF1B (RS422)	—
SIMATIC 500/505 - PROFIBUS DP	IF1B (connection box)	IF1B (connection box)	—	IF1B (connection box)	—
SIMATIC HMI HTTP Protocol	—	—	Ethernet	Ethernet	Ethernet/Wireless
OPC	—	—	—	—	OPC
Allen-Bradley DF1	IF1A, IF1B [9] (connection box), IF2 [8]	IF1A [8], IF1B [8][9] (connection box)	—	IF1A [8], IF1B [8][9] (connection box)	—
Allen-Bradley DH 485	IF1A, IF1B (connection box), IF2 [8]	IF1A [8], IF1B [8] (connection box)	—	IF1A [8], IF1B [8] (connection box)	—
Allen-Bradley Ethernet IP	—	---	Ethernet	Ethernet	Ethernet/Wireless
GE Fanuc	IF1A, IF1B (connection box), IF2 [8]	IF1A [8], IF1B [8] (connection box)	—	IF1A [8], IF1B [8] (connection box)	—
LG GLOFA-GM	IF1A, IF1B (connection box), IF2 [8]	IF1A [8], IF1B [8] (connection box)	—	IF1A [8], IF1B [8] (connection box)	—
Mitsubishi FX	IF1A, IF1B (connection box), IF2 [8]	IF1A [8], IF1B [8] (connection box)	—	IF1A [8], IF1B [8] (connection box)	—
Mitsubishi P4	IF1A, IF1B (connection box), IF2 [8]	IF1A [8], IF1B [8] (connection box)	—	IF1A [8], IF1B [8] (connection box)	—
Modicon Modbus RTU	IF1A, IF1B [12] (connection box), IF2 [8]	IF1A [8], IF1B [8][12] (connection box)	—	IF1A [8], IF1B [8][12] (connection box)	—
Modicon Modbus TCP/IP	—	—	Ethernet	Ethernet	—
Omron	IF1A, IF1B (connection box), IF2 [8]	IF1A [8], IF1B [8] (connection box)	—	IF1A [8], IF1B [8] (connection box)	—
Telemecanique	IF1B	IF1B [8]	—	IF1B [8]	—

Basic Panels

	KTP400 Basic PN	KTP600 Basic DP	KTP600 Basic PN	KTP1000 Basic DP	KTP1000 Basic PN	TP1500 Basic PN
SIMATIC S7 - PPI [1]	—	IF1B	—	IF1B	—	—
SIMATIC S7 - MPI	—	IF1B	—	IF1B	—	—
SIMATIC S7 - PROFIBUS DP	—	IF1B	—	IF1B	—	—
SIMATIC S7 - PROFINET	Ethernet	—	Ethernet	—	Ethernet	Ethernet
SIMATIC S5 - AS511	—	—	—	—	—	—
SIMATIC S5 - PROFIBUS DP	—	—	—	—	—	—
SIMATIC 500/505 - NITP	—	—	—	—	—	—
SIMATIC 500/505 - PROFIBUS DP	—	—	—	—	—	—
SIMATIC HMI HTTP Protocol	—	—	—	—	—	—
OPC	—	—	—	—	—	—
Allen-Bradley DF1	—	IF1B [11]	—	IF1B [11]	—	—
Allen-Bradley DH 485	—	—	—	—	—	—
Allen-Bradley Ethernet IP	—	—	—	—	—	—
GE Fanuc	—	—	—	—	—	—
LG GLOFA-GM	—	—	—	—	—	—
Mitsubishi FX	—	—	—	—	—	—
Mitsubishi P4	—	—	—	—	—	—
Modicon Modbus RTU	—	IF1B [5]	—	IF1B [5]	—	—
Modicon Modbus TCP/IP	—	—	—	—	—	—
Omron	—	—	—	—	—	—
Telemecanique	—	—	—	—	—	—

Panels

	OP 73	OP 77A	OP 77B [8]	TP 170A [8]	TP 170B OP 170B	TP 177A	TP 177B [8] OP 177B [8]	TP 270 OP 270	TP 277 [8] OP 277 [8]
SIMATIC S7 - PPI [1]	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC S7 - MPI	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC S7 - PROFIBUS DP	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC S7 - PROFINET	—	—	—	—	Ethernet	—	Ethernet [6]	Ethernet	Ethernet [6]
SIMATIC S5 - AS511	—	—	IF1A	IF1A	IF1A, IF2	—	—	IF1A, IF2	—
SIMATIC S5 - PROFIBUS DP	—	—	IF1B	—	IF1B	—	IF1B	IF1B	IF1B
SIMATIC 500/505 - NITP	—	—	IF1A, IF1B	IF1A, IF1B	IF1A, IF1B, IF2	—	IF1B	IF1A, IF1B, IF2	IF1B
SIMATIC 500/505 - PROFIBUS DP	—	—	IF1B	—	IF1B	—	IF1B	IF1B	IF1B
SIMATIC HMI HTTP Protocol	—	—	—	—	—	—	Ethernet [6]	Ethernet	Ethernet
OPC	—	—	—	—	—	—	—	—	—
Allen-Bradley DF1	—	IF1B [11]	IF1A [8], IF1B [8][9]	IF1A [8], IF1B [8][9]	IF1A, IF1B [9], IF2 [8]	IF1B [6] [11]	IF1B [8] [11]	IF1A, IF1B [11], IF2 [8]	IF1B [8] [11]
Allen-Bradley DH 485	—	—	IF1A [8], IF1B [8]	IF1A [8], IF1B [8]	IF1A, IF1B, IF2 [8]	—	IF1B [8]	IF1A, IF1B, IF2 [8]	IF1B [8]
Allen-Bradley Ethernet IP	—	—	—	—	—	—	Ethernet [6]	—	Ethernet
GE Fanuc	—	—	IF1A [8], IF1B [8]	IF1A [8], IF1B [8]	IF1A, IF1B, IF2 [8]	—	IF1B [8]	IF1A, IF1B, IF2 [8]	IF1B [8]
LG GLOFA-GM	—	—	IF1A [8], IF1B [8]	IF1A [8], IF1B [8]	IF1A, IF1B, IF2 [8]	—	IF1B [8]	IF1A, IF1B, IF2 [8]	IF1B [8]
Mitsubishi FX	—	—	IF1A [8], IF1B [8]	IF1A [8], IF1B [8]	IF1A, IF1B, IF2 [8]	—	IF1B [8]	IF1A, IF1B, IF2 [8]	IF1B [8]
Mitsubishi P4	—	—	IF1A [8], IF1B [8]	IF1A [8], IF1B [8]	IF1A, IF1B, IF2 [8]	—	IF1B [8]	IF1A, IF1B, IF2 [8]	IF1B [8]
Modicon Modbus RTU	—	IF1B [5]	IF1A [8], IF1B [5][8][12]	IF1A [8], IF1B [5][8][12]	IF1A, IF1B [5] [12] IF2 [8]	IF1B [5]	IF1B [5] [8]	IF1A, IF1B [5] [12], IF2 [8]	IF1B [5] [8]
Modicon Modbus TCP/IP	—	—	—	—	—	—	Ethernet [6]	Ethernet	Ethernet
Omron	—	—	IF1A [8], IF1B [8]	IF1A [8], IF1B [8]	IF1A, IF1B, IF2 [8]	—	IF1B [8]	IF1A, IF1B, IF2 [8]	IF1B [8]
Telemecanique	—	—	IF1B [8]	IF1B [8]	IF1B	—	IF1B [8]	IF1B	IF1B [8]

Multi Panels

	MP 177 [8)]	MP 270B	MP 277 [8)]	MP 370	MP 377 [8)]
SIMATIC S7 - PPI [1)]	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC S7 - MPI	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC S7 - PROFIBUS DP	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC S7 - PROFINET	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet
SIMATIC S5 - AS511	-	IF1A, IF2	-	IF1A, IF2	-
SIMATIC S5 - PROFIBUS DP	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC 500/505 - NITP	IF1B	IF1A, IF1B, IF2	IF1B	IF1A, IF1B, IF2	IF1B
SIMATIC 500/505 - PROFIBUS DP	IF1B	IF1B	IF1B	IF1B	IF1B
SIMATIC HMI HTTP Protocol	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet
OPC	-	OPC	OPC	OPC	OPC
Allen-Bradley DF1	IF1B [8) 11)]	IF1A, IF1B [9)], IF2 [8)]	IF1B [8) 11)]	IF1A, IF1B [9)], IF2 [8)]	IF1B [8) 11)]
Allen-Bradley DH 485	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]
Allen-Bradley Ethernet IP	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet
GE Fanuc	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]
LG GLOFA-GM	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]
Mitsubishi FX	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]
Mitsubishi P4	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]
Modicon Modbus RTU	IF1B [5) 8)]	IF1A, IF1B [12)], IF2 [8)]	IF1B [5) 8)]	IF1A, IF1B [12)], IF2 [8)]	IF1B [5) 8)]
Modicon Modbus TCP/IP	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet
Omron	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]	IF1A, IF1B, IF2 [8)]	IF1B [8)]
Telemecanique	IF1B [8)]	IF1B	IF1B [8)]	IF1B	IF1B [8)]

WinCC flexible Runtime

	WinCC flexible Runtime on Panel PC	WinCC flexible Runtime on PC
SIMATIC S7 - PPI [1)]	MPI/PROFIBUS DP	PROFIBUS DP card (e.g. CP5611)
SIMATIC S7 - MPI	MPI/PROFIBUS DP	PROFIBUS DP card (e.g. CP5611)
SIMATIC S7 - PROFIBUS DP	MPI/PROFIBUS DP	PROFIBUS DP card (e.g. CP5611)
SIMATIC S7 - PROFINET	Ethernet	Ethernet
SIMATIC S5 - AS511	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
SIMATIC S5 - PROFIBUS DP	MPI/PROFIBUS DP	PROFIBUS DP card (e.g. CP5611)
SIMATIC 500/505 - NITP	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
SIMATIC 500/505 - PROFIBUS DP	MPI/PROFIBUS DP	PROFIBUS DP card (e.g. CP5611)

	WinCC flexible Runtime on Panel PC	WinCC flexible Runtime on PC
SIMATIC HMI HTTP Protocol	Ethernet [7)]	Ethernet [7)]
OPC	Ethernet	Ethernet
Allen-Bradley DF1	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
Allen-Bradley DH 485	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
Allen-Bradley Ethernet IP	Ethernet	Ethernet
GE Fanuc	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
LG GLOFA-GM	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
Mitsubishi FX	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
Mitsubishi P4	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
Modicon Modbus RTU	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
Modicon Modbus TCP/IP	Ethernet	Ethernet
Omron	COM1 to COM4 [10)]	COM1 through COM4 (depending on arrangement)
Telemecanique	—	—

— not supported

[1)] only with SIMATIC S7-200

[2)] only MP 270B

[3)] only with RS 232/TTY adapter 6ES5 734-1BD20 (option)

[4)] Depends on which connection box is used

[5)] only with converter RS 422-RS 232 6AV6 671-8XE00-0AX0 (option)

[6)] not cleared for TP 177B DP, OP 177B DP.

[7)] WinCC flexible Runtime must be installed on the devices

[8)] For a series communication in the menu "File > Transfer > Options", clear "Remote Control" from "Channel 1".

[9)] Only with PLC5 and KF2 module

[10)] COM2 is locked for PC 477.

[11)] Direct communication with PLC5 or KF2 module, otherwise approved only with converter RS422-RS232 6AV6 671-8XE00-0AX0 (option)

[12)] Can be selected and used but is not approved.

Note

Communication with SIMATIC 500/505 and with third-party PLCs

If you use the "IF1B" port, this must also be configured with the DIP switch on the back of the HMI device. In this case, the RS 422 received data and the RTS signal are interchanged.

1.5.3 Device/based dependency of area pointers

Introduction

Area pointers are parameter fields from which WinCC flexible Runtime obtains information about the location and size of data areas in the PLC. During communication, the PLC and the HMI device alternately access these data areas for read and write operations. Based on the evaluation of data stored in the data areas, the PLC and HMI device trigger defined actions.

WinCC flexible uses the following area pointers:

- Job mailbox
- Project ID
- Screen number
- Data record
- Date/time
- Date/time PLC
- Coordination

Availability of the area pointers

The following tables show the availability of the area pointers for the HMI devices. Note that the area pointers can be used only for available communication drivers.

Overview

Micro Panels

	OP 73micro [1)]	TP 170micro [1)]	TP 177micro [1)]
Screen number	No	No	No
Data record	No	No	No
Date/time	No	No	No
Date/time PLC	Yes	Yes	Yes
Coordination	No	No	No
Project ID	No	No	No
Job mailbox	No	No	No

Mobile Panels

	Mobile Panel 170	Mobile Panel 177 DP	Mobile Panel 177 PN	Mobile Panel 277	Mobile Panel 277 IWLAN Mobile Panel 277F IWLAN
Screen number	Yes	Yes	Yes	Yes	Yes
Data record	Yes	Yes	Yes	Yes	Yes
Date/time	Yes	Yes	Yes	Yes	Yes
Date/time PLC	Yes	Yes	Yes	Yes	Yes
Coordination	Yes	Yes	Yes	Yes	Yes
Project ID	Yes	Yes	Yes	Yes	Yes
Job mailbox	Yes	Yes	Yes	Yes	Yes

Basic Panels

	KTP400 Basic PN	KTP600 Basic PN	KTP600 Basic DP	KTP1000 Basic PN	KTP1000 Basic DP	TP1500 Basic PN
Screen number	Yes	Yes	Yes	Yes	Yes	Yes
Data record	Yes	Yes	Yes	Yes	Yes	Yes
Date/time	Yes	Yes	Yes	Yes	Yes	Yes
Date/time PLC	Yes	Yes	Yes	Yes	Yes	Yes
Coordination	Yes	Yes	Yes	Yes	Yes	Yes
Project ID	Yes	Yes	Yes	Yes	Yes	Yes
Job mailbox	Yes	Yes	Yes	Yes	Yes	Yes

Panels

	OP 73	OP 77A	OP 77B	TP 170A	TP 170B OP 170B	TP 177A	TP 177B OP 177B	TP 270 OP 270	TP 277 OP 277
Screen number	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Data record	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Date/time	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Date/time PLC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coordination	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Project ID	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Job mailbox	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

Multi Panels

	MP 177	MP 270B	MP 277	MP 370	MP 377
Screen number	Yes	Yes	Yes	Yes	Yes
Data record	Yes	Yes	Yes	Yes	Yes
Date/time	Yes	Yes	Yes	Yes	Yes
Date/time PLC	Yes	Yes	Yes	Yes	Yes
Coordination	Yes	Yes	Yes	Yes	Yes
Project ID	Yes	Yes	Yes	Yes	Yes
Job mailbox	Yes	Yes	Yes	Yes	Yes

WinCC flexible Runtime

	WinCC flexible Runtime
Screen number	Yes
Data record	Yes
Date/time	Yes
Date/time PLC	Yes
Coordination	Yes
Project ID	Yes
Job mailbox	Yes

[1] The devices OP 73 micro, TP 170micro and TP 177micro can only communicate with a S7-200 PLC.

1.5.4 Device-based dependency of alarms

Introduction

Alarms are issued to the HMI device. They give information regarding the operating states or operating faults on the PLC or the HMI device.

The alarm texts consist of configurable texts and/or tags with actual values.

We differentiate between the following alarms:

- Warning alarms

  A warning alarm shows a status.

- Error alarms

  An error alarm shows an operating fault.

The programmer defines what a warning alarm and what an error alarm is.

Device-based dependency of alarms and words

The following tables show the maximum number of alarms and words for different HMI devices.

Overview

Micro Panels

	OP 73micro	TP 170micro	TP 177micro
Words, in total	16	32	32
Alarms, in total	250	500	500

Mobile Panels

	Mobile Panel 170	Mobile Panel 177 DP	Mobile Panel 177 PN	Mobile Panel 277	Mobile Panel 277 IWLAN Mobile Panel 277F IWLAN
Words, in total	125	125	125	250	250
Alarms, in total	2000	2000	2000	4000	4000

Basic Panels

	KTP400 Basic PN	KTP600 Basic DP	KTP600 Basic PN	KTP1000 Basic DP	KTP1000 Basic PN	TP1500 Basic PN
Words, in total	13	13	13	13	13	13
Alarms, in total	200	200	200	200	200	200

Panels

	OP 73	OP 77A	OP 77B	TP 170A [1)]	TP 170B OP 170B	TP 177A	TP 177B OP 177B	TP 270 OP 270	TP 277 OP 277
Words, in total	32	63	63	63	125	63	125	250	250
Alarms, in total	500	1000	1000	1000	2000	1000	2000	4000	4000

Multi Panels

	MP 177	MP 270B	MP 277	MP 370	MP 377
Words, in total	125	250	250	250	250
Alarms, in total	2000	4000	4000	4000	4000

WinCC flexible Runtime

	WinCC flexible Runtime
Words, in total	250
Alarms, in total	4000

[1)] Only warning alarms possible

1.5.5 Device-based dependency of direct keys

Supported HMI devices

You can use the functionality of the direct keys with the following HMI devices:

Overview

Micro Panels

	OP 73micro	TP 170micro	TP 177micro
PROFIBUS DP direct keys	No	No	No
PROFINET IO direct keys	No	No	No

Mobile Panels

	Mobile Panel 170	Mobile Panel 177 DP	Mobile Panel 177 PN	Mobile Panel 277	Mobile Panel 277 IWLAN Mobile Panel 277F IWLAN
PROFIBUS DP direct keys	No	Yes	No	Yes	Yes
PROFINET IO direct keys	No	No	Yes	Yes	Yes

Basic Panels

	KTP400 Basic PN	KTP600 Basic DP	KTP600 Basic PN	KTP1000 Basic DP	KTP1000 Basic PN	TP1500 Basic PN
PROFIBUS DP direct keys	No	No	No	No	No	No
PROFINET IO direct keys	No	No	No	No	No	No

Panels

	OP 73	OP 77A	OP 77B	TP 170A	TP 170B OP 170B	TP 177A	TP 177B OP 177B	TP 270 OP 270	TP 277 OP 277
PROFIBUS DP direct keys	No	No	Yes	No	Yes	No	Yes	Yes	Yes
PROFINET IO direct keys	No	No	No	No	No	No	Yes [1]	No	Yes

Multi Panels

	MP 177	MP 270B	MP 277	MP 370	MP 377
PROFIBUS DP direct keys	Yes	Yes	Yes	Yes	Yes
PROFINET IO direct keys	No	No	Yes	No	Yes

WinCC flexible Runtime

	WinCC flexible Runtime
PROFIBUS DP direct keys	No
PROFINET IO direct keys	No

[1] Only available with TP 177B PN/DP and OP 177B PN/DP

1.5.6 Device-based dependency of interfaces for the project transfer

Supported HMI devices

Depending on the HMI device, the transfer of projects can take place via the following interfaces:

Overview

Micro Panels

	OP 73micro	TP 170micro	TP 177micro
Serial	Yes [1)]	Yes [1)]	Yes [1)]
MPI/PROFIBUS DP	No	No	No
Ethernet	No	No	No
USB	Yes [2)]	No	Yes [2)]
S7Ethernet	No	No	No

Mobile Panels

	Mobile Panel 170	Mobile Panel 177 DP	Mobile Panel 177 PN	Mobile Panel 277	Mobile Panel 277 IWLAN Mobile Panel 277F IWLAN
Serial	Yes	Yes [1)]	Yes [1)]	Yes [1)]	No
MPI/PROFIBUS DP	Yes	Yes	No	Yes [6)]	No
Ethernet	No	No	Yes	Yes [6)]	Yes
USB	No	No	No	Yes	Yes
S7Ethernet	No	No	No	Yes	Yes

Basic Panels

	KTP400 Basic PN	KTP600 Basic DP	KTP600 Basic PN	KTP1000 Basic DP	KTP1000 Basic PN	TP1500 Basic PN
Serial	No	Yes [1)]	No	Yes [1)]	No	No
MPI/PROFIBUS DP	No	Yes	Yes	Yes	No	No
Ethernet	Yes	No	No	No	Yes	Yes
USB	Yes [2)]	Yes [2)]	Yes [2)]	Yes [2)]	No	Yes [2)]
S7Ethernet	No	No	No	No	No	No

Panels

	OP 73	OP 77A	OP 77B	TP 170A	TP 170B OP 170B	TP 177A	TP 177B OP 177B	TP 270 OP 270	TP 277 OP 277
Serial	Yes [1)]	Yes [1)]	Yes	Yes	Yes	Yes [1)]	Yes [1)]	Yes	Yes [1)]
MPI/PROFIBUS DP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethernet	No	No	No	No	No	No	Yes [3)]	Yes [4)]	Yes
USB	Yes [2)]	Yes [2)]	Yes	No	No	Yes [2)]	Yes	Yes	Yes
S7Ethernet	No	No	No	No	No	No	no [7)]	No	No

Multi Panels

	MP 177	MP 270B	MP 277	MP 370	MP 377
Serial	Yes	Yes	Yes [1)]	Yes	Yes
MPI/PROFIBUS DP	Yes	Yes	Yes	Yes	Yes
Ethernet	Yes	Yes	Yes	Yes	Yes
USB	Yes	Yes	Yes	Yes	Yes
S7Ethernet	Yes	No	Yes	No	Yes

WinCC flexible Runtime

	WinCC flexible Runtime on Panel PC	WinCC flexible Runtime on PC
Serial	Yes (COM1 through COM4)	Yes (COM1 ... COM4, depending on configuration)
MPI/PROFIBUS DP	Yes	Yes [5)]
Ethernet	Yes	Yes
USB	Yes	Yes
S7Ethernet	No	No

[1)] Only when using a PC/PPI cable via the RS-485 interface

[2)] Only when using a USB/PPI cable (6ES7 901-3DB30-0XA0) via the RS-485 interface

[3)] Only available with TP 177B PN/DP and OP 177B PN/DP

[4)] Only when using an Ethernet CF card

[5)] Only when using a PROFIBUS DP card (e.g. CP5611)

[6)] Depends on which connection box is used

[7)] Exception: TP 177B 4" supports the S7Ethernet interface

1.6 Conversion when changing controllers

Changing the controller

With controllers and drivers for which it is pointless to attempt to adopt the addresses from other controllers, for example SIMOTION, SIMATIC HMI HTTP protocol or OPC, the address is deleted. With all other controllers, there is an attempt to adopt the data type. If this is successful, there is an attempt to adopt the address. If the adoption of the data type fails, a default data type and a default address are used. If the adoption of the address fails, a default address is used.

Changing within a device family or changing the CPU type

As described above, there is an attempt to adopt the address and data type. If an address or a data type needs to be adapted before it can be accepted (for example because the new CPU/controller does not support the previous address format),

- a message is displayed
- the field is displayed on an orange background.
  Change the relevant value to a valid value.

Communication with SIMATIC S7 controllers 2

2.1 Communication with SIMATIC S7

2.1.1 Communication partners

Introduction

This section describes communication between HMI devices and SIMATIC S7.

When working with SIMATIC S7, the HMI devices can be connected over various networks. The network depends on the module being used. Networks supported:

PLC	Modules	Network	Profile
SIMATIC S7-200	CPU	PPI	PPI
		MPI	MPI
	CPU with PROFIBUS DP interface or PROFIBUS CP	PROFIBUS	PROFIBUS DP Standard, Universal
	CP 243-1	Ethernet	TCP/IP ISO[1)]
SIMATIC S7-300/400	CPU FM with communication functions	MPI	MPI
	CPU with PROFIBUS DP interface or PROFIBUS CP	PROFIBUS	PROFIBUS DPStandard, Universal
SIMATIC S7-300	CP 343-1	Ethernet	TCP/IP ISO[1)]
SIMATIC S7-400	CP 443-1	Ethernet	TCP/IP ISO[1)]
[1)] The current WinCC flexible versions do not support ISO.			

Special features of communication

Applies to SINUMERIK modules:

Windows CE devices, except for TP 170A, also support the SINUMERIK modules. For the HMI device to communicate with the CPU and the SINUMERIK module, a connection must be created to each communication partner in WinCC flexible.

Applies to SIMODRIVE:

Create the SIMODRIVE MCU 172A control system as a PLC with an address in WinCC flexible.

2.1.2 Communication between the HMI device and the controller

Communications principle

The HMI device and the SIMATIC S7 PLC communicate using tags, user data areas and networks.

Tags

The PLC and the HMI exchange data using process values. In your configuration, create tags that point to specific PLC addresses. The HMI reads the value from the defined address, and then displays it. The operator may also enter values on the HMI which will be written to the relevant PLC address.

User data areas

User data areas are used to exchange special data, and are set up only when such data are being used.

Data for which user data areas are required, for example:

- Alarms
- Trends
- Recipes
- PLC jobs
- Sign-of-life monitoring

You set up the user data areas when you create the project in the project window of the HMI, by selecting "Communication ▸ Connections" from the "Area pointers" work area. At the same time, you also set up the user data areas with the corresponding address area on the PLC.

Networks

WinCC flexible offers diverse networks for the communication between the HMI and SIMATIC S7 PLCs. Networks significant for the communication with WinCC flexible:

- PPI (Point-to-Point Interface)
- MPI (Multi-Point Interface)
- PROFIBUS (Process Field Bus)
- Ethernet

On the Ethernet network, the connection is established via communications processor (CP) or a CPU of the SIMATIC S7 PLCs. Other network connections can be established using the MPI/PROFIBUS interface of the CPU.

Note

Whether a connection is made during startup of the HMI depends on the communications resources of the partner modules which support routing. For further information, refer to the SIMATIC NET documentation.

Note

A SIMATIC S7 PLC supports parallel communication via MPI/PROFIBUS interface and Ethernet. When communication via the MPI interface is interrupted, communication via Ethernet is also limited. The interruption could be caused, for example, by the removal of the MPI connector.

2.1.3 Networks

Introduction

HMI devices and SIMATIC S7 PLCs can communicate using the following networks:

- PPI (Point-to-Point Interface)
- MPI (Multi-Point Interface)
- PROFIBUS (Process Field Bus)
- Ethernet

PPI network

PPI communication is only supported by the SIMATIC S7-200 [1]. A connection via PPI is a point-to-point connection. The HMI device always operates as master station. The SIMATIC S7-200 is the slave.

You can connect only one SIMATIC S7-200 to an HMI device. You connect the HMI device using the serial connector of the CPU. You can connect multiple HMI devices to a SIMATIC S7-200. A SIMATIC S7-200 supports only one connection at any given time.

Note

The PPI network supports up to six further masters in addition to the HMI. To avoid loss of performance, however, you should not configure more than four nodes as masters on the PPI network.

MPI Network

You connect the HMI device to the MPI interface of the SIMATIC S7 PLC. You can connect multiple HMI devices to the same SIMATIC S7 PLC and connect several SIMATIC S7 PLCs to the same HMI device. The maximum number of communications partners you can connect to the HMI device depends on the HMI device being used. For additional information, refer to the documentation of the relevant HMI device.

You configure the SIMATIC S7-200 PLC as a passive network node. You connect the SIMATIC S7-200 via the PPI port.

PROFIBUS Network

You can connect an HMI device on the PROFIBUS network, to S7 modules which are equipped with an integrated PROFIBUS or PROFIBUS DP interface. Multiple HMI devices can be connected to the same SIMATIC S7 PLC, and multiple SIMATIC S7 PLCs can be connected to the same HMI device. The maximum number of communications partners you can connect to the HMI device depends on the HMI device being used. For additional information, refer to the documentation of the relevant HMI device.

You configure the SIMATIC S7-200 PLC as a passive network node. You connect the SIMATIC S7-200 using a DP connector or PROFIBUS CP.

Ethernet network

You can use WinCC flexible in the Ethernet network to connect all S7 modules physically connected to the network which have an integrated Ethernet interface or CP. Multiple HMI devices can be connected to the same SIMATIC S7 PLC, and multiple SIMATIC S7 PLCs can be connected to the same HMI device. The maximum number of communications partners you can connect to the HMI device depends on the HMI device being used. For additional information, refer to the documentation of the relevant HMI device.

[1] OP 77B up to four controllers

2.2 Configuring the SIMATIC S7 communication driver

2.2.1 Installing the communication driver

2.2.1.1 Installing the communication driver

Drivers for the HMI

The communication drivers for SIMATIC S7-200 and SIMATIC S7-300/400 PLCs are supplied with WinCC flexible, and are installed automatically.

The PLC does not require any special blocks for the connection.

2.2.2 PPI communication

2.2.2.1 Requirements for PPI communication

Hardware requirements

- Communication via a point-to-point interface is only possible with a SIMATIC S7-200 [1].
- You need a PC/PPI cable or a CP e.g. CP 5611 to connect Panel PCs or standard PCs to the SIMATIC S7-200 PLC.

  WinCC flexible automatically installs the necessary drivers.

Cables

Note

If you use the new PC/PPI cable 6ES7 901-3CB30-0XA0 with WinCC flexible Runtime, switch to the compatibility mode. It does not support the functionality for 187.5 kbps in this mode.

The new PC/PPI USB cable 6ES7 901-3DB30-0XA0 is supported at present.

Software requirement

The following software components are necessary for communication via the point-to-point interface:

- WinCC flexible engineering tool
- STEP 7 Micro Win software for the SIMATIC S7-200 PLC

Note

With global data exchange via the "NetR/NetW" function, the interface of the CPU switches to PPI master mode. This may cause interruptions in the connection to the HMI. In certain situations, it may take longer to shut down the connection at the HMI.

Avoid carrying out a slave / master switch with the CPU that is communicating with the HMI device.

---

1) OP 77B up to four controllers

2.2.2.2 Configuring protocol parameters using PPI

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC S7-200" is selected from the "Communication drivers" column on the work area. You can now enter or modify the protocol parameters in the Properties window:

Device-dependent parameters

Select "HMI device" to set the network parameters for the HMI device. The modification applies to all communication partners.

- "Interface"

  Under "Interface", select the HMI interface with which the HMI device is connected to the PPI network.

- "Transmission rate"

  Under "Transmission rate", select the data transmission rate for the network.
  The transmission rate is determined by the slowest HMI device connected to the network.
  The setting must be consistent on the entire network.

Note

The highest station address must be less than or equal to 63 if you set a transmission rate of 1.5 Mbaud at OP 73 or OP 77A.

If connecting a TP 170A to a SIMATIC S7 station at a transmision rate of 1.5 MBaud on PROFIBUS DP, set a value less than or equal to 63 for the highest station address (HSA).

- "Address"

  Under "Address" set the PPI address of the HMI device. The PPI address must be unique on the PPI network.
- "Access point"

  Under "Access point", set the access point over which the communication partner can be reached.
- "Only master on the bus"

  Disables an additional safety function that prevents bus disturbances when the HMI device connects to the network. A passive station (slave) can only send data on request by an active station (master). If you only have slaves connected to the HMI device, disable this safety function by setting the "Only master on the bus" check box.

  For a S7-200, you have to set an HMI device as master.

Network parameters

Select "Network" to set the network parameters for the HMI.

- "Profile"

  Under "Profile", select the relevant network profile used in the network. Under "Profile" set "PPI". The setting must be consistent on the entire network.
- "Highest station address"

  Under "Highest station address", set the highest station address. The highest station address must be equal to or higher than the highest MPI address. The setting must be consistent on the entire network.
- "Number of masters"

  Set the number of masters operating on the network to "1".

Communication partners

Select "PLC" to set the address of the S7 module with which the HMI device will exchange data. Assign a name for the connection for each communication partner.

- "Address"

  Under "Address", set the PPI address of the S7 module (CPU) to which the HMI device is connected.
- "Slot"

  This parameter is not necessary for PPI communication.
- "Rack"

  This parameter is not necessary for PPI communication.
- "Cyclic operation"

  This parameter is not necessary for PPI communication.

2.2.3 MPI communication

2.2.3.1 Requirements for MPI communication

Hardware requirements

Hardware components required for MPI networking:

- To connect a Panel PC or standard PC to the MPI interface of the S7 PLC, you need either a communications processor (for example, CP 5512, CP 5611, CP 5613), or a PC/MPI adapter (for example, PC adapter). The PC adapter converts RS-232 (serial) to RS-485 (MPI).

Note

The PC/MPI adapter must be supplied with power via the MPI connector. The PC/MPI adapter cannot be connected to HMI devices, but only to the MPI interface of a CPU. The PC adapter may only be used for PtP connections.

NOTICE
The PC adapter is not approved for MPI transfer.

- Use an MPI cable to connect the HMI device to the SIMATIC S7 PLC.

Note

For a SIMATIC S7-200 of the first generation (CPU 214, 215, 216), always use port 1 for MPI/PROFIBUS DP communication. When using a CPU 214, set a transmission rate of 9.6 kbps.

- Use a serial data cable to connect the HMI device to the PC.
- To set up an MPI network, you need a PROFIBUS bus cable with PROFIBUS connector.

Note

A cable must be terminated with its characteristic wave impedance. Enable the terminating resistor on the first and last node of the PROFIBUS/MPI network.

Both nodes must be supplied with power. Of the two end nodes (first and last) of a PROFIBUS/MPI network, only one can be an OP!

The RS485 PROFIBUS terminal and the PROFIBUS connector are equipped with a switch for setting the terminating resistor. Meaning of the ON and OFF switch settings:

OFF: The terminating resistor is disabled, i.e. the bus segment is not terminated.

ON: The terminating resistor is enabled, i.e. the bus segment is terminated.

If a problem occurs on the connection between an S7-400 (version 1 only) and an OP, a new connection can only be established again after turning off the power on the OP.

Software requirements

Software components required for MPI communication:

- WinCC flexible engineering tool
- STEP 7 software for the SIMATIC S7 PLC
- SIMATIC NET software, for example, for CP5613

2.2.3.2 Configuring protocol parameters over MPI

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC S7-200" or "SIMATIC S7-300/400" is selected in the "Communication drivers" column of the work area. You can now enter or modify the protocol parameters in the Properties window:

Device-dependent parameters

Select "HMI device" to set the network parameters for the HMI device. The modification applies to all communication partners.

- "Interface"

  Under "Interface", select the HMI interface with which the HMI device is connected to the PPI network.

- "Transmission rate"

  Under "Transmission rate", select the data transmission rate for the network.
  The transmission rate is determined by the slowest HMI device connected to the network.
  The setting must be consistent on the entire network.

  Note

  The highest station address must be less than or equal to 63 if you set a transmission rate of 1.5 Mbaud at OP 73 or OP 77A.

  If connecting a TP 170A to a SIMATIC S7 station at a transmision rate of 1.5 MBaud on PROFIBUS DP, set a value less than or equal to 63 for the highest station address (HSA).

- "Address"

  Under "Address" set the MPI address of the HMI device. The MPI address must be unique in the MPI network.

- "Only master on the bus"

  Disables an additional safety function that prevents bus disturbances when the HMI device connects to the network. A passive station (slave) can only send data on request by an active station (master). If you only have slaves connected to the HMI device, disable this safety function by setting the "Only master on the bus" check box.

  For a S7-200, you have to set an HMI device as master.

Network parameters

Select "Network" to set the parameters of the MPI network to which the HMI is connected. Those network parameters will be applied if you have integrated WinCC flexible in STEP 7, and the HMI is connected to the network.

- "Profile"

  Under "Profile", select the relevant network profile used in the network. Under "Profile" set "MPI". The setting must be consistent on the entire network.

- "Highest station address"

  Under "Highest station address", set the highest station address. The highest station address must be equal to or higher than the highest MPI address. The setting must be consistent on the entire network.

- "Number of masters"

  This information is not required for MPI.

Communication partner

Select "PLC" to set the address of the S7 module with which the HMI device will exchange data. Assign a name for the connection for each communication partner.

- "Address"

  Under "Address", set the MPI address of the S7 module (CPU, FM or CP) to which the HMI device is connected.

- "Slot"

  Under "Slot", set the number of the slot in which the S7 module is inserted. This setting is not required for SIMATIC S7-200 PLCs.

- "Rack"

  Under "Rack", set the number of the rack in which the S7 module is inserted. This setting is not required for SIMATIC S7-200 PLCs.

- "Cyclic operation"

  When cyclic operation is enabled, the PLC optimizes its data exchange with the HMI device. This increases system performance. Disable cyclic mode if you are operating several HMI devices in parallel. This setting is not required for SIMATIC S7-200 PLCs.

Handling the "Cyclic operation" selection

If "cyclic operation" is activated, the HMI device outputs a message frame to the CPU at the beginning of communication requesting certain tags constantly.

The CPU always transmits the data at the same cyclic interval.

This saves the HMI device from having to output new requests for the data.

If cyclic operation is disabled, the HMI device sends a request whenever information is required.

Additional properties:

- Cyclic operation reduces data transmission load at the HMI device. The PLC resources are used to relieve load on the HMI device.
- The PLC only supports a certain number of cyclic services. The HMI device handles the operation if the PLC cannot provide any further resources for cyclic services.
- The HMI device generates the cycle if the PLC does not support the cyclic mode.
- Screen tags are not integrated in cyclic operation.
- Cyclic mode is only set up at the restart of Runtime.
- The HMI device transfers several jobs to the PLC if cyclic mode is enabled, depending on the PLC.
- The HMI device only transfers one job to the PLC if cyclic mode is disabled.

2.2.3.3 Assigning the MPI address to the SIMATIC S7

Introduction

Each communication partner must be assigned an MPI network address.

Each S7 module which supports communication functions and is operated the SIMATIC S7-300/400 PLC is assigned a unique MPI address. Only one CPU may be used per rack.

The MPI address is created in STEP 7.

Note

HMI devices cannot be operated with incorrect addressing

Always avoid redundant addressing on the MPI bus.

MPI address of the communication partner of a SIMATIC S7-300

When assigning addresses, you have to distinguish between communication partners with and without separate MPI address.

- If the communications partner has its own MPI address, you only need to define the MPI address.
- If the communication partners do not have a separate MPI address, specify the MPI address of the communications partner used for the connection. In addition, define the slot and rack of a communication partner without its own MPI address.

MPI address of the communication partner of a SIMATIC S7-400

Only S7 modules with an MPI connector are assigned an MPI address. Modules without an MPI connector are addressed indirectly:

- MPI address of the module to which the HMI is connected.
- The slot and the rack of the module with which the HMI device communicates.

MPI address of the FM

The HMI can only communicate with FM modules which are assigned an MPI address. FM modules with MPI addresses are all FMs which are connected to the communications bus (K-bus).

FMs without MPI address are connected to the P-bus. This includes, for example, the FM 350.

2.2.4 PROFIBUS communication

2.2.4.1 Requirements of PROFIBUS communication

Hardware requirements

The following hardware components are required for inclusion in an existing PROFIBUS DP network:

- To connect a Panel PC or standard PC to the PROFIBUS DP interface of the S7 PLC, you need either a communications processor (for example, CP 5512, CP 5611), or an adapter (for example, PC adapter). PC adapters are available for the RS232 (serial) and USB (USB 1.1) ports.
- Use a PROFIBUS cable to connect the HMI device to the SIMATIC S7 PLC.

Note

At a SIMATIC S7-200 of the first generation (CPU 214, 215, 216), always use port 1 for MPI/PROFIBUS DP communication. When using a CPU 214, set a transmission rate of 9.6 kbps.

- Use a serial data cable to connect the HMI device to the PC.
- To set up a PROFIBUS DP network, you need a PROFIBUS bus cable with PROFIBUS connector.

Note

A cable must be terminated with its characteristic wave impedance. Enable the terminating resistor on the first and last node of the PROFIBUS/MPI network.

Both nodes must be supplied with power. Of the two end nodes (first and last) of a PROFIBUS/MPI network, only one can be an OP!

The RS485 PROFIBUS terminal and the PROFIBUS connector are equipped with a switch for setting the terminating resistor. Meaning of the ON and OFF switch settings:

OFF: The terminating resistor is disabled, i.e. the bus segment is not terminated.

ON: The terminating resistor is enabled, i.e. the bus segment is terminated.

If a problem occurs on the connection between an S7-400 (version 1 only) and an OP, a new connection can only be established again after turning off the power on the OP.

Software requirements

The following software components are required for communication over PROFIBUS DP

- WinCC flexible engineering tool
- STEP 7 software for the SIMATIC S7 PLC

2.2.4.2 Configuring protocol parameters using PROFIBUS DP

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC S7-200" or "SIMATIC S7-300/400" is selected in the "Communication drivers" column of the work area. You can now enter or modify the protocol parameters in the Properties window:

Device-dependent parameters

Select "HMI device" to set the network parameters for the HMI device. The modification applies to all communication partners.

- "Interface"

  Under "Interface", select the HMI interface with which the HMI device is connected to the PROFIBUS network.

- "Transmission rate"

  Under "Transmission rate", select the data transmission rate for the network.
  The transmission rate is determined by the slowest HMI device connected to the network. The setting must be consistent on the entire network.

  Note

  The highest station address must be less than or equal to 63 if you set a transmission rate of 1.5 Mbaud at OP 73 or OP 77A.

  If connecting a TP 170A to a SIMATIC S7 station at a transmision rate of 1.5 MBaud on PROFIBUS DP, set a value less than or equal to 63 for the highest station address (HSA).

- "Address"

  Under "Address" set the PROFIBUS DP address of the HMI device. The PROFIBUS DP address must be unique on the PROFIBUS network.

  Note

  You should assign intermittent addresses, with at least one free address, to the active PROFIBUS nodes when using certain modules. In this case, STEP 7 V5.1 automatically assigns addresses which takes this rule into account.

  However, this only affects modules with ASIC Version ASPC2 to STEP D. Extract the current version from the GSD file or the manual.

- "Only master on the bus"

  Disables an additional safety function that prevents bus disturbances when the HMI device connects to the network. A passive station (slave) can only send data on request by an active station (master). If you only have slaves connected to the HMI device, disable this safety function by setting the "Only master on the bus" check box.

  For a S7-200, you have to set an HMI device as master.

Network parameters

Select "Network" to set the PROFIBUS parameters of the network to which the HMI is connected. Those network parameters will be applied if you have integrated WinCC flexible in STEP 7, and the HMI device is connected to the network.

- "Profile"

  Under "Profile", select the relevant network profile used in the network. Under "Profile", set "DP", "Universal" or "Standard". The setting must be consistent on the entire network.

- "Highest station address"

  Under "Highest station address", set the highest station address. The highest station address must be equal to or higher than the highest PROFIBUS address. The setting must be consistent on the entire network.

  Note

  If you set a transmission rate of 1.5 Mbps at the TP 170A, the highest station address must be less than or equal to 63.

- "Number of masters"

  There, under "Number of masters", set the number of masters on the PROFIBUS network. This information is necessary to ensure the correct calculation of bus parameters.

Communication partners

Select "PLC" to set the address of the S7 module with which the HMI device will exchange data. Assign a name for the connection for each communication partner.

- "Address"

  Under "Address", set the PROFIBUS address of the S7 module (CPU, FM or CP) to which the HMI device is connected.

- "Slot"

  Under "Slot", set the number of the slot in which the S7 module is inserted. This setting is not required for SIMATIC S7-200 PLCs.

- "Rack"

  Under "Rack", set the number of the rack in which the S7 module is inserted. This setting is not required for SIMATIC S7-200 PLCs.

- "Cyclic operation"

  When cyclic operation is enabled, the PLC optimizes its data exchange with the HMI device. This increases system performance. Disable cyclic mode if you are operating several HMI devices in parallel. This setting is not required for SIMATIC S7-200 PLCs.

Handling the "Cyclic operation" selection

If "cyclic operation" is activated, the HMI device outputs a message frame to the CPU at the beginning of communication requesting certain tags constantly.

The CPU always transmits the data at the same cyclic interval.

This saves the HMI device from having to output new requests for the data.

If cyclic operation is disabled, the HMI device sends a request whenever information is required.

Additional properties:

- Cyclic operation reduces data transmission load at the HMI device. The PLC resources are used to relieve load on the HMI device.
- The PLC only supports a certain number of cyclic services. The HMI device handles the operation if the PLC cannot provide any further resources for cyclic services.
- The HMI device generates the cycle if the PLC does not support the cyclic mode.
- Screen tags are not integrated in cyclic operation.
- Cyclic mode is only set up at the restart of Runtime.
- The HMI device transfers several jobs to the PLC if cyclic mode is enabled, depending on the PLC.
- The HMI device only transfers one job to the PLC if cyclic mode is disabled.

2.2.5 Ethernet communication

2.2.5.1 Requirements of Ethernet communication

Hardware requirements

Hardware components required for Ethernet networking:

- To connect a Panel PC or standard PC to the S7-300/400 PLC over Ethernet, you need a communications processor (for example CP 1613, CP 1612, or CP 1512) or Ethernet network card (for example SIMATIC Panel PC On-Board Ethernet adapter, standard Ethernet module).
- For Ethernet connections between a Panel PC or standard PC to the S7-200 PLC, you need a communication processor, such as CP243-1.

Note

To connect an HMI device via communication processor CP243-1, the CP243-1 must be installed in the first slot to the right of the CPU (module No. 0).

Software requirements

- SIMATIC S7-300/400

  Software components required for Ethernet communication:

  – WinCC flexible engineering tool

  – STEP 7 software for the SIMATIC S7 PLC

  – IE SOFTNET-S7 LEAN software for PC and Panel PC with Ethernet ON Board interface, or alternatively with CP1512, CP1612

  – S7-1613 software for PC and Panel PC with CP1613

- SIMATIC S7-200

  Software components required for Ethernet communication:

  – WinCC flexible engineering tool

  – MicroWin

2.2.5.2 Configuring protocol parameters on Ethernet

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC S7-200" or "SIMATIC S7-300/400" is selected in the "Communication drivers" column of the work area. You can now enter or modify the protocol parameters in the Properties window:

Device-dependent parameters

Select "HMI device" to set the network parameters for the HMI. The changes are not transferred automatically to the HMI. Edit the settings in the Control Panel of the HMI.

- "Interface"

  Under "Interface", select the HMI interface with which the HMI device is connected to the network. Under "Interface" set "Ethernet".

- "Type"

  Under "Type" protocol type "IP" is set as default.

  Note

  The "ISO" protocol is not released for the current version of WinCC flexible.

- "Address"

  Under "Address", set the IP address of your PC system.

- "Subnet mask"

  Under "Subnet mask", set the subnet mask for your PC system. The subnet mask is used in combination with the IP address to identify the subnet in which the PC system resides. You can obtain the value from your network administrator.

Note

On Ethernet, the parameters of the configuration computer will not be transferred to the destination device. The IP address and subnet mask parameters are not assigned on the HMI.

You thus need to configure the IP address and the subnet mask manually at the HMI.

Communication partner

Select "PLC" to set the address of the S7 module with which the HMI device will exchange data. Assign a name for the connection for each communication partner.

- "Address"

  Under "Address", set the IP address of the S7 module to which the HMI device is connected.

- "Slot"

  Under "Slot", set the number of the slot in which the S7 module is inserted. This setting is not required for SIMATIC S7-200 PLCs.

- "Rack"

  Under "Rack", set the number of the rack in which the S7 module is inserted. This setting is not required for SIMATIC S7-200 PLCs.

- "Cyclic operation"

  When cyclic operation is enabled, the PLC optimizes its data exchange with the HMI device. This increases system performance.

  Disable cyclic mode if you are operating several HMI devices in parallel.

Handling the "Cyclic operation" selection

If "cyclic operation" is activated, the HMI device outputs a message frame to the CPU at the beginning of communication requesting certain tags constantly.

The CPU always transmits the data at the same cyclic interval.

This saves the HMI device from having to output new requests for the data.

If cyclic operation is disabled, the HMI device sends a request whenever information is required.

Additional properties:

- Cyclic operation reduces data transmission load at the HMI device. The PLC resources are used to relieve load on the HMI device.
- The PLC only supports a certain number of cyclic services. The HMI device handles the operation if the PLC cannot provide any further resources for cyclic services.
- The HMI device generates the cycle if the PLC does not support the cyclic mode.
- Screen tags are not integrated in cyclic operation.
- Cyclic mode is only set up at the restart of Runtime.
- The HMI device transfers several jobs to the PLC if cyclic mode is enabled, depending on the PLC.
- The HMI device only transfers one job to the PLC if cyclic mode is disabled.

2.2.6 Permitted data types

2.2.6.1 Permitted data types (SIMATIC S7)

Permitted data types

The data types listed in the tables below are available for configuration of your tags and area pointers.

SIMATIC S7-300/400

Label	Object	Data type
Data block	DB	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRING, STRINGCHAR, TIMER, COUNTER, DATE, TIME, DATE AND TIME, TIME OF DAY
Bit memory	M	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRING, STRINGCHAR, TIMER, COUNTER, DATE, TIME, DATE AND TIME, TIME OF DAY
Input	I	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRING, STRINGCHAR
Peripheral input	PI	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRING, STRINGCHAR
Output	Q	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRING, STRINGCHAR
Peripheral output	PQ	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRING, STRINGCHAR
Timer	T	Timer
Counter	C	Counter

SIMATIC S7-200

Label	Object	Data type
Tag	V	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRINGCHAR
Input	I	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRINGCHAR
Output	Q	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRINGCHAR
Bit memory	M	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, BOOL, STRINGCHAR
Timer	T	Timer
Counter	C	INT

Time and Timer data type

You can configure a start value for numerical variables. Set the start value in ms units when you configure variables of the data type Time or Timer, for example, the value 1000 is equivalent to 1 s.

2.2.7 Optimizing the configuration

2.2.7.1 Optimizing the configuration

Acquisition cycle and update time

The acquisition cycles for the "Area pointers" and tags defined in the engineering software are decisive factors for the update times which can actually be achieved.

The update time is equivalent to the acquisition cycle + transmission time + processing time.

To achieve optimum update times, remember the following points during configuration:

- Set up the minimum and maximum size of the various data areas to suit requirements.
- Define associated data areas. You can improve the update time by setting up one large data area instead of several small areas.
- If the acquisition cycles you select are too short, this is detrimental to the overall performance. Set the acquisition cycle to suit the rate of change of the process values. The rate of temperature changes at a furnace, for example, is significantly slower compared to the speed rate of an electrical drive. Guideline value of the acquisition cycle: approx. 1 s.
- To improve update times, you could do without the cyclic transfer of large numbers of tags. Enter "On request" as the acquisition cycle. Instead of the cyclic transfer, use a deliberate, spontaneous, event-controlled transfer of tags (Job mailbox).
- Write the tags of an alarm or a screen without gaps to a single data area.
- To allow changes in the PLC to be recognized reliably, the changes must be available at least during the actual acquisition cycle.
- Set the transmission rate to the highest possible value.

Screens

The actually feasible update rate of screens depends on the data type and volume to be visualized.

Configure short acquisition cycles only for objects which actually require shorter refresh cycles.

Trends

When using bit-triggered trends, if the group bit is set in the "Trend transfer area", the HMI device always updates all the trends whose bit is set in this area. It then resets the bits.

The group bit in the S7 program can only be set again after all bits have been reset by the HMI.

PLC jobs

A large transfer volume of PLC jobs transferred rapidly and in succession, may cause an overload in the communication between the HMI and the PLC.

The HMI device confirms acceptance of the Job mailbox by entering the value zero in the first data word of the job mailbox. The HMI now processes the job, for which it requires further time. If a new PLC job is entered again immediately in the job mailbox, it may take some time before the HMI device can process the next PLC job. The next Job mailbox will not be accepted unless the system provides sufficient computing capacity.

Multiplexing OP connections using SIMATIC NET communications processors

The SIMATIC NET communications processors listed below support multiplexing of OP connections (can be configured in STEP 7 V5.1 SP3 or higher):

- CP342-5 PROFIBUS (V5.0 and higher)
- CP343-1 ETHERNET

Each CP supports up to 16 OP, while requiring only one CPU connection resource. In multiplex mode, when addressing OP connections, enter the rack/slot assignment of the CP instead of the rack/slot assignment of the CPU. In integrated mode, activate the CP as the partner station, rather than the CPU. Enable multiplexing of OP connections (HMI) in HW Config (STEP 7), on the "Options" properties page of the communications processor. This does not require any communications blocks in the user program of the S7-300 CPU.

Note

Multiplexed OP connections are only suitable for low data volumes.

Transmission rates of PPI connections (S7-200)

In the PPI connection, on account of the low transmission speeds, observe the following:

- The transfer of data records and the indirect transfer of tags is speeded up significantly if the release of the data mailbox and the positive acknowledgment happen at the same time instead of one after the other.
- When selecting a screen with a bit-triggered trend, activate a different screen with a new trend only if the trend values are updated on the OP. The area pointers (trend request) are rarely updated.

Timeout response with TCP/IP (Ethernet)

Due to the use of the TCP/IP protocol, the breakdown of a connection is detected at the earliest after approximately one minute. Communication failure cannot be reliably detected if no tags are requested, for example, no output tags in the current screen.

Configure area pointer coordination for each PLC. This ensures that a communication failure is recognized after approximately two minutes, even in the aforementioned scenario.

2.3 Direct keys

2.3.1 Configuration of PROFIBUS DP direct keys

Application

In addition to their standard use, the F, K and S keys of the operator panel can be used as PROFIBUS DP direct keys. The "DirectKey" function is appended to the configured button for the Touch Panel. With PROFIBUS DP direct keys, when the key or button is pressed, a bit is set in the I/O area of the CPU.

The cycle time of the PROFIBUS DP bus is calculated from the total of all configured inputs and outputs. The number of configured inputs and outputs can influence the reaction time of the PROFIBUS DP direct key. For a typical configuration the response time of the PROFIBUS DP direct key is < 100 ms.

Restrictions

- The functionality of direct keys is available only on certain HMI devices.
- It is not possible to operate PROFIBUS DP direct keys and PROFINET IO direct keys simultaneously.

  Establish the following via the "PROFINET IO enabled" option in the control panel of the HMI device:
  Option deactivated = PROFIBUS DP - direct keys enabled
  Option activated = PROFINET-IO - direct keys enabled
- You can operate direct keys only on local HMI devices. On the Sm@rtClient it is possible to operate the key / button for the direct key. However, No bit is set in the I/O area of the CPU.
- The buttons used as direct keys on HMI devices with touch screen functionality may not be modified as follows by means of scripting:
  - Moving
  - Resizing
  - Hiding
  - Disabling for operation.
- The LEDs are addressed either via the PROFIBUS DP direct keys or the HMI Runtime application. Avoid concurrent addressing via the PROFIBUS DP direct keys and the HMI Runtime application. The LEDs "ACK", "A-Z l", "A-Z r" and "HELP" are reserved for system functions and cannot be configured. We do not recommend addressing the LEDs "ACK", "A-Z l", "A-Z r" and "HELP" with the PROFIBUS DP direct keys.

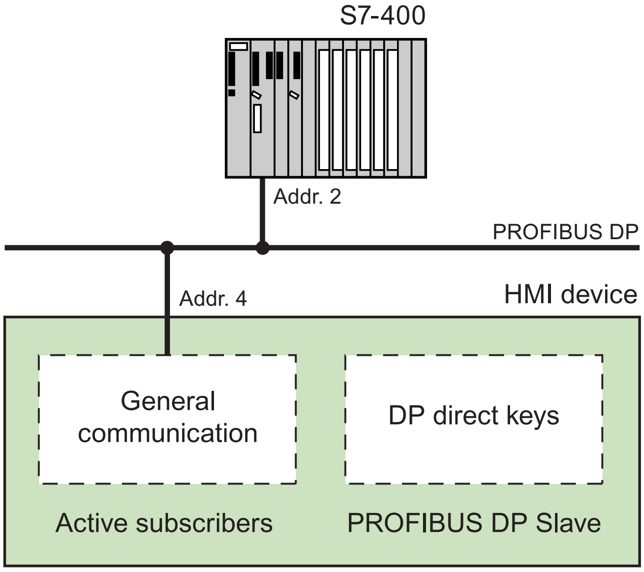
NOTICE
If an external application such as Pocket Internet Explorer or Control Panel is started, it will run in the foreground and Runtime is placed in the background. The bit for the function "DirectKeyScreenNumber" is no longer set and the keys or buttons with the configured function "DirectKey" no longer trigger the associated bit in the PLC.

Requirements

- The HMI device must be linked to a SIMATIC S7 PLC via PROFIBUS DP.
- WinCC flexible must be installed "integrated in STEP 7". You will find more detailed information on working with integrated WinCC flexible in the "Integration of WinCC flexible in STEP 7" chapter.
- To be able to use PROFIBUS DP direct keys, you must deactivate the option "PROFINET IO enabled" in the control panel of the HMI device.

Configuration for STEP 7

Configure the HMI device as an active node for general communication (reading and writing of variables). For the DP direct keys, configure the HMI device as a slave in the PROFIBUS DP network. The following figure shows the basic configuration based on an S7-400.



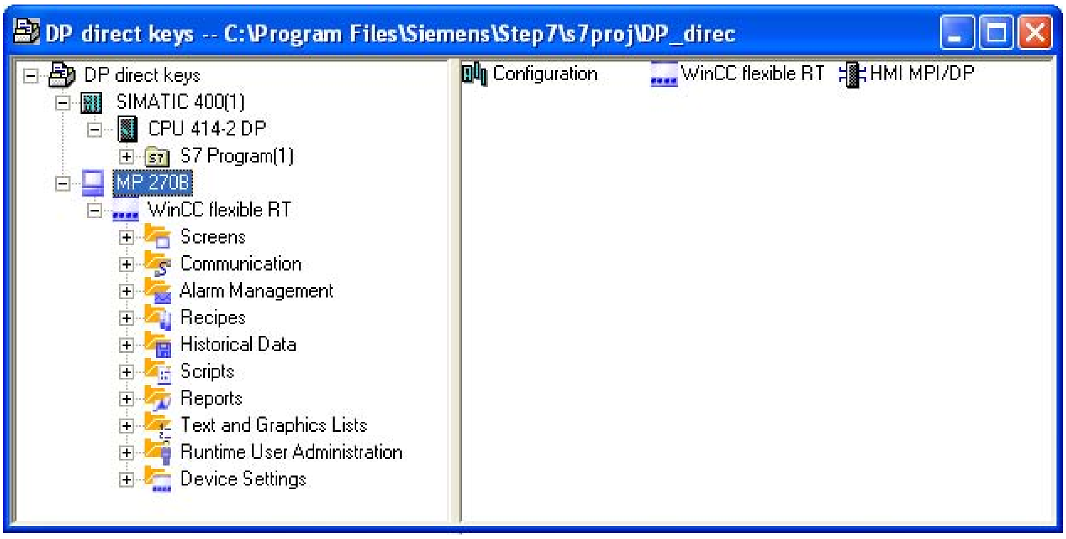
Configuration of the HMI device for DP direct keys

Basic configuration procedure

Steps 1 to 3 below describe the basic procedure for configuring the HMI device in STEP 7 (as a master) for general communication. Steps 4 to 6 describe how to configure the HMI device as a PROFIBUS DP slave in order to use the DP direct keys.

The same address is used to configure the HMI device as an active node and as a DP slave.

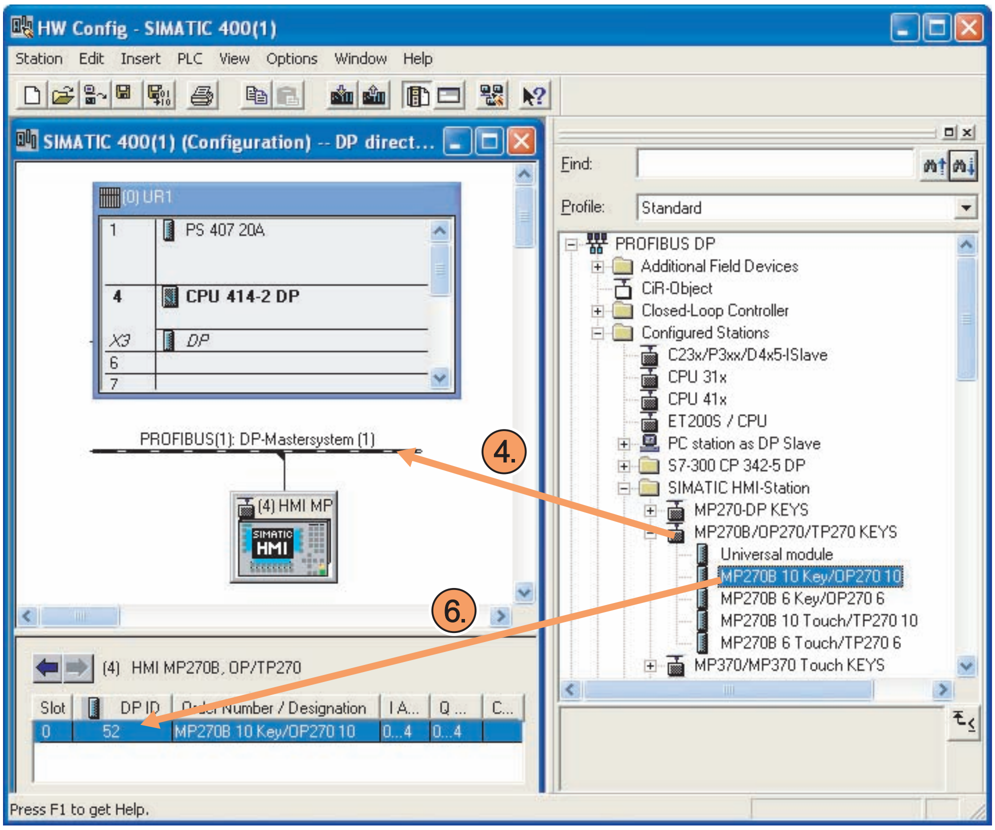
1. Create a new project in STEP 7 and configure the hardware with a DP-capable CPU, e.g. CPU 414-2 DP.
   – Assign the PROFIBUS DP an address and connect the CPU to the network.
2. Insert a new "SIMATIC HMI Station" object into your project. Select the desired HMI device for this. You will see the inserted HMI device in your STEP 7 project:



Configuring the HMI device in the STEP 7 project

3. Double-click "Configuration" and connect the HMI device to the same PROFIBUS DP network as the one for the CPU.

4. Open the HW configuration of the CPU. Drag the configured HMI device type from the hardware catalog under "Configured stations > SIMATIC HMI Station" to the displayed PROFIBUS DP:

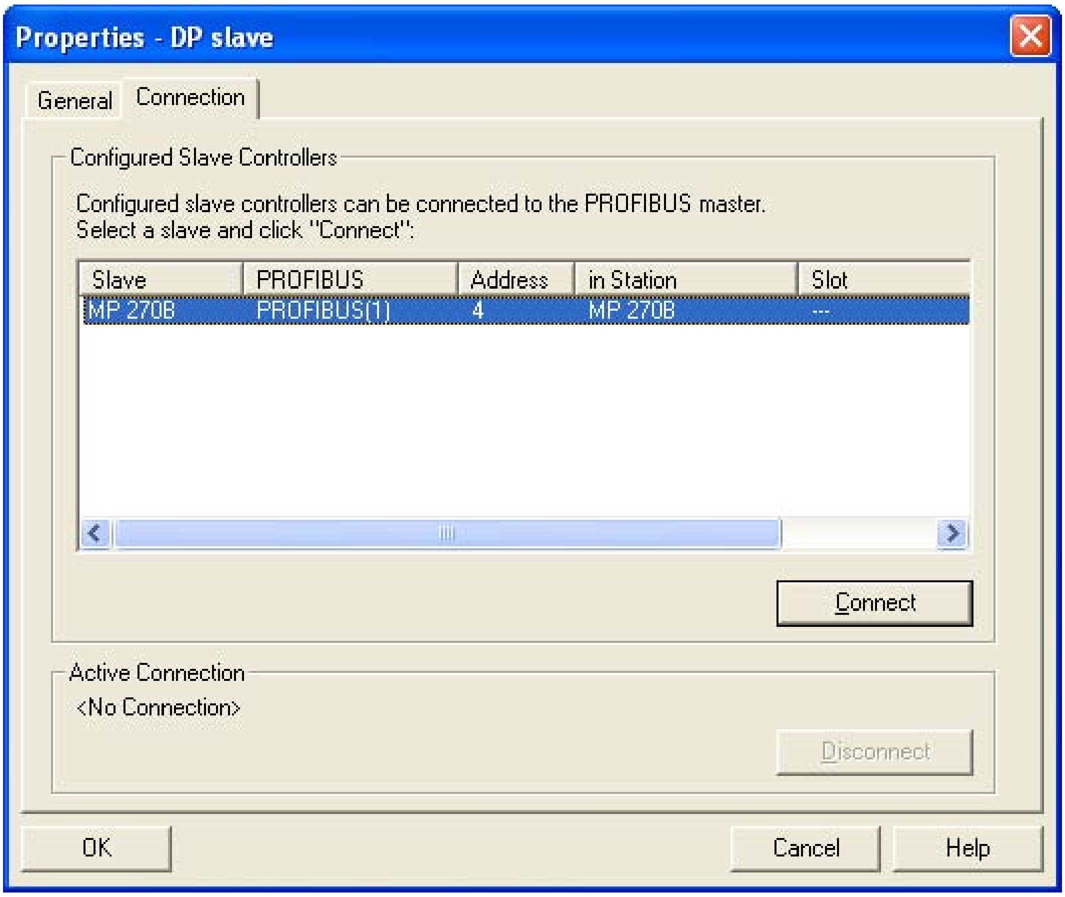


Slot		DP ID	Order Number / Designation	I A...	Q ...	C...
0		52	MP270B 10 Key/OP270 10	0...4	0...4	

Press F1 to get Help.

Configuration in the STEP 7 project for DP direct keys (example)

5. Once you have inserted the configured HMI device into the station window, the "Properties DP Slave" dialog opens. Select the DP slave and connect it to the PLC by clicking the "Connect" button.



Configured slave controllers can be connected to the PROFIBUS master.
Select a slave and click "Connect":

Slave	PROFIBUS	Address	in Station	Slot
MP 270B	PROFIBUS(1)	4	MP 270B	---

<No Connection>

Connecting the HMI device as a slave

6. Establish the type of the HMI device being used. Select the HMI device in the HW catalog and drag it to the detailed view of the station window. The type and address of the HMI device are displayed in the detailed view.

Assigning the inputs/outputs

The keys or buttons of the device are assigning bytes in the input area. The LEDs occupy bytes in the DP output area. The following table shows the number of bytes used in the various HMI devices. The precise assignment is shown in the following screens.

The touch panels do not have any permanently assigned keys. They only have user-configurable buttons. Via the direct keys function you can assign to a button a bit in the input area. The counting direction of the bit in the input direction is from right to left. In contrast to the operator panels which have permanently assigned keys, the touch panel buttons can be assigned freely. For more detailed information, refer to the "WinCC flexible - Configuring WinCC Windows-based Systems" user manual.

Assignment for the DP inputs/outputs

HMI device	Inputs	Outputs
MP 377 touch device	5 bytes	5 bytes
MP 377 touch device	5 bytes	–
MP 370 key device, MP 270B, OP 270-10"	5 bytes	5 bytes
MP 370 touch device, TP 270-10"	5 bytes	–
MP 277-10" touch device	5 bytes	5 bytes
MP 277-8" touch device	5 bytes	5 bytes
MP 277-10" touch device, MP 277-8" touch device	5 bytes	–
MP 177-6" touch device	5 bytes	-
OP 277-6"	4 bytes	4 bytes
TP 277-6"	4 bytes	–
Mobile Panel 277	10 bytes	4 bytes
OP 270-6", OP 170	4 bytes	4 bytes
TP 270-6", TP 170	4 bytes	–
OP 177B	9 bytes	4 bytes
TP 177B	4 bytes	–
TP 177B 4"	5 bytes	-
Mobile Panel 177	9 bytes	4 bytes
OP 77B	4 bytes	4 bytes

Input/output assignment for MP 377 touch device and MP 370 touch device

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	S8	S7	S6	S5	S4	S3	S2	S1	n+0	S8	S7	S6	S5	S4	S3	S2	S1
	S16	S15	S14	S13	S12	S11	S10	S9	n+1	S16	S15	S14	S13	S12	S11	S10	S9
	F8	F7	F6	F5	F4	F3	F2	F1	n+2	F8	F7	F6	F5	F4	F3	F2	F1
	F16	F15	F14	F13	F12	F11	F10	F9	n+3	F16	F15	F14	F13	F12	F11	F10	F9
	ACK	ALT	CTRL	SHIFT	F20	F19	F18	F17	n+4	ACK	A-Z left	A-Z right	INFO	F20	F19	F18	F17

I/O assignment of the MP 377, MP 370, TP 270-10", MP 277-10", MP 277-8" and MP 177-6" touch devices and of TP 177B-4"

	Direct keys assignment									LED
	7	6	5	4	3	2	1	0	Byte	
Touch buttons	7	6	5	4	3	2	1	0	n+0	
	15	14	13	12	11	10	9	8	n+1	No output area
	23	22	21	20	19	18	17	16	n+2	
	31	30	29	28	27	26	25	24	n+3	
	39	38	37	36	35	34	33	32	n+4	

Input/output assignment for MP 277-10" touch device, MP 270B and OP 270-10"

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	F16	F15	F14	F13	F12	F11	F10	F9	n+1					F12	F11	F10	F9
	K4	K3	K2	K1	F20	F19	F18	F17	n+2	K4	K3	K2	K1				
	K12	K11	K10	K9	K8	K7	K6	K5	n+3	K12	K11	K10	K9	K8	K7	K6	K5
	ACK	ALT	CTRL	SHIFT	K16	K15	K14	K13	n+4	ACK	A-Z left	A-Z right	HELP	K16	K15	K14	K13

Input/output assignment for MP 277-8" touch device

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	F16	F15	F14	F13	F12	F11	F10	F9	n+1							F10	F9
	K4	K3	K2	K1			F18	F17	n+2	K4	K3	K2	K1				
					K8	K7	K6	K5	n+3					K8	K7	K6	K5
	ACK	ALT	CTRL	SHIFT					n+4	ACK	A-Z left	A-Z right	HELP				

Input/output assignment for OP 277-6", OP 270-6" and OP 170B

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	K2	K1	F14	F13	F12	F11	F10	F9	n+1	K2	K1						
	K10	K9	K8	K7	K6	K5	K4	K3	n+2	K10	K9	K8	K7	K6	K5	K4	K3
	ACK	ALT	CTRL	SHIFT					n+3	ACK	A-Z left	A-Z right	HELP				

Input/output assignment for TP 277-6", TP 270-6", TP 177B and TP 170B

	Direct keys assignment									LED
	7	6	5	4	3	2	1	0	Byte	
Touch buttons	7	6	5	4	3	2	1	0	n+0	
	15	14	13	12	11	10	9	8	n+1	No output area
	23	22	21	20	19	18	17	16	n+2	
	31	30	29	28	27	26	25	24	n+3	

Input/output assignment for OP 177B

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Membrane keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	K2	K1	F14	F13	F12	F11	F10	F9	n+1	K2	K1						
	K10	K9	K8	K7	K6	K5	K4	K3	n+2	K10	K9	K8	K7	K6	K5	K4	K3
	K18	K17	K16	K15	K14	K13	K12	K11	n+3	K18	K17	K16	K15	K14	K13	K12	K11
									n+4								
Touch buttons	7	6	5	4	3	2	1	0	n+5								
	15	14	13	12	11	10	9	8	n+6								
	23	22	21	20	19	18	17	16	n+7								
	31	30	29	28	27	26	25	24	n+8								

Input/output assignment for OP 77B

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Membrane keys					K4	K3	K2	K1	n+0					K4	K3	K2	K1
					F4	F3	F2	F1	n+1								
									n+2								
									n+3								

Assignment of the inputs / outputs for Mobile Panel 277

	Direct keys assignment									LED-Bits							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Membrane keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	F16	F15	F14	F13	F12	F11	F10	F9	n+1	F16	F15	F14	F13	F12	F11	F10	F9
							F18	F17	n+2							F18	F17
optional operator controls				T2		T1	S1	S0	n+3						T2	T1	
	I7	I6	I5	I4	I3	I2	I1	I0	n+4								
	D7	D6	D5	D4	D3	D2	D1	D0	n+5								
Touch buttons	7	6	5	4	3	2	1	0	n+6								
	15	14	13	12	11	10	9	8	n+7								
	23	22	21	20	19	18	17	16	n+8								
	31	30	29	28	27	26	25	24	n+9								

S0-S1:	Key-operated switch
T1:	Illuminated pushbutton 1
T2:	Illuminated pushbutton 2
I0-I7:	Handwheel pulses (forwards)
D0-D7:	Handwheel pulses (backwards)

I/O assignments for Mobile Panel 170

Direct keys assignment

	7	6	5	4	3	2	1	0	Byte
Membrane keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0
			F14	F13	F12	F11	F10	F9	n+1
optional operator controls						T1	S1	S0	n+2
	I7	I6	I5	I4	I3	I2	I1	I0	n+3
	D7	D6	D5	D4	D3	D2	D1	D0	n+4
Touch buttons	7	6	5	4	3	2	1	0	n+5
	15	14	13	12	11	10	9	8	n+6
	23	22	21	20	19	18	17	16	n+7
	31	30	29	28	27	26	25	24	n+8

LED-Bits

7	6	5	4	3	2	1	0
F8	F7	F6	F5	F4	F3	F2	F1
							T1

S0-S1:	Key-operated switch
T1:	Illuminated pushbutton 1
I0-I7:	Handwheel pulses (forwards)
D0-D7:	Handwheel pulses (backwards)

Assignment of the inputs / outputs for Mobile Panel 177 DP

Direct key assignment

7	6	5	4	3	2	1	0	Byte
F8	F7	F6	F5	F4	F3	F2	F1	n+0
		F14	F13	F12	F11	F10	F9	n+1
					T0	S1	S0	n+2
I7	I6	I5	I4	I3	I2	I1	I0	n+3
D7	D6	D5	D4	D3	D2	D1	D0	n+4

LED

7	6	5	4	3	2	1	0
F8	F7	F6	F5	F4	F3	F2	F1

F	Bit for function key
S	Bit for key switch
T	Bit for illuminated pushbutton
I	Bit for handwheel pulses, forwards
D	Bit for handwheel pulses, backwards

Assigning direct keys to screen numbers (only for touch devices)

If a PROFIBUS DP direct key is using the same bit for different functions in different screens, the S7 must differentiate between the respective functionality by means of the screen number. To combat the delayed updating of the screen number in the PLC after a change of screen you use the "DirectKeyScreenNumber" screen function.

Using the "DirectKeyScreenNumber" you can set within the input area any number of bits in order to identify the screen and simultaneously transfer the direct key bits to the PLC. This ensures unambiguous allocation of a control bit to screen number at all times.

Assigning PROFIBUS DP direct keys on the Mobile Panel 170

The direct-key layout on the Mobile Panel 170 corresponds to that of the Mobile Panel 177 with the following exceptions:

- The touch bits for touch command buttons are not supported.
- The LED bit of the illuminated pushbutton is not supported.

The direct key layout of the Mobile Panel 177 is contained in the Online Help under "Configuration of PROFIBUS DP Direct Keys".

2.3.2 Configuration of PROFINET IO direct keys

Application

In addition to their standard use, the F, K and S keys of the operator panel can be used as PROFINET IO direct keys. The "DirectKey" function is appended to the configured button for the Touch Panel. If PROFINET IO direct keys are used, a bit is set in the I/O area of the CPU as soon as the key or button is pressed.

The cycle time of the Ethernet bus can be set between 8 ms and 512 ms. Thus, the reaction time of the PROFINET IO direct keys can also be determined. For a typical configuration with a cycle time of 64 ms, the response time of the PROFINET IO direct keys is at < 100 ms.

A response time of < 100 ms to the CPU is usually ensured when using the PROFINET IO direct keys. This time can be exceeded significantly in the following cases:

- Complex functions run in the background, e.g. transmitting recipes, printing reports.
- At the same time, multiple connections can be maintained to the CPU.

Restrictions

- The functionality of direct keys is available only on certain HMI devices.
- It is not permitted to operate PROFIBUS IO direct keys and PROFINET DP direct keys simultaneously.

  Establish the following via the "PROFINET IO enabled" option in the control panel of the HMI device:
  Option deactivated = PROFIBUS DP - direct keys enabled
  Option activated = PROFINET IO - direct keys enabled
- If communication is enabled with PROFINET IO, you are not permitted to use the serial interface.
- You can operate direct keys only on local HMI devices. On the Sm@rtClient it is possible to operate the key / button for the direct key. However, No bit is set in the I/O area of the CPU.

- Direct keys which are assigned to a button are only triggered through touch operation. Triggering with a mouse click, for example with a connected USB mouse, is not possible.
- With touch operation, direct keys are triggered independent of any configured password protection.
- The buttons used as direct keys on HMI devices with touch screen functionality may not be modified as follows by means of scripting:
  - Moving
  - Resizing
  - Hiding
  - Disabling for operation.
- The LEDs are addressed either via the PROFINET IO direct keys or the HMI Runtime application. Avoid concurrent addressing via the PROFINET IO direct keys and the HMI Runtime application. The LEDs "ACK", "A-Z l", "A-Z r" and "HELP" are reserved for system functions and cannot be configured. It is not advisable to control the "ACK", "A-Z l", "A-Z r" and "HELP" LEDs by means of PROFINET IO direct key functionality.

NOTICE
If an external application such as Pocket Internet Explorer or Control Panel is started, it will run in the foreground and Runtime is placed in the background. The bit for the function "DirectKeyScreenNumber" is no longer set and the keys or buttons with the configured function "DirectKey" no longer trigger the associated bit in the PLC.

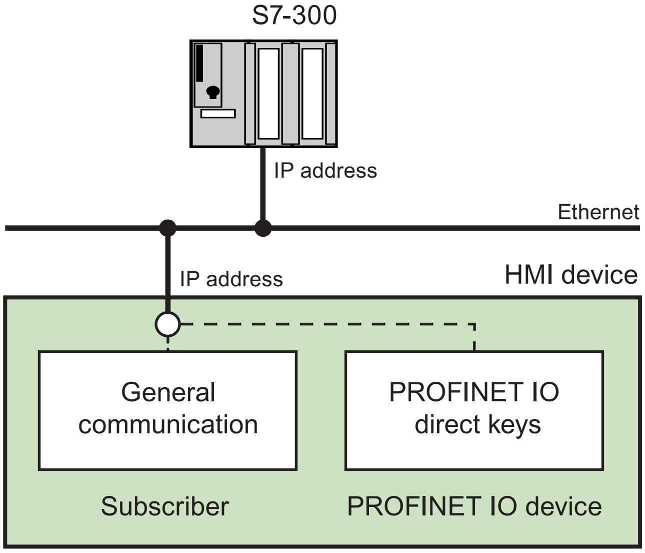
NOTICE
Direct keys are still active when the HMI device is in "offline" mode.

Requirements

- The HMI device must be linked to a SIMATIC S7 PLC via the industrial Ethernet (IE).
- WinCC flexible must be integrated in the SIMATIC Manager and installed on the configuration computer.
- To be able to use PROFINET IO direct keys, you must activate the option "PROFINET IO enabled" in the control panel of the HMI device.

Configuration for STEP 7

The HMI device should be configured as a node for general communication (reading and writing of variables). For the PROFINET IO direct keys, the HMI device can also be configured as an IO device in the PROFINET IO network. The following figure illustrates the configuration of the HMI device with PROFINET IO direct keys using a S7-300 as an example.



Principal procedure for configuration in STEP 7

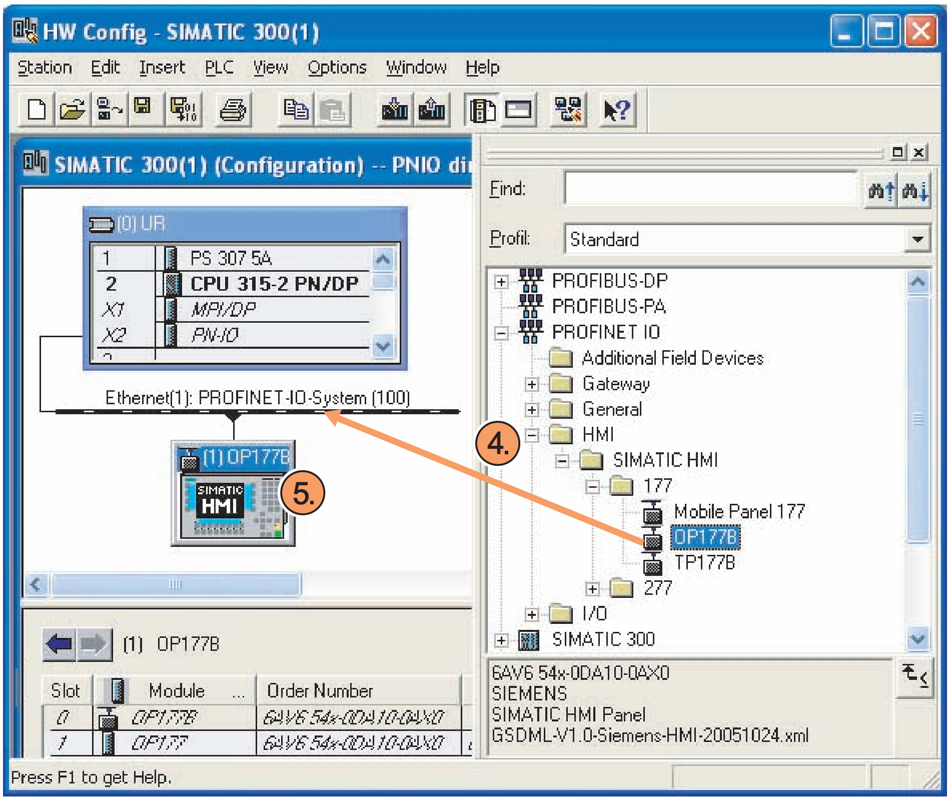
The following steps show how the HMI device is configured in STEP 7 for the general communication (as an IO device).

1. Create a new project in the SIMATIC manager.
2. Insert a PLC. Configure the hardware with a PROFINET IO-capable CPU, e.g. a SIMATIC 300 with a CPU 315 2 PN/DP.
3. Assign an IP address to the CPU.

   In HW Config, double-click on the "PN-IO" interface of the CPU. Use the "Properties ..." button to open the "Properties - Ethernet interface PN-IO" dialog. In the "IP address" input field enter the IP address of the CPU.

   Always click on "OK" to close the opened dialog.
4. Add an HMI station to the PROFINET IO network. You operate the direct keys using this device.

Open the HW Config and drag the desired HMI device type from the HW catalog under "PROFINET IO > HMI > SIMATIC HMI station" to the Ethernet bus shown.



1	PS 307 5A
2	CPU 315-2 PN/DP
X1	MPI/DP
X2	PN-IO

(1) OP177B

Slot		Module	...	Order Number
0		OP177B		6AV6 54x-0DA10-0AX0
1		OP177		6AV6 54x-0DA10-0AX0

6AV6 54x-0DA10-0AX0
SIEMENS
SIMATIC HMI Panel
GSDML-V1.0-Siemens-HMI-20051024.xml

5. In your project enter the device names of the newly configured station.

   The device name specified here must fulfill the following conditions:

   – The device name must be in concordance with the name used in the HMI station.

   – The device name must be unambiguous in the Ethernet subnet.

   – The device name must satisfy the DNS conventions.

   The DNS conventions include, for example, the following rules:

   – Restriction to 240 characters in total (letters, digits, hyphen or point)

   – A name component within the device name, e.g. a string between two points, may not exceed 63 characters.

   – No special characters like umlauts, brackets, underscores, slashes, blank spaces, etc. The hyphen is the only permitted special character.

   – The device name must not start or end with the "-" character.

   – The device name must not take the form n.n.n.n (n = 0...999).

   – The device name must not start with the string "port-xyz-" (xyz = 0...9).

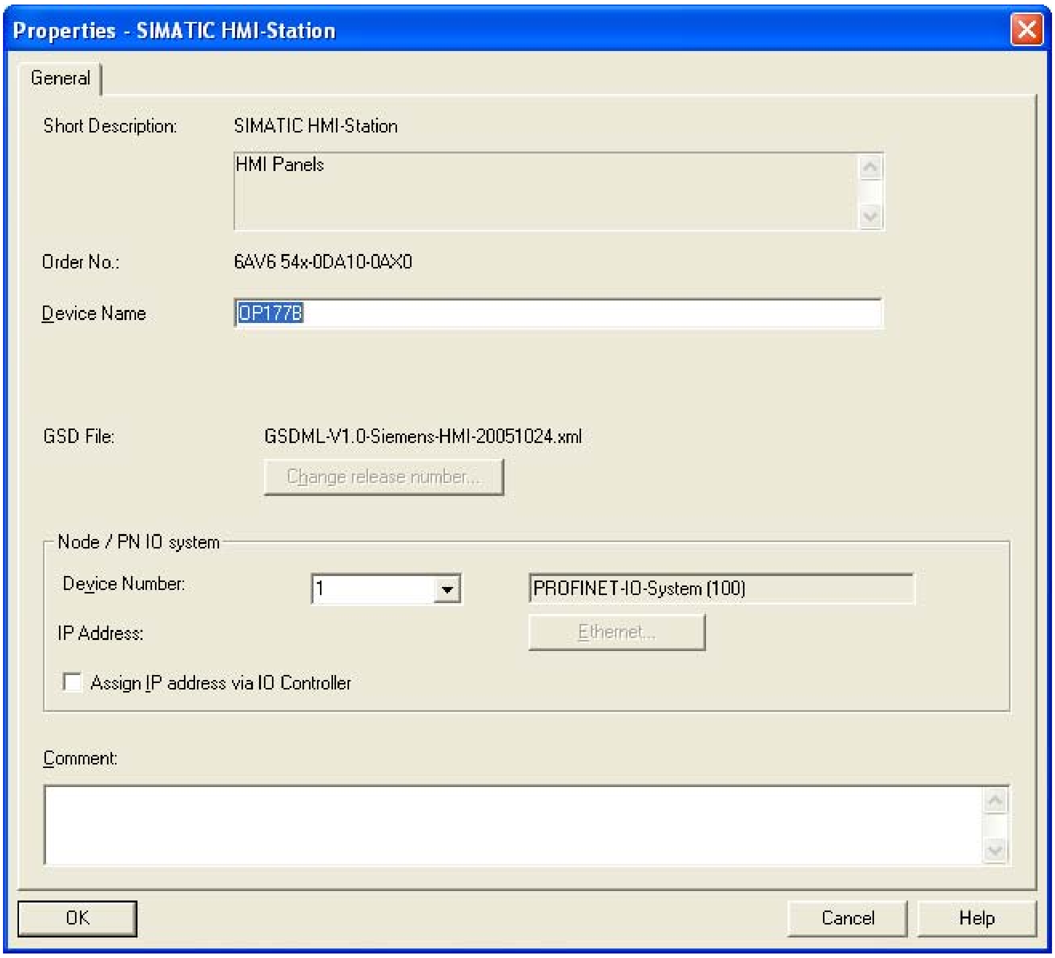
   By double-clicking on the HMI station icon, open the "Properties - SIMATIC HMI station" dialog. In the "Device name" input field, enter the name of the HMI station.

   You should also deactivate the check box "Assign IP address by IO PLC". This way you can ensure that the IP addresses you have entered are not altered in any way.

Note

The IP address assignment will not function as long as Runtime is active.

Click on "OK" to close the opened dialogs.



Properties - SIMATIC HMI-Station

General

Short Description: SIMATIC HMI-Station

HMI Panels

Order No.: 6AV6 54x-0DA10-0AX0

Device Name: OP177B

GSD File: GSDML-V1.0-Siemens-HMI-20051024.xml

Node / PN IO system

Device Number: 1

PROFINET-IO-System (100)

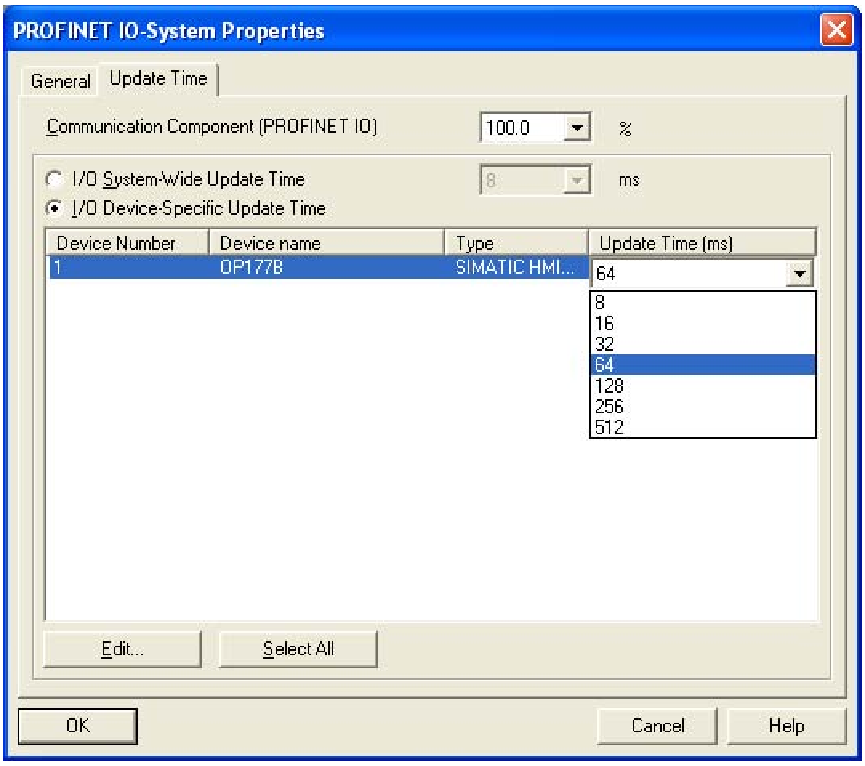
IP Address:

□ Assign IP address via IO Controller

Comment:

6. Configure the update time using the PROFINET IO system.

   Double click on the icon "Ethernet: PROFINET IO system". Change to the "Update time" tab. In the line of the recently added HMI station, select the update time (ms). We recommend a value of 64 ms, so that you can ensure a response time < 100 ms for the direct keys. Note that a very short response time can influence the performance of the system.



PROFINET IO-System Properties

Communication Component (PROFINET IO) 100.0 %

○ I/O System-Wide Update Time 8 ms

● I/O Device-Specific Update Time

Device Number	Device name	Type	Update Time (ms)
1	OP177B	SIMATIC HMI...	64

7. Connect the CPU and the HMI device to an Ethernet network.

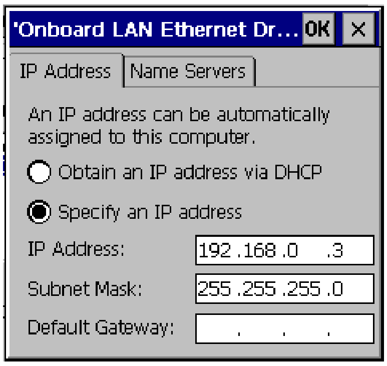
Basic procedure for configuring the HMI station

The following steps illustrate how you can configure the HMI device as a PROFINET IO device in order to use the direct keys.

1. Assign an IP address to the HMI station.

   Open the control panel of the HMI station. Double click on the "Network" icon and switch to the "Adapters" tab. From the list of available network drivers, select the "Onboard LAN Ethernet driver".

   Double click on the "Properties" button and enter the IP address for the HMI station.



'Onboard LAN Ethernet Dr... OK ×

IP Address | Name Servers

An IP address can be automatically assigned to this computer.

○ Obtain an IP address via DHCP

● Specify an IP address

IP Address: 192 .168 .0 .3

Subnet Mask: 255 .255 .255 .0

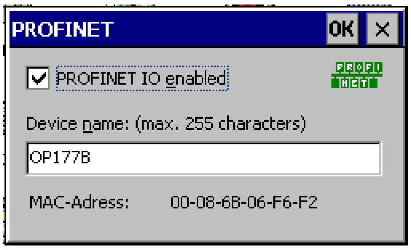
Default Gateway: . . .

   Always click on "OK" to close the opened dialog.

2. Assign a name to the HMI station.

   In the control panel, double click on the "PROFINET" symbol.

   Select the "PROFINET IO enabled" check box. In the "Device name" entry box, enter the name of the HMI station that is used in the S7 project.



PROFINET OK ×

☑ PROFINET IO enabled

Device name: (max. 255 characters)

OP177B

MAC-Adress: 00-08-6B-06-F6-F2

3. Reboot the system in order to apply the values.

   In the control panel, double click on the "OP" symbol. Switch to the "Device" tab and then double-click on the "Reboot" button.

4. Open an HMI project for your HMI device.

   The direct keys are configured differently for keys and touch screens.

   The following applies to configuring the **keys**:

   You do not have to configure as the direct keys are already assigned to the memory area (refer to the following section "Assignment of the inputs / outputs").

   The following applies to configuring the **touch screens**:

   A button must be configured for each direct key. In the Properties view, assign the "DirectKey" system function to the button.
5. Download your HMI configuration to the HMI device.
6. Start WinCC flexible Runtime.

   To be able to use direct keys, WinCC flexible Runtime must be running on the HMI device.

Changing the PROFINET IO parameters via STEP 7

The IP configuration and the "Device Name" of the HMI device can be changed via the SIMATIC Manager. Information can be found in the SIMATIC STEP 7 documentation.

The change can only be made after Runtime has been completed on the HMI device.

After the acceptance of the IP Configuration, the device is automatically restarted.

Assigning the inputs/outputs

The keys or buttons of the device are assigning bytes in the input area. The LEDs are assigning bytes in the output area. The number of bytes used depends on the HMI device. The following table shows the number of bytes used in the various direct keys:

HMI device	Inputs	Outputs
MP 377-12" touch device	5 bytes	5 bytes
MP 377-12", -15", -19" touch device	5 bytes	–
MP 277-10" touch device	5 bytes	5 bytes
MP 277-10" touch device	5 bytes	–
MP 277-8" touch device, OP 277-6"	4 bytes	4 bytes
MP 277-8" touch device, TP 277-6"	4 bytes	–
MP 177-6"	4 bytes	4 bytes
Mobile Panel 277	10 bytes	4 bytes
Mobile Panel 277-10"	5 bytes	--
OP 177B PN/DP	9 bytes	4 bytes
TP 177B PN/DP	4 bytes	–
TP 177B -6"	5 bytes	5 bytes
TP 177B -4"	5 bytes	–
Mobile Panel 177 PN	9 bytes	2 bytes

The touch panels do not have any permanently assigned keys. They only have user-configurable buttons. Via the "DirectKeys" function you can assign to a button a bit in the input area. The counting direction of the bit in the input direction is from right to left. In contrast to the operator panels which have permanently assigned keys, the touch panel buttons can be assigned freely.

The following figures illustrate the assignment of the bytes in the input / output area.

Input/output assignment for MP 377", MP/OP 277 and TP 177B-6"

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	S8	S7	S6	S5	S4	S3	S2	S1	n+0	S8	S7	S6	S5	S4	S3	S2	S1
	S16	S15	S14	S13	S12	S11	S10	S9	n+1	S16	S15	S14	S13	S12	S11	S10	S9
	F8	F7	F6	F5	F4	F3	F2	F1	n+2	F8	F7	F6	F5	F4	F3	F2	F1
	F16	F15	F14	F13	F12	F11	F10	F9	n+3	F16	F15	F14	F13	F12	F11	F10	F9
	ACK	ALT	CTRL	SHIFT	F20	F19	F18	F17	n+4	ACK	A-Z left	A-Z right	INFO	F20	F19	F18	F17

I/O assignments for MP 377 12", 15" and 19" touch devices, TP 177B-4"

	Direct keys assignment									LED
	7	6	5	4	3	2	1	0	Byte	
Touch buttons	7	6	5	4	3	2	1	0	n+0	
	15	14	13	12	11	10	9	8	n+1	No output area
	23	22	21	20	19	18	17	16	n+2	
	31	30	29	28	27	26	25	24	n+3	
	39	38	37	36	35	34	33	32	n+4	

Input/output assignment for MP 277-10" touch device and Mobile Panel 277-10"

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	F16	F15	F14	F13	F12	F11	F10	F9	n+1					F12	F11	F10	F9
	K4	K3	K2	K1	F20	F19	F18	F17	n+2	K4	K3	K2	K1				
	K12	K11	K10	K9	K8	K7	K6	K5	n+3	K12	K11	K10	K9	K8	K7	K6	K5
	ACK	ALT	CTRL	SHIFT	K16	K15	K14	K13	n+4	ACK	A-Z left	A-Z right	HELP	K16	K15	K14	K13

Input/output assignment for MP 277-8" touch device and MP 177-6"

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	F16	F15	F14	F13	F12	F11	F10	F9	n+1							F10	F9
	K4	K3	K2	K1			F18	F17	n+2	K4	K3	K2	K1				
					K8	K7	K6	K5	n+3					K8	K7	K6	K5
	ACK	ALT	CTRL	SHIFT					n+4	ACK	A-Z left	A-Z right	HELP				

I/O assignments for the MP 277-10" and MP 277-8" touch devices and for Mobile Panel 277 10"

	Direct keys assignment									LED
	7	6	5	4	3	2	1	0	Byte	
Touch buttons	7	6	5	4	3	2	1	0	n+0	
	15	14	13	12	11	10	9	8	n+1	No output area
	23	22	21	20	19	18	17	16	n+2	
	31	30	29	28	27	26	25	24	n+3	
	39	38	37	36	35	34	33	32	n+4	

Input/output assignment for OP 277-6"

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	K2	K1	F14	F13	F12	F11	F10	F9	n+1	K2	K1						
	K10	K9	K8	K7	K6	K5	K4	K3	n+2	K10	K9	K8	K7	K6	K5	K4	K3
	ACK	ALT	CTRL	SHIFT					n+3	ACK	A-Z left	A-Z right	HELP				

Input/output assignment for TP 277-6"

	Direct keys assignment									LED
	7	6	5	4	3	2	1	0	Byte	
Touch buttons	7	6	5	4	3	2	1	0	n+0	
	15	14	13	12	11	10	9	8	n+1	No output area
	23	22	21	20	19	18	17	16	n+2	
	31	30	29	28	27	26	25	24	n+3	

Assignment of the inputs / outputs for OP 177B PN/DP

	Direct keys assignment									LED							
	7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
Membrane keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
	K2	K1	F14	F13	F12	F11	F10	F9	n+1	K2	K1						
	K10	K9	K8	K7	K6	K5	K4	K3	n+2	K10	K9	K8	K7	K6	K5	K4	K3
	K18	K17	K16	K15	K14	K13	K12	K11	n+3	K18	K17	K16	K15	K14	K13	K12	K11
									n+4								
Touch buttons	7	6	5	4	3	2	1	0	n+5								
	15	14	13	12	11	10	9	8	n+6								
	23	22	21	20	19	18	17	16	n+7								
	31	30	29	28	27	26	25	24	n+8								

Assignment of the inputs / outputs for TP 177B PN/DP

	Direct keys assignment									LED
	7	6	5	4	3	2	1	0	Byte	
Touch buttons	7	6	5	4	3	2	1	0	n+0	
	15	14	13	12	11	10	9	8	n+1	No output area
	23	22	21	20	19	18	17	16	n+2	
	31	30	29	28	27	26	25	24	n+3	

Assignment of the inputs / outputs for Mobile Panel 277

Direct keys assignment

	7	6	5	4	3	2	1	0	Byte
Membrane keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0
	F16	F15	F14	F13	F12	F11	F10	F9	n+1
							F18	F17	n+2
optional operator controls				T2		T1	S1	S0	n+3
	I7	I6	I5	I4	I3	I2	I1	I0	n+4
	D7	D6	D5	D4	D3	D2	D1	D0	n+5
Touch buttons	7	6	5	4	3	2	1	0	n+6
	15	14	13	12	11	10	9	8	n+7
	23	22	21	20	19	18	17	16	n+8
	31	30	29	28	27	26	25	24	n+9

LED-Bits

7	6	5	4	3	2	1	0
F8	F7	F6	F5	F4	F3	F2	F1
F16	F15	F14	F13	F12	F11	F10	F9
						F18	F17
					T2	T1	

S0-S1:	Key-operated switch
T1:	Illuminated pushbutton 1
T2:	Illuminated pushbutton 2
I0-I7:	Handwheel pulses (forwards)
D0-D7:	Handwheel pulses (backwards)

Assignment of the inputs / outputs for Mobile Panel 177 PN

Direct keys assignment

	7	6	5	4	3	2	1	0	Byte
Membrane keys	F8	F7	F6	F5	F4	F3	F2	F1	n+0
			F14	F13	F12	F11	F10	F9	n+1
optional operator controls						T1	S1	S0	n+2
	I7	I6	I5	I4	I3	I2	I1	I0	n+3
	D7	D6	D5	D4	D3	D2	D1	D0	n+4
Touch buttons	7	6	5	4	3	2	1	0	n+5
	15	14	13	12	11	10	9	8	n+6
	23	22	21	20	19	18	17	16	n+7
	31	30	29	28	27	26	25	24	n+8

LED-Bits

7	6	5	4	3	2	1	0
F8	F7	F6	F5	F4	F3	F2	F1
							T1

S0-S1:	Key-operated switch
T1:	Illuminated pushbutton 1
I0-I7:	Handwheel pulses (forwards)
D0-D7:	Handwheel pulses (backwards)

I/O assignments for Mobile Panel 170

Direct key assignment									LED							
7	6	5	4	3	2	1	0	Byte	7	6	5	4	3	2	1	0
F8	F7	F6	F5	F4	F3	F2	F1	n+0	F8	F7	F6	F5	F4	F3	F2	F1
		F14	F13	F12	F11	F10	F9	n+1								
					T0	S1	S0	n+2								
I7	I6	I5	I4	I3	I2	I1	I0	n+3								
D7	D6	D5	D4	D3	D2	D1	D0	n+4								

F	Bit for function key
S	Bit for key switch
T	Bit for illuminated pushbutton
I	Bit for handwheel pulses, forwards
D	Bit for handwheel pulses, backwards

Assigning direct keys to screen numbers (only for touch devices)

If a PROFINET IO direct key is using the same bit for different functions in different screens, the S7 must differentiate between the respective functionality by means of the screen number. You can use the "DirectKeyScreenNumber" system function to avoid the delayed updating of the screen number following a screen change.

Using the "DirectKeyScreenNumber" you can set within the input area any number of bits in order to identify the screen and simultaneously transfer the direct key bits to the PLC. This ensures unambiguous allocation of a control bit to screen number at all times.

2.4 User data areas

2.4.1 Area pointer

2.4.1.1 General information about area pointers (SIMATIC S7)

Introduction

Area pointers are parameter fields. WinCC flexible Runtime reads these parameter fields in order to obtain information about the location and size of data areas in the PLC. The PLC and the HMI device interactively communicate read and write data for these data areas. The PLC and the HMI device trigger defined interactions based on the evaluation of stored data.

The area pointers reside in PLC memory. Their addresses are configured in the "Area pointers" dialog of the "Connections" editor.

Area pointers used in WinCC flexible:

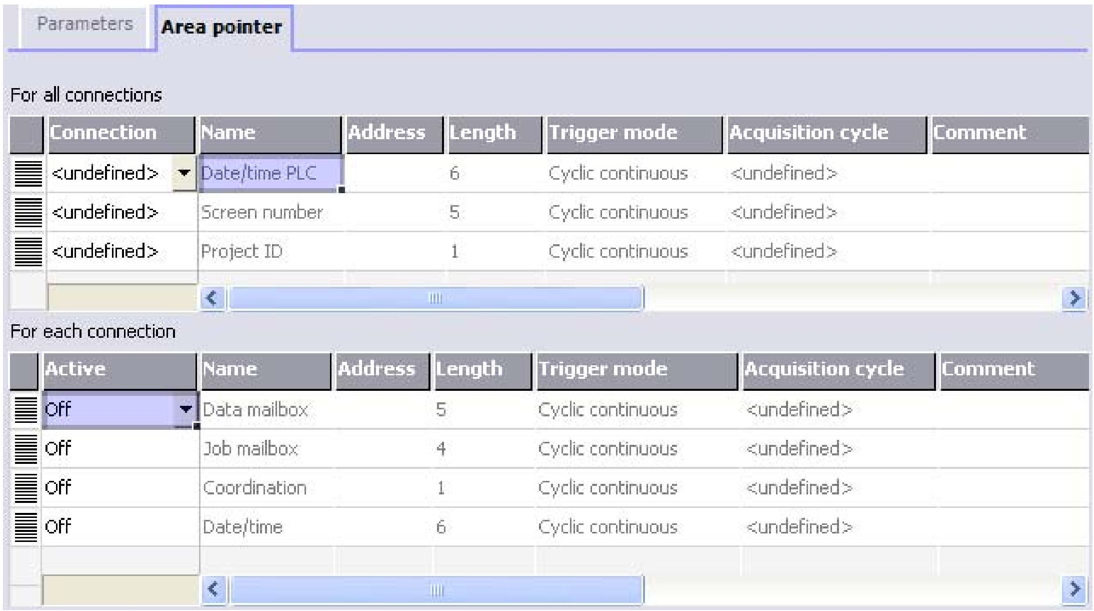
- PLC job
- Project ID
- Screen number
- Data record
- Date/time
- Date/time PLC
- Coordination

Device-dependency

Availability of the area pointer depends on the HMI device used.

Application

Configure and enable the area pointer in "Communication ▸ Connections" before you put it into use.



For all connections

Connection	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
<undefined>	Date/time PLC		6	Cyclic continuous	<undefined>	
<undefined>	Screen number		5	Cyclic continuous	<undefined>	
<undefined>	Project ID		1	Cyclic continuous	<undefined>	

For each connection

Active	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
Off	Data mailbox		5	Cyclic continuous	<undefined>	
Off	Job mailbox		4	Cyclic continuous	<undefined>	
Off	Coordination		1	Cyclic continuous	<undefined>	
Off	Date/time		6	Cyclic continuous	<undefined>	

Enabling an area pointer based on the example of a SIMATIC S7 PLC

- Active

  Enables the area pointer.
- Name

  Name of the area pointer defined by WinCC flexible.
- Address

  Tag address of the area pointer in the PLC.
- Length

  WinCC flexible defines the default length of the area pointer.
- Acquisition cycle

  Define an acquisition cycle in this field to allow cyclic reading of the area pointer in Runtime. An extremely short acquisition time may have a negative impact on HMI device performance.
- Comment

  Save a comment, for example, to describe the purpose of the area pointer.

Accessing data areas

The table shows how the PLC and HMI device handle read (R) and write (W) access to the data areas.

Data area	Required for	HMI device	PLC
Screen number	Evaluation by the PLC in order to determine the active screen.	W	R
Data record	Transfer of data records with synchronization	R/W	R/W
Date/time	Transfer of the date and time from the HMI device to the PLC	W	R
Date/time PLC	Transfer of the date and time from the PLC to the HMI device	R	W
Coordination	Requesting the HMI device status in the control program	W	R
Project ID	Runtime checks consistency between the WinCC flexible project ID and the project in the PLC.	R	W
PLC job	Triggering of HMI device functions by the control program	R/W	R/W

The next sections describe the area pointers and their associated PLC jobs.

2.4.1.2 "Screen number" area pointer

Function

The HMI device saves information about the screen called on the HMI device to the "Screen number" area pointer.

This allows the transfer of the current screen contents from the HMI device to the PLC.
The PLC can trigger specific reactions such as the call of a different screen.

Application

Configure and enable the area pointer in "Communication ▸ Connections" before you put it into use. You can create only **one** instance of the "Screen number" area pointer and only on **one** PLC.

The screen number is transferred spontaneously to the PLC. That is, it is always transferred when a new screen is activated on the HMI device. It is therefore unnecessary to configure an acquisition cycle.

Structure

The area pointer is a data area in the memory of the PLC with a fixed length of 5 words.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1st word	Current screen type															
2nd word	Current screen number															
3rd word	Reserved															
4th word	Current field number															
5th word	Reserved															

- Current screen type

  "1" for the root screen or
  "4" for the permanent window
- Current screen number

  1 to 32767
- Current field number

  1 to 32767

2.4.1.3 "Date/time" area pointer

Function

This area pointer is used to transfer the date and time from the HMI device to the PLC.

The PLC writes the control job "41" to the job mailbox.

When it evaluates the control job, the HMI device writes its current date and the time in the data area configured in the "Date/time" area pointer. All definitions are coded in BCD format.

If several connections are configured in a project, and the "Date/Time" area pointer is to be used in one of the connections, the area pointer must be enabled for each configured connection.

The date/time data area has the following structure:

Data word	Most significant byte								Least significant byte								
	7							0	7							0	
n+0	Reserved								Hour (0-23)								Time
n+1	Minute (0-59)								Second (0-59)								
n+2	Reserved								Reserved								
n+3	Reserved								Weekday (1-7, 1=Sunday)								Date
n+4	Day (1-31)								Month (1-12)								
n+5	Year (80-99/0-29)								Reserved								

Note

Note that when you enter the year, values 80-99 result in years 1980 through 1999 and the values 0-29 result in the years 2000 through 2029.

2.4.1.4 "Date/time controller" area pointer

Function

This area pointer is used to transfer the date and time from the PLC to the HMI device. Use this area pointer if the PLC is the time master.

The PLC loads the data area of the area pointer. All definitions are coded in BCD format.

The HMI device reads the data cyclically within the configured acquisition cycle and synchronizes itself.

Note

Set an acquisition cycle of sufficient length for the date/time area pointer in order to avoid any negative impact on HMI device performance.
Recommended: Acquisition cycle of 1 minute, if the process allows this.

The date/time data area has the following structure:

DATE_AND_TIME format (in BCD code)

Data word	Most significant byte			Least significant byte		
	7	......	0	7	......	0
n+0	Year (80-99/0-29)			Month (1 to 12)		
n+1	Day (1 to 31)			Hour (0 to 23)		
n+2	Minute (0 to 59)			Second (0 to 59)		
n+3	Reserved			Reserved	Weekday (1 to 7, 1 = Sunday)	
n+4 [1]	Reserved			Reserved		
n+5 [1]	Reserved			Reserved		

[1] The two data words must exist in the data area in order to ensure compliance of the data format with WinCC flexible and to avoid reading of the wrong information.

Note

Note that when you enter the year, values 80-99 result in years 1980 through 1999 and the values 0-29 result in the years 2000 through 2029.

2.4.1.5 "Coordination" area pointer

Function

The "Coordination" area pointer is used to implement the following functions:

- Detecting the startup of the HMI device in the control program
- Detecting the current operating mode of the HMI device in the control program
- Detecting whether the HMI device is ready to communicate in the control program

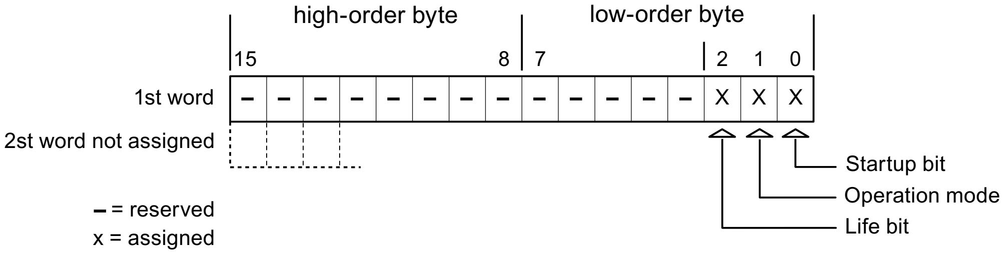
The "Coordination" area pointer has a length of two words.

Application

Note

Each time the area pointer is updated by the HMI device, the entire coordination area is always written.
For this reason, the PLC program must not make any changes in the coordination area.

Assignment of the bits in the "Coordination" area pointer



Startup bit

The startup bit is set briefly to "0" by the HMI device during startup. After startup, the bit is set permanently to "1".

Operating mode

As soon as the HMI device is switched offline by the user, the operating mode bit is set to 1. In normal operation of the HMI device, the state of the operating mode bit is "0". You can find out the current operating mode of the HMI device by querying this bit.

Life bit

The life bit is inverted by the HMI device at intervals of approximately one second. By querying this bit in the PLC program, you can check whether or not the connection to the HMI device still exists.

2.4.1.6 "User version" area pointer

Function

When Runtime starts it can check to see if the HMI device is connected to the correct PLC. This check is important when operating with several HMI devices.

The HMI device compares a value stored on the PLC with the value specified in the configuration data. This ensures the compatibility of the configuration data and the PLC program. If there is no concordance, a system alarm is given on the HMI device and Runtime is stopped.

Use

In order to use this area pointer you must set up the following during the configuration:

- Specify the version of the configuration data. Possible values between 1 and 255.

  Enter the version in the "Device settings ▸ Device settings" editor in "Project ID".
- Data address of the value for the version that is stored in the PLC:

  Enter the data address in the "Communication ▸ Connections" editor in "Address".

Connection failure

A connection failure to a device on which the "project ID" area pointer is configured results in all the other connections in the project being switched to "offline".

This behavior has the following prerequisites:

- You have several connections configured in a project.
- You are using the "project ID" area pointer in at least one connection.

Causes which may set connections "offline":

- The PLC is not available.
- The connection has been switched to offline in the engineering system.

2.4.1.7 "Job mailbox" area pointer

Function

The PLC can use the job mailbox to transfer jobs to the HMI device to trigger corresponding actions on the HMI device. These functions include, for example:

- Display screen
- Set date and time

Data structure

The first word of the job mailbox contains the job number. Depending on the job mailbox, up to three parameters can be transferred.

Word	Most significant byte	Least significant byte
n+0	0	Job number
n+1	Parameter 1	
n+2	Parameter 2	
n+3	Parameter 3	

The HMI device evaluates the job mailbox if the first word of this job is unequal to zero. This means that the parameters must be entered in the job mailbox first, followed by the job number.

When the HMI device accepts the job mailbox, the first word is set to 0 again. The execution of the job mailbox is generally not completed at this point in time.

Job mailboxes

All job mailboxes and their parameters are listed below. The "No." column contains the job number of the job mailbox. Job mailboxes can only be triggered by the PLC when the HMI device is online.

Note

Please note that not all HMI devices support job mailboxes. TP 170A and Micro Panel do not support job mailboxes, for example.

No.	Function	
14	**Setting the time (BCD coded)**	
	Parameter 1	Left byte: - Right byte: hours (0-23)
	Parameter 2	Left byte: minutes (0-59) Right byte: seconds (0-59)
	Parameter 3	-
15	**Setting the date (BCD coded)**	
	Parameter 1	Left byte: - Right byte: weekday (1-7: Sunday-Saturday)
	Parameter 2	Left byte: day (1-31) Right byte: month (1-12)
	Parameter 3	Left byte: year
23	**User logon**	
	Logs the user on with the name "PLC user" at the HMI device with the group number transferred in parameter 1. The logon is possible only when the transferred group number exists in the project.	
	Parameter 1	Group number 1 to 255
	Parameter 2, 3	-
24	**User logoff**	
	Logs off the current user. (The function corresponds to the "logoff" system function)	
	Parameter 1, 2, 3	-
40	**Transfer date/time to PLC**	
	(in the S7 format DATE_AND_TIME) An interval of at least 5 seconds must be maintained between successive jobs in order to prevent overload of the HMI device.	
	Parameter 1, 2, 3	-
41	**Transfer date/time to PLC**	
	(In OP/MP format) An interval of at least 5 seconds must be maintained between successive jobs in order to prevent overload of the HMI device.	
	Parameter 1, 2, 3	-
46	**Update tags**	
	Causes the HMI device to read the current value of the PLC tags whose update ID matches the value transferred in Parameter 1. (Function corresponds to the "UpdateTag" system function.)	
	Parameter 1	1 - 100

No.	Function	
49	Clear process alarm buffer	
	Parameter 1, 2, 3	-
50	Clear alarm buffer	
	Parameter 1, 2, 3	-
51	Screen selection [2]	
	Parameter 1	Screen number
	Parameter 2	-
	Parameter 3	Field number
69	Reading data record from PLC [1]	
	Parameter 1	Recipe number (1-999)
	Parameter 2	Data record number (1-65535)
	Parameter 3	0: Do not overwrite existing data record 1: Overwrite existing data record
70	Writing data record from PLC [1]	
	Parameter 1	Recipe number (1-999)
	Parameter 2	Data record number (1-65535)
	Parameter 3	-

[1] Only devices supporting recipes

[2] OP 73, OP 77A and TP 177A HMI devices also execute the "Screen selection" job mailbox if the on-screen keyboard is active.

2.4.1.8 "Data mailbox" area pointer

"Data mailbox" area pointer

Function

When data records are transferred between the HMI device and PLC, both partners access common communications areas on the PLC.

Data transfer types

There are two ways of transferring data records between the HMI device and PLC:

- Transfer without synchronization
- Transfer with synchronization over the data record

Data records are always transferred directly. That is, the tag values are read from an address or written to an address configured for this tag directly, without redirecting the values by means of interim memory.

Initiating the transfer of data records

There are three ways of triggering the transfer:

- Operator input in the recipe view
- PLC jobs

  The transfer of data records can also be triggered by the PLC.
- Triggering by configured functions

If the transfer of data records is triggered by a configured function or by a PLC job, the recipe display on the HMI device remains operable. The data records are transferred in the background.

Simultaneous processing of several transfer requests is, however, not possible. In this case, the HMI device rejects the other transfer requests with a system alarm.

Transfer without synchronization

If you select asynchronous transfer of data records between the HMI device and PLC, there is no coordination over the common data areas. It is therefore unnecessary to set up a data area during configuration.

Asynchronous data record transfer can be a useful alternative, for example, when:

- The system is capable of excluding the risk of uncontrolled overwriting of data by the communication peer.
- The PLC does not require information about the recipe number and data record number.
- The transfer of data records is triggered by the operator of the HMI device.

Reading values

When a read job is triggered, the values are read from the PLC addresses and transferred to the HMI device.

- Triggering by the operator in the recipe view:

  The values are downloaded to the HMI device. You can then process, edit, or save these values, for example.
- Triggering by a function or PLC job:

  The values are saved immediately to the data volume.

Writing values

When a write job is triggered, the values are written to the PLC addresses.

- Triggering by the operator in the recipe view:

  The current values are written to the PLC.
- Triggering by a function or PLC job:

  The current values are written to the PLC from the data medium.

Transfer with synchronization (SIMATIC S7)

If you select synchronous transfer, both communication partners set status bits in the common data area. You can use this mechanism to prevent uncontrolled overwriting of data in either direction in your control program.

Application

Synchronous data record transfer can be a useful solution, for example, when:

- The PLC is the "active partner" in the transfer of data records.
- The PLC evaluates the information about the recipe number and data record number.
- The transfer of data records is triggered by means of a Job mailbox.

Requirements

In order to synchronize transfer of data records between the HMI device and the PLC, the following requirements must be met during configuration:

- An area pointer has been set up: "Communication ▸ Connections" editor in "Area pointer"
- The PLC with which the HMI device synchronizes transfer of data records is specified in the recipe: "Recipes" editor, properties view of the recipe, "Properties" group in "Transfer".

Structure of the data area

The data area has a fixed length of 5 words. Structure of the data area:

	15		0
1. Word	Current recipe number (1 - 999)		
2. Word	Current data record number (0 - 65535)		
3. Word	Reserved		
4. Word	Status (0, 2, 4, 12)		
5. Word	Reserved		

- Status

  The status word (word 4) can adopt the following values:

Value		Meaning
Decimal	Binary	
0	0000 0000	Transfer permitted, data record free
2	0000 0010	Transfer is busy
4	0000 0100	Transfer completed without error
12	0000 1100	Transfer completed with error

Sequence of a transfer started by the operator in the recipe display

Reading from the PLC started by the operator in the recipe display

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe number to be read and the status "Transfer active" in the data record and sets the data record number to 0.	Abort with system alarm.
3	The HMI device reads the values from the PLC and displays them in the recipe display. If the recipes have synchronized tags, the values from the PLC are also written to the tags.	
4	The HMI device sets the status "Transfer completed."	
5	The control program must reset the status word to zero in order to enable further transfers.	

Writing to the PLC started by the operator in the recipe display

Step	Action	
	Check: Status word = 0?	
1	Yes	No
	The HMI device enters the recipe and data record number to be written and the status "Transfer active" in the data record.	Abort with system alarm.
2	The HMI device writes the current values to the PLC. If the recipes have synchronized tags, the changed values are synchronized between the recipe display and tags and then written to the PLC.	
3	The HMI device sets the status "Transfer completed."	
4	If required, the control program can now evaluate the transferred data.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Note

The status word may only be set by the HMI device. The PLC may only reset the status word to zero.

Note

The PLC may only evaluate the recipe and data record numbers when data inconsistency is detected if one of the conditions outlined below has been met:

- The data mailbox status is set to "Transfer completed".
- The data mailbox status is set to "Transfer completed with error".

Sequence of the transfer triggered by a job mailbox SIMATIC S7

The transfer of data records between the HMI device and the PLC can be initiated by either one of these stations.

The two PLC jobs No. 69 and No. 70 are available for this type of transfer.

No. 69: Read data mailbox from PLC ("PLC → DAT")

Job mailbox no. 69 transfers data mailboxes from the PLC to the HMI device. The job mailbox is structured as follows:

	Most significant byte	Least significant byte
Word 1	0	69
Word 2	Recipe number (1-999)	
Word 3	Data mailbox number (1-65,535)	
Word 4	Do not overwrite existing data mailbox: 0 Overwrite existing data mailbox: 1	

No. 70: Write data mailbox to PLC ("DAT → PLC")

Job mailbox no. 70 transfers data mailboxes from the HMI device to the PLC. The job mailbox is structured as follows:

	Most significant byte	Least significant byte
Word 1	0	70
Word 2	Recipe number (1-999)	
Word 3	Data mailbox number (1-65,535)	
Word 4	—	

Sequence when reading from the PLC with job mailbox "PLC → DAT" (no. 69)

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data mailbox number specified in the job and the status "Transfer active" in the data mailbox.	Abort without return message.
3	The HMI device reads the values and stores the values in the data mailbox specified in the job mailbox.	
4	• If "Overwrite" was selected in the job, an existing data mailbox is overwritten without any prompt for confirmation. The HMI device sets the status "Transfer completed". • If "Do not overwrite" was selected in the job, and the data mailbox already exists, the HMI device aborts the job and enters 0000 1100 in the status word of the data mailbox.	
5	To allow further transfers, the PLC program must set the status word to 0 again.	

Sequence writing to the PLC with job mailbox "DAT → PLC" (no. 70)

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data mailbox number specified in the job and the status "Transfer active" in the data mailbox.	Abort without return message.
3	The HMI device fetches the values of the data mailbox specified in the job from the data medium and writes the values to the PLC.	
4	The HMI device sets the status "Transfer completed".	
5	The PLC program can now evaluate the transferred data. To allow further transfers, the PLC program must set the status word to 0 again.	

Sequence of the transfer when triggered by a configured function

Reading from the PLC using a configured function

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the function and the status "Transfer active" in the data record.	Abort with system alarm.
3	The HMI device reads the values from the PLC and stores them in the data record specified in the function.	
4	• If "Yes" was selected for the "Overwrite" function, an existing data record is overwritten without any prompt for confirmation. The HMI device sets the status "Transfer completed." • If "No" was selected for the "Overwrite" function and the data record already exists, the HMI device aborts the job and enters 0000 1100 in the status word of the data record.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Writing to the PLC by means of configured function

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the function and the status "Transfer active" in the data record.	Abort with system alarm.
3	The HMI device fetches the values of the data record specified in the function from the data medium and transfers the values to the PLC.	
4	The HMI device sets the status "Transfer completed."	
5	The control program can now evaluate the transferred data. The control program must reset the status word to zero in order to enable further transfers.	

Possible causes of error when transferring data records

Possible causes of error

The section below shows possible error causes which lead to the cancellation of data record transfer:

- Tag address not set up on the PLC
- Overwriting data records not possible
- Recipe number does not exist
- Data record number does not exist

Note

The status word may only be set by the HMI device. The PLC may only reset the status word to zero.

Note

The PLC may only evaluate the recipe and data record numbers when data inconsistency is detected if one of the conditions outlined below has been met:

- The data mailbox status is set to "Transfer completed".
- The data mailbox status is set to "Transfer completed with error".

Reaction to an aborted transfer due to errors

If the transfer of data records is aborted due to errors, the HMI device reacts as follows:

- Triggering by the operator in the recipe display

  Information in the status bar of the recipe view and output of system alarms
- Triggered by function

  Output of system alarms
- Triggering by PLC job

  No feedback message on the HMI device

You can nonetheless evaluate the status of the transfer by querying the status word in the data record.

2.4.2 Events, alarms, and acknowledgments

2.4.2.1 General information on operational messages, alarm messages and acknowledgments

Function

Messages return information about the PLC or HMI device operating states or problems to the user on the HMI device. The message texts consist of configurable texts and/or tags with actual values.

Operational messages and events must be distinguished. The programmer defines what is an operational message and what is an error alarm.

Operational message

An operational message indicates a state. Example:

- Motor on
- PLC in manual mode

Alarm message

An error alarm indicates a malfunction. Example:

- Valve does not open.
- Excess motor temperature

Alarms indicate exceptional operational states, and must therefore be acknowledged.

Acknowledgment

To acknowledge error alarms:

- Operator input on the HMI device
- The PLC sets an acknowledgment bit.

Triggering alarms

Triggering of an alarm in the PLC:

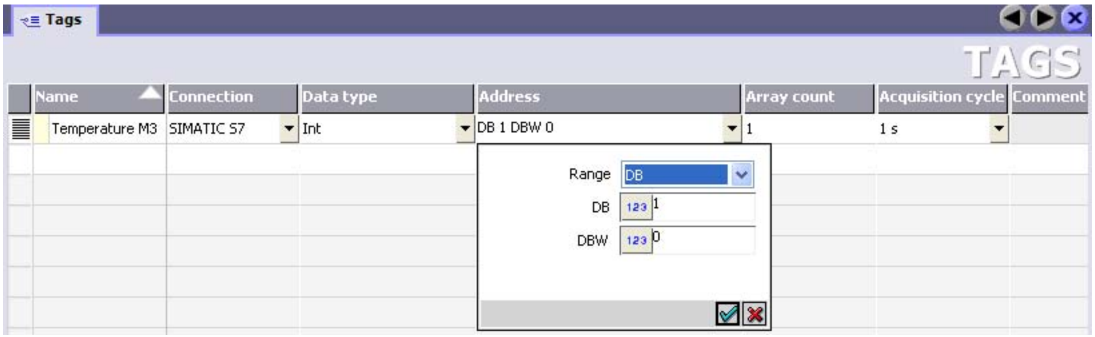
- Setting a tag bit
- Measured value limits exceeded

The location of tags, or of the tag array, is defined in WinCC flexible ES. The tag or array must be set up on the PLC.

2.4.2.2 Step 1: Creating tags or an array

Procedure

You create tags or arrays in the "Tags" editor. The dialog box is shown below.



Name	Connection	Data type	Address	Array count	Acquisition cycle	Comment
Temperature M3	SIMATIC S7	Int	DB 1 DBW 0	1	1 s	

Range: DB
DB: 1
DBW: 0

- Specifying the names of the tags or the name of the array
- Select the connection to the PLC

  The connection must already be configured in the "Connections" editor.
- Select the data type

  The available data types depend on the PLC being used. If you select an illegal data type, the tag will not be available in the "Discrete alarms" and "Analog alarms" editors.

  The following data types are supported for SIMATIC S5 controllers:

PLC	Permitted data types	
	Discrete alarms	Analog alarms
AS 300/400	WORD, INT	CHAR, BYTE, INT, WORD, DINT, DWORD, REAL, COUNTER, TIME

- Specify the address

  The tag addressed contains the bit that triggers the alarm.

  As soon as the bit of the tag is set on the PLC and is transferred to the HMI device in the configured acquisition cycle, the HMI device recognizes the alarm as "incoming".

  After the same bit is reset on the PLC, the HMI device recognizes the alarm as "outgoing".
- Specify array elements

  If the number of array elements is increased, you can select more bit numbers in the "Discrete alarms" editor. An array with a length of three words provides 48 alarm bits, for example.

2.4.2.3 Step 2: Configuring an alarm

Procedure

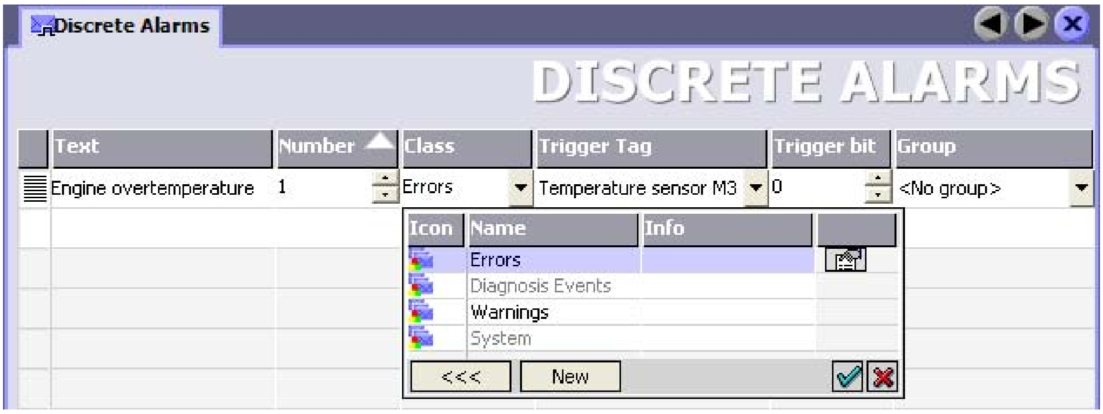
We differentiate between the following alarms:

- Discrete alarms
- Analog alarms

You create alarms in the "Discrete alarms" and "Analog alarms" editors.

Discrete alarms

The editor is shown in the figure below.



Text	Number	Class	Trigger Tag	Trigger bit	Group
Engine overtemperature	1	Errors	Temperature sensor M3	0	<No group>

Icon	Name	Info
	Errors	
	Diagnosis Events	
	Warnings	
	System	

- Edit text

  Enter the text to be displayed in runtime. You can format the text characters. The text may contain fields for the output of tags.

  The text is output to the alarm view if this view was configured in the "Screens" editor.

- Specify number

  Every alarm has a number that must be unique within the project. It is used to uniquely identify the alarm and is indicated with the alarm in runtime.

  The permitted range of values is 1 to 32767.

  The WinCC flexible engineering system assigns consecutive numbers. You can change the alarm numbers when assigning these to groups, for example.

- Specify the alarm class

  Available alarm classes:

  – Error alarms

    This class must be acknowledged.

  – Warning alarms

    This class signals events with incoming and outgoing alarms.

  – User-defined alarm classes

- Assign trigger tag

  In the "Trigger tag" column, you link the configured alarm with the tag created in step 1. All tags with permitted data types are shown in the selection list.
- Specify the bit number

  In the "bit number" column, specify the relevant bit position in the created tag.

  Remember that the way the bit positions are counted depends on the particular PLC. The following way of counting applies for SIMATIC S7 controllers:

Counting method in memory bit area and data block

How the bit positions are counted	Byte 0								Byte 1							
	Most significant byte								Least significant byte							
In SIMATIC S7 controllers	7							0	7							0
In the WinCC flexible, you configure the following:	15							8	7							0

Analog alarms

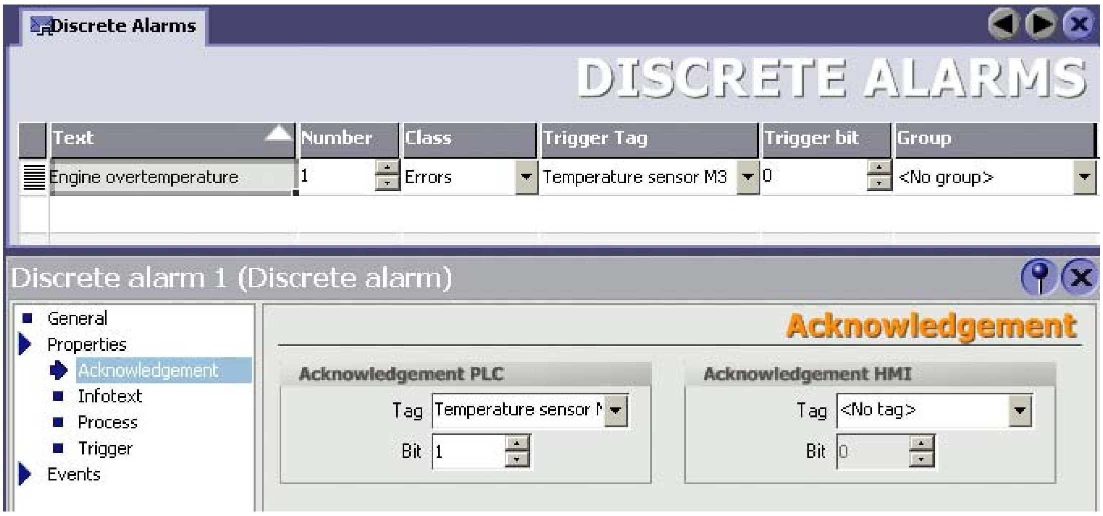
The only difference between discrete alarms and analog alarms is that you configure a limit value, rather than a bit number. The alarm is triggered when this limit is exceeded. The outgoing alarm is triggered when the low limit is violated, making allowances for any configured hysteresis.

2.4.2.4 Step 3: Configuring the acknowledgment

Procedure

Create suitable tags on the PLC to acknowledge an error alarm. You assign these tags to an alarm in the "Bit messages" editor. You make the assignment in "Properties ▸ Acknowledgment."

The following figure shows the dialog for configuring an acknowledgment.



Text	Number	Class	Trigger Tag	Trigger bit	Group
Engine overtemperature	1	Errors	Temperature sensor M3	0	<No group>

Acknowledgement PLC
Tag: Temperature sensor M
Bit: 1

Acknowledgement HMI
Tag: <No tag>
Bit: 0

Distinction in terms of acknowledgment:

- Acknowledgment on the HMI device
- Acknowledgment by the PLC

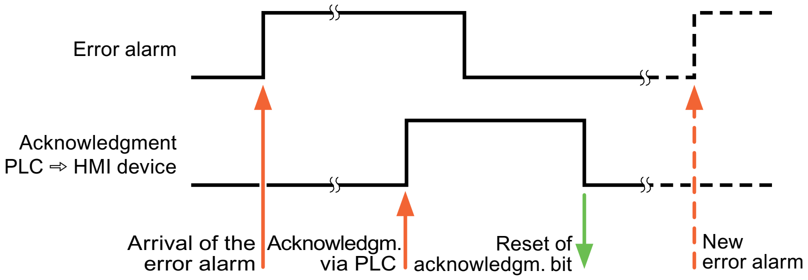
Acknowledgment by the PLC

In "Acknowledgment PLC tag", you configure the tag or the array tag and the bit number based on which the HMI device can recognize an acknowledgment by the PLC.

A bit set in the tag triggers acknowledgment of the assigned error alarm bit at the HMI device. This tag bit returns a function similar to acknowledgment on the HMI device which is triggered by pressing the "ACK" button, for example.

The acknowledgment bit must be located in the same tag as the bit for the error alarm.

Reset the acknowledgment bit before setting the bit in the alarm area again. The figure below shows the pulse diagram.


Error alarm
Acknowledgment PLC ⇨ HMI device
Arrival of the error alarm
Acknowledgm. via PLC
Reset of acknowledgm. bit
New error alarm

Acknowledgment on the HMI device

In "Ack read tag", you configure the tag or the array tag and the bit number that is written to the PLC after acknowledgment from the HMI device. Make sure when you use an array tag that it is not longer than 6 words.

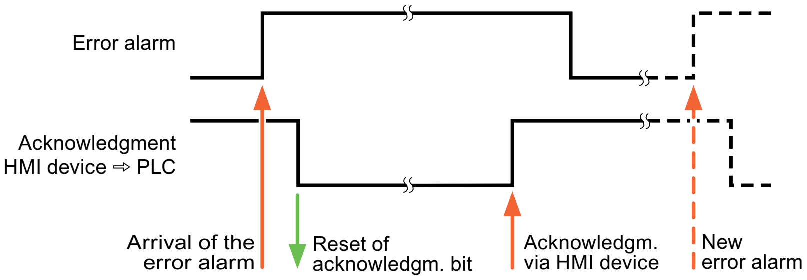
In order to ensure that a signal transition is generated as soon as the acknowledgment bit is set, the HMI device first resets the acknowledgment bit assigned to an error alarm. There is a certain time-based offset between these two operations, due to the processing time of the HMI device.

Note

The reset includes all alarm bits acknowledged since the last restart of Runtime. The PLC may only read this area once.

If the alarm is acknowledged on the HMI device, the bit is then set in the assigned acknowledgment tag on the PLC. This allows the PLC to recognize that the error alarm has been acknowledged.

The figure below shows the pulse diagram.


Error alarm
Acknowledgment HMI device ⇨ PLC
Arrival of the error alarm
Reset of acknowledgm. bit
Acknowledgm. via HMI device
New error alarm

2.4.3 Trend request and trend transfer

Function

A trend is the graphic visualization of one or more values from the PLC. The value is read either time- or bit-triggered, depending on the configuration.

Time-triggered trends

The HMI device reads in the trend values cyclically at an interval specified in the configuration. Time-triggered trends are suitable for continuous processes, for example, the operating temperature of a motor.

Bit-triggered trends

By setting a trigger bit in the tag trend transfer, the HMI device either reads in a trend value or an entire trend buffer. This setting is defined in configuration data. Bit-triggered trends are normally used to visualize rapidly changing values. One example might be the injection pressure in the production of plastic parts.

To trigger bit-triggered trends, create suitable external tags in the "Tags" editor of WinCC flexible. The external tags must be linked with the trend areas. The HMI device and PLC then communicate with each other over these trend areas.

The following areas are available for trends:

- Trend request area
- Trend transfer area 1
- Trend transfer area 2 (required only with switch buffers)

Assign a bit to each trend. Valid are tags and array tags of the data type "Word" or "Int".

Trend request area

The HMI device sets corresponding bits in the trend request area when you open a screen which contains one or several trends on the HMI device. After deselecting the screen, the HMI device resets the relevant bits in the trend request area.

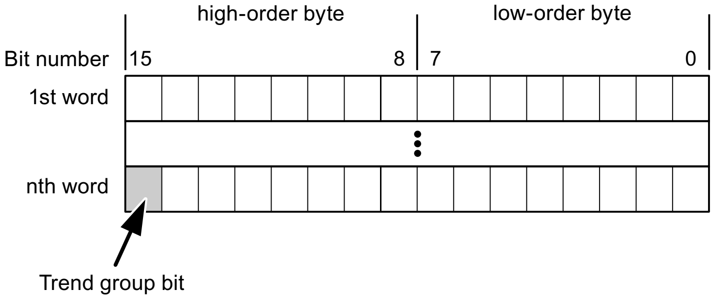
Using the trend request area, the PLC can recognize which trend is currently displayed on the HMI device. Trends can also be triggered without evaluation of the trend request area.

Trend transfer area 1

This area is used to trigger trends. In your PLC program, you set the bit assigned to the trend in the trend transfer area and set the trend group bit. The trend group bit is the last bit in the trend transfer area.

The HMI device recognizes the trigger and either reads a value or the entire buffer from the PLC. It then resets the trend bit and the trend group bit.

The following picture shows the structure of a trend transfer area.



The trend transfer area must not be modified by the PLC program until the trend group bit has been reset.

Trend transfer area 2

Trend transfer area 2 is required for trends configured with a switch buffer. The trend transfer areas 1 and 2 have a similar structure.

Switch buffers

The switch buffer is a second buffer for the same trend that can be set up during configuration.

While the HMI device reads the values from buffer 1, the PLC writes to buffer 2. If the HMI device is reading buffer 2, the PLC writes to buffer 1. This prevents the trend values being overwritten by the PLC while the trend is being read out by the HMI device.

2.4.4 LED mapping

Function

The function keys of the keyboard units of the Operator Panel (OP), Multi Panel (MP) and Panel PC are equipped with LEDs. These LEDs can be controlled by the PLC. This functionality can be used to activate an LED in order to tell the operator which key to press in a specific situation, for example.

Requirements

In order to enable control of an LED, you must set up an LED tag or array tag in the PLC and declare this as the LED tag in the configuration data.

LED assignment

Assign the LEDs to the LED tag bits when you configure the function keys. Define the "LED tag" and the corresponding "bit" for each function key in the "General" group of the properties view.

The bit number "bit" identifies the first of two consecutive bits that control the following LED states:

		LED function	
Bit n+ 1	**Bit n**	**all Mobile Panels, Operator Panels, and Multi Panels**	**Panel PCs**
0	0	Off	Off
0	1	Rapid flashing	Flashing
1	0	Slow flashing	Flashing
1	1	Permanent signal	Permanent signal

2.5 Commissioning components

2.5.1 Commissioning components

Transferring the PLC program to the PLC

1. Interconnect the PC with the CPU using the appropriate cable.
2. Download the program files to the CPU.
3. Then set the CPU to RUN.

Transferring the project to the HMI device

1. The HMI device must be in transfer mode in order to accept the project transfer.

   Possible scenarios:

   – Initial startup

     The HMI device does not yet contain any configuration data in the initial startup phase. The project data and runtime software required for operation must be transferred from the configuration computer to the device: The HMI device automatically changes to transfer mode.
     The message "Transfer mode" appears on the HMI device.

   – Recommissioning

     Recommissioning means that you overwrite existing project data on the HMI device.

     For corresponding detailed instructions, refer to the HMI device manual.

2. In your WinCC flexible project, check whether the alarm settings meet your requirements.
3. Before you transfer the project to the HMI device, set the transfer parameters using the "Project" menu "Transfer" ▸ "Transfer settings":
4. To transfer the project to the HMI device, click on the "transfer" button.

   – The project is compiled automatically.

   – All compilation and transfer steps are logged to a message window.

   Message output on the configuration computer on successful completion of the transfer: "Transfer completed successfully".

   The start screen appears on the HMI device.

Interconnecting the PLC with the HMI device

1. Interconnect the PLC with the HMI device using a suitable cable.
2. The connection message appears on the HMI device. Note that users can edit the system alarm texts in WinCC flexible.

NOTICE
Always observe the safety-related information in the HMI device manual when commissioning the device. RF radiation emitted from devices such as mobile phones may cause unwanted operating states.

2.5.2 Commissioning the interface

Introduction

To connect a Panel PC or PC to the interface of the S7 PLC, you require a communications processor or a PC/MPI adapter. To establish communication with the S7 PLC, the PG/PC interface must be set.

How to commission the interface

1. Go to the Start menu of the operating system and select the command "Settings ▸ Control Panel".
2. Double-click on "Set PG/PC interface".

   The "Set PG/PC interface" dialog opens.
3. Select the access point of the application "S7ONLINE".
4. Select the interface parameter assignment to suit your CP card or adapter.
5. Close the dialog with the "OK" button.

Alternative procedure

1. Select the "Set PG/PC interface" command in the "Tools" menu of the SIMATIC Manager.
2. Select the access point of the application "S7ONLINE".
3. Select the interface parameter assignment to suit your CP card or adapter.
4. Close the dialog with the "OK" button.

Communication via SIMATIC HMI HTTP protocol 3

3.1 Principles on the protocol

3.1.1 Principles on the protocol

Introduction

The SIMATIC HMI HTTP protocol is a constituent part of the Sm@rtAccess option. The SIMATIC HMI HTTP protocol is used for the data exchange between HMI devices.

It is used in the following cases:

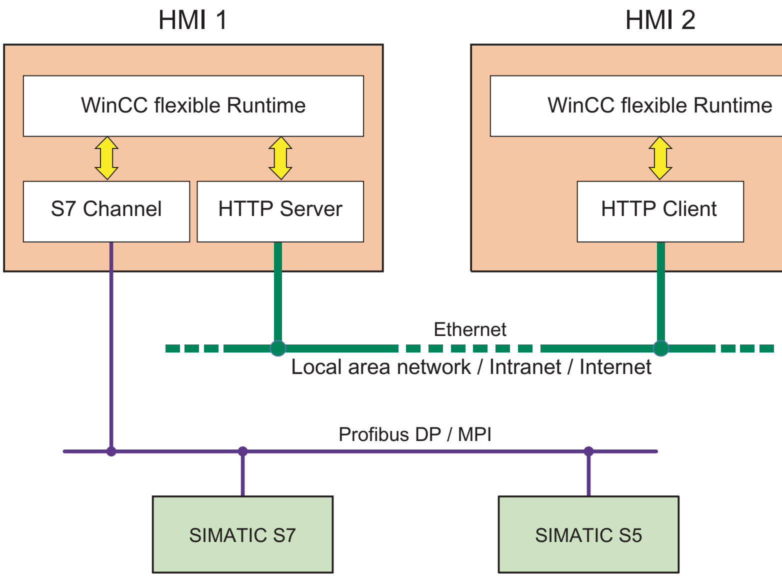
- PCs with WinCC flexible Runtime and Panels from the 177 series should exchange tags with each other via existing LANs (Sm@rtAccess).
- The transfer should take place using a firewall server.

The SIMATIC HMI HTTP protocol is not suitable for exchanging mass data.

Data exchange occurs according to the Request-Response method. The HTTP client sends his request to the HTTP server which processes it and returns his response.

A device can be configured as an HTTP client and HTTP server simultaneously.

The client and server establish a connection via the Ethernet interface for data exchange.



HTTP / HTTPS

The SIMATIC HMI HTTP Protocol provides two standards:

- HTTP

  Is implemented in local networks for a fast, uncoded transfer of uncritical data.

- HTTPS

  Enables a reliable HTTP connection between devices. Initially there is an exchange of secret keys. Then, in a further step, the respective public keys can be securely exchanged in the form of digital certificates. The public keys are used to encode the utility data in order to guarantee a bug-proof communication.

Note

Due to the encryption, the HTTPS Protocol has a lower transmission performance than the HTTP Protocol.

⚠ **CAUTION**

End users are responsible for the security of their own networks.

3.2 Configuring the communication driver

3.2.1 Permitted data types

Permitted data types

When configuring tags, the data types listed below can be used.

Data types in the HTTP Protocol	Length	Signs	Range of values
Bool	0	No	true (-1) or false (0)
Char	1 bytes	Yes	-128 to 127
Byte	1 bytes	No	0 to 255
Int	2 bytes	Yes	-32768 to 32767
UInt	2 bytes	No	0 to 65535
Long	4 bytes	Yes	-2,147,483,648 to 2,147,483,647
ULong	4 bytes	No	0 to 4,294,967,295
Float	4 bytes	Yes	-3.402823E38 to -1.401298E-45 for negative values and 1.401298E-45 to 3.402823E38 for positive values
Double	8 bytes	Yes	-1.79769313486231E308 to -4.94065645841247E-324 for negative values and 4.94065645841247E-324 to 1.79769313486232E308 for positive values
String	1 to 255 byte	——	
DateTime	8 bytes	——	1.1.1970 00:00:00 up to 31.12.2037 23:59:59

Please note that data types can be defined in external controllers which have different names in WinCC flexible. To ensure correct assignment, please observe the tag definition in the external controllers.

Note

It is not possible to access array tags from an HTTP client.

Multiplex tags are not supported by the HTTP protocol. If you need a multiplex tag, you will have to configure it on the HTTP client. You will have to create the tags for the multiplex list on the server and the client and then connect them. You will then add these tags to the multiplex list on the client.

Address multiplex tags are not supported by the HTTP protocol.

3.2.2 Installing the communication driver

3.2.2.1 Installing the communication driver

Installing HTTP components

The following HTTP components are supplied with WinCC flexible and installed when you transfer the configuration to the HMI devices:

- HTTP server
- HTTP client

For a standard PC or Panel PC, the following must also be installed:

- WinCC flexible Runtime

No special blocks are required on the HMI device for communication.

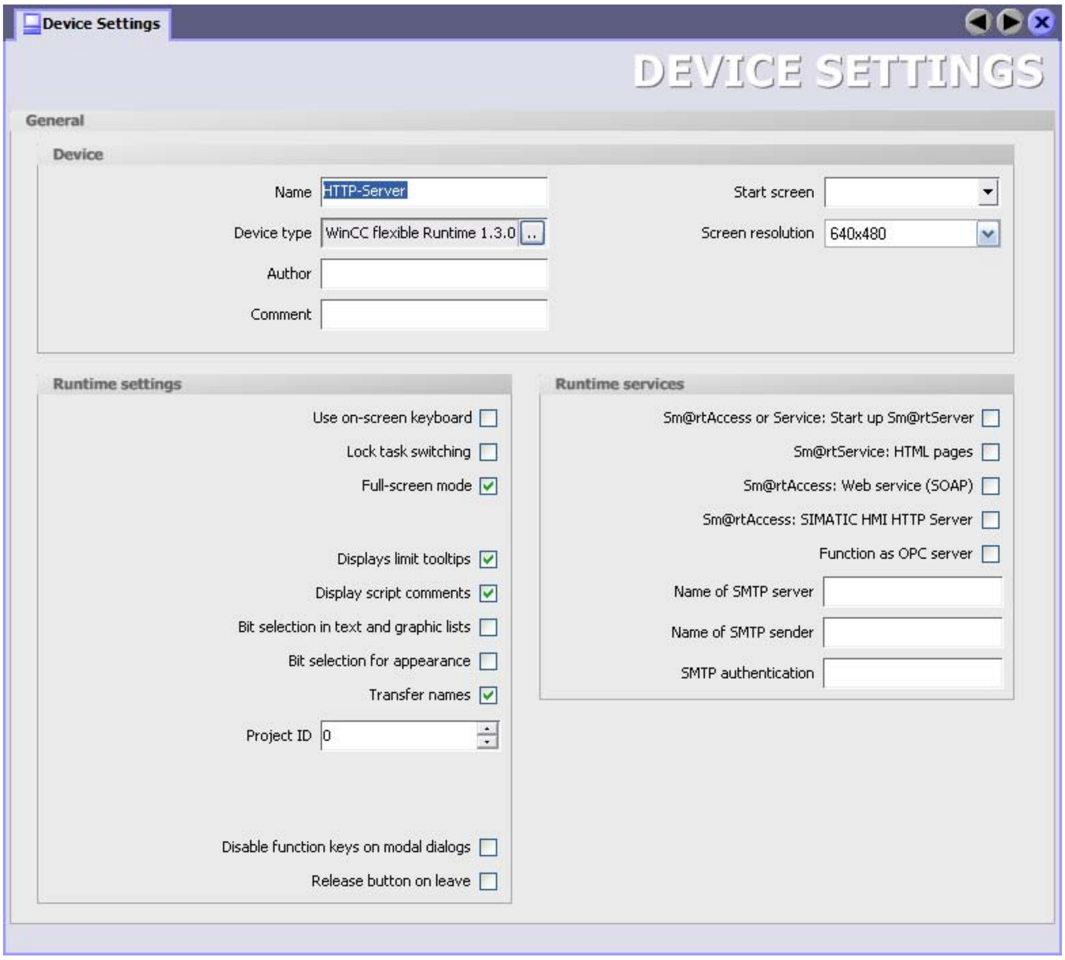
3.2.3 Configure HTTP server

3.2.3.1 Configuring HTTP server functions

Procedure

In addition to the HTTP communication channels (in the control panel), it must also be ensured that the HTTP server is supported by WinCC flexible Runtime. These settings are defined in the project from WinCC flexible ES.

1. Double-click "Device settings" in the project window, and open the "Device settings" editor.



General

Device

Name: HTTP-Server
Device type: WinCC flexible Runtime 1.3.0
Author:
Comment:
Start screen:
Screen resolution: 640x480

Runtime settings

Use on-screen keyboard ☐
Lock task switching ☐
Full-screen mode ☑
Displays limit tooltips ☑
Display script comments ☑
Bit selection in text and graphic lists ☐
Bit selection for appearance ☐
Transfer names ☑
Project ID: 0
Disable function keys on modal dialogs ☐
Release button on leave ☐

Runtime services

Sm@rtAccess or Service: Start up Sm@rtServer ☐
Sm@rtService: HTML pages ☐
Sm@rtAccess: Web service (SOAP) ☐
Sm@rtAccess: SIMATIC HMI HTTP Server ☐
Function as OPC server ☐
Name of SMTP server:
Name of SMTP sender:
SMTP authentication:

2. Select the "Sm@rtAccess: SIMATIC HMI HTTP Server" check box in the "Services in Runtime" area.

Before the HMI device can be used as an HTTP server, the project must be transferred to the HMI device.

3.2.3.2 Configuring tags in HTTP servers

Tags used

The client can use the HTTP protocol for read and write access to tags configured on the server in runtime. This means that it is not necessary to configure additional tags for an HTTP communication.

However, the following aspects must be taken into account to ensure correct data exchange:

1. The data type of the server tags must match the data type in the client.
2. The tag name configured in the HTTP server must be identical to the name of the address tag of the HTTP client.

3.2.4 Configuring HTTP clients

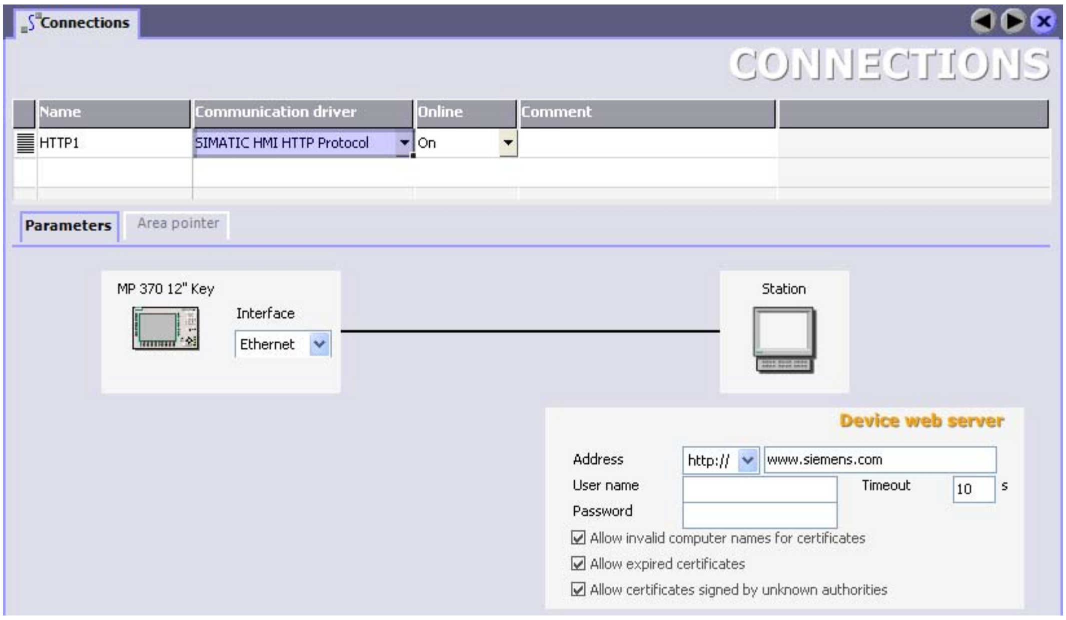
3.2.4.1 Configuring HTTP connections in the client

Procedure

To be able to access the tags on the HTTP server, a SIMATIC HMI HTTP protocol communication connection must be created.

1. Create a new connection under "Communication > Connections". Assign the connection to the "SIMATIC HMI HTTP protocol" communications driver.

   The "Connections" editor is shown in the following diagram.



Name	Communication driver	Online	Comment
HTTP1	SIMATIC HMI HTTP Protocol	On	

Interface: Ethernet

Address: http:// www.siemens.com
User name:
Timeout: 10 s
Password:
☑ Allow invalid computer names for certificates
☑ Allow expired certificates
☑ Allow certificates signed by unknown authorities

2. Assign a name to this connection that indicates its function.

3. Define the parameters in the Properties view:

Interface	Select "Ethernet".
Address	Select the protocol http:// or https:// and enter the name of the HTTP server or its address to which communication is required. Ask your network administrator for the specific name or parameters of your network. If the server has already been commissioned, you can read out the IP address on the server as well: • Panel Click "Start > Programs > Command Prompt" on the server and enter the "ipconfig" command using the screen keyboard. The IP address is displayed after pressing <Ret>. • PC/Panel PC Click "Start > Run", enter "Cmd", and press <Ret>: The command interpreter is displayed. Enter the "ipconfig" command. The IP address is displayed after pressing <Ret>.
User name and password	If the "Authentication required" check box was selected in the HTTP server in the "Control Panel > WinCC Internet Settings > Web Server" dialog, a user name and password must be entered here in the client.
Timeout	The period after which a connection break is recognized.

4. If the HTTPS protocol is selected, with the following settings you can establish how the HTTPS client should check the properties of the server certificate and how it should react in the event of error:

   – "Allow invalid computer names for certificates"

   – "Allow expired certificates"

   – "Allow certificates signed by unknown authorities"

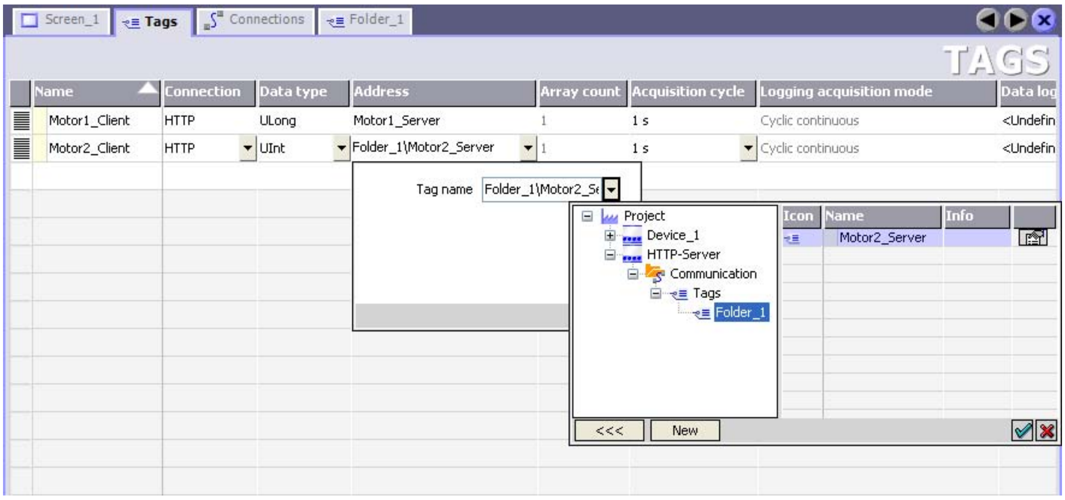
3.2.4.2 Configuring tags in HTTP clients

Procedure

In order to be able to access tags on the HTTP server, they must be configured in the client as tag addresses.

1. Create tags in the client project under "Communication > Tags" for all server tags you wish to access.

   The following figure illustrates the "Tags" editor with the browser open:



Name	Connection	Data type	Address	Array count	Acquisition cycle	Logging acquisition mode	Data log
Motor1_Client	HTTP	ULong	Motor1_Server	1	1 s	Cyclic continuous	<Undefin
Motor2_Client	HTTP	UInt	Folder_1\Motor2_Server	1	1 s	Cyclic continuous	<Undefin

Tag name Folder_1\Motor2_Se

Icon	Name	Info
	Motor2_Server	

2. Define the parameters in the working area:

Name	Enter the tag names on the HTTP client.
Connection	Select the HTTP connection.
Data type	Select the data type of the tags. Note The client does not check the data type. Therefore, pay attention that the data type selected here matches the data type of the tags on the server. Note Array tags are not permissible.
Address	Enter the name of the tag to be used to communicate on the HTTP server exactly as it is written. If the tag to be addressed is located in a subfolder, the full path including tag name must be specified as the address, e.g. [folder name]\[tag name]. This is a particular advantage when the devices for server and client are in the same WinCC flexible Project. In this case, the names of the server tags can be selected in the editor browser and thus accepted.

3.3 Initiating an HTTP connection

3.3.1 Setting the Internet Settings

Introduction

Initiating an HTTP/HTTPS connection requires settings to be made in WinCC Internet Settings on the Control Panel of both the server and client, in addition to the configuration in WinCC flexible.

The number of tabs and the names of the tabs in the "WinCC flexible Internet Settings" dialog depend on the software you installed. Only the required tabs for the MP 270B HMI device are shown in the example below.

WinCC flexible Internet Settings, Proxy tab

The valid network settings are specified by the network administrator.

Make the following settings:

- Internet settings for HMI devices with Windows CE

  In this case, there are several options for calling the Control Panel:

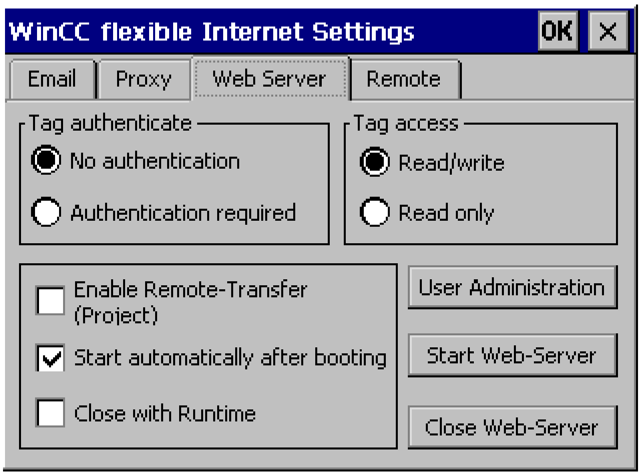
  - In the startup phase, click on the "Control Panel" button in the Windows CE Loader menu.
  - Select "Start > Settings > Control Panel" in the toolbar.
  - During normal operation, pressing the key combination <CTRL + ESC> opens the toolbar. Start the Control Panel by selecting "Start > Settings > Control Panel".
  - Using the RT function "OpenControlPanel"

  The language in the Windows CE based devices is always English.

WinCC flexible Internet Settings, Web Server tab

Settings for using the integrated Web Server are made in this tab.

The "Web Server" tab is only available in the WinCC flexible Internet Settings if the Web Server is installed on the HMI.



Tag authenticate
● No authentication
○ Authentication required

Tag access
● Read/write
○ Read only

□ Enable Remote-Transfer (Project)
☑ Start automatically after booting
□ Close with Runtime

- Tag authenticate

  Controls authentication for tag access:

  – "No authentication": Authentication (user name password) is not required for access.

  – "Authentication required": Authentication (user name password) is required for access. The user name and password for the client are specified during configuration.

- Tag access

  Controls access to tags:

  – "Read/write": Tags can be read and rewritten.

  – "Read only": Tags can only be read.

- Group for defining operational performance

  The following check boxes are not selected in conjunction with tag exchange via the HTTP/HTTPS protocol:

  – Enable remote transfer (project)

  Activating this check box enables an HTTP transfer from the configuration computer to the HMI device, e.g., to load a WinCC flexible Runtime project.

  – Start automatically after booting

  Specifies when the HTTP server should be started:

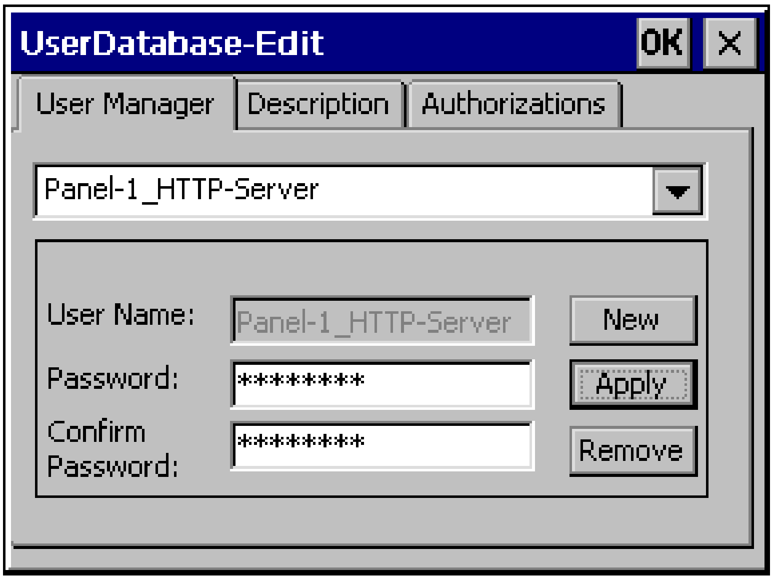
  Enabled: The HTTP server starts immediately after the HMI device is booted, irrespective of the runtime software
  Disabled: The HTTP server starts at the same time as the runtime software.

  – Close with Runtime

  Enabling this check box causes the HTTP server to be closed at the same time as the runtime software.

- User Administration

  This button opens the "UserDatabase-Edit" dialog box.



UserDatabase-Edit

User Name: Panel-1_HTTP-Server

Password: ********

Confirm Password: ********

  In the "User Manager" tab of this dialog box, you can select, delete, or create a new user. The "Description" and "Authorizations" tabs always apply to the user currently selected.

  (This example dialog box shows a user with the name 'Panel-1_HTTP-Server'.)

- User Manager

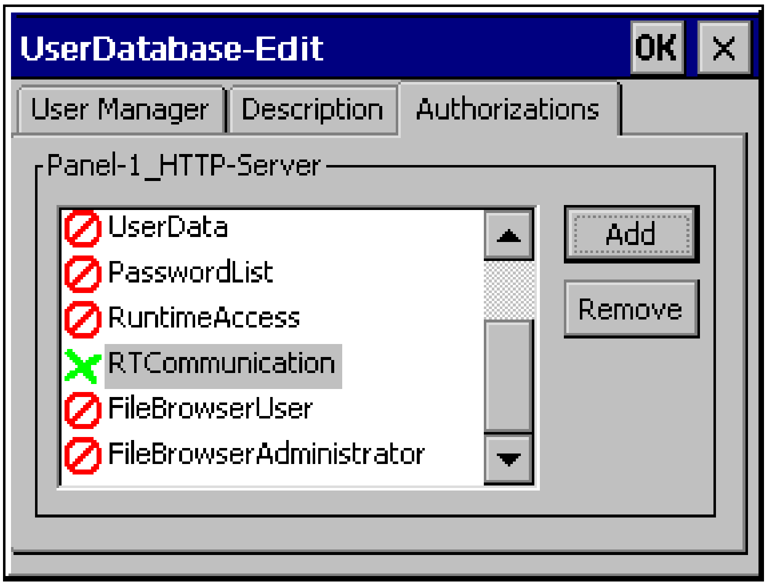
  "Administrator" is the default user name, and "100" is the default password setting. If a user name and password have been entered for the HTTP server in "Communication > Connections" in your WinCC flexible project, the same user name and password must be specified here.

- Description

  Enables input of a user description.

- Authorizations

  The newly set up user must be assigned the authorizations for "RT Communication on the "Authorizations" tab control.



3.3.2 Setting up an HTTPS connection

Introduction

To establish an HTTP connection, you must perform the following actions:

- In the "Connections" editor of WinCC flexible ES, configure the connection as an "https://" protocol type and define how the HTTPS client should verify the properties of the server certificate and respond to errors.
- Install a valid certificate on the HTTPS client.

  Certificates are necessary for server authentication. Using certificates you can ensure that the server with which the connection is to be developed is actually the server for which it is outputting.

Principle of an HTTPS connection

After runtime start, the HTTPS client establishes a connection to the HTTPS server. The HTTPS server presents its certificate, which the client verifies for authenticity. The session code that can only be read by the HTTPS server is then transmitted. The session code is now available on both sides and enables a symmetrical data encryption.

Note

The certificate contains the current time. The current time can lead to problems if the time zones of the server and client are different. For example, a certificate generated on a server with an Asian time zone only becomes valid on a client with European time zone in the future (8 hours).

Preparation for installing a certificate on the client

With the first HTTPS client access, the HTTPS server generates the certificate itself and then saves it in the "Cert.cer" memory. The file is stored in the following directory:

- On a PC / Panel PC (with Windows XP) in the directory "..\WinCC flexible 2008 Runtime\SystemRoot\SSL"
- On Windows CE-based devices in the directory "Flash\Simatic\SystemRoot\SSL"

The certificate must be stored on the HTTPS client on a storage medium from which it can be launched with a double click. You can select from the following transfer options:

Server	Client	Possible file transfer
With Windows XP (PC, Panel PC)	With Windows XP (PC, Panel PC)	• Diskette • USB stick • LAN (Ethernet) • Internet Explorer (via TCP/IP if service is already running)
with Windows CE (xP 270, xP 277, MP 370, MP 377, xP 177B, Mobile Panel 177 PN, Mobile Panel 277)	With Windows XP (PC, Panel PC)	• Memory card • ActiveSync (serial)
With Windows XP (PC, Panel PC)	with Windows CE (xP 270, xP 277, MP 370, MP 377, xP 177B, Mobile Panel 177 PN, Mobile Panel 277)	
with Windows CE (xP 270, xP 277, MP 370, MP 377, xP 177B, Mobile Panel 177 PN, Mobile Panel 277)	with Windows CE (xP 270, xP 277, MP 370, MP 377, xP 177B, Mobile Panel 177 PN, Mobile Panel 277)	• Memory card

Installing a certificate on a client with Windows XP

Insert the storage medium on which you have saved the "Cert.cer" file into the HTTPS client or open the directory in which the file is located. Double click on the file and follow the instructions in the Windows dialog.

Tip: The Internet Explorer provides an easy way to install a certificate. Connect to this device via HTTPS (e.g.: https://<my device>). The browser establishes if a certificate has not yet been imported. In this case, the browser asks if you want to install the certificate. Any faults in the certificate are displayed.

Installing a certificate on a client with Windows CE

Insert the memory card on which you have saved the converted "Cert.cer" file into the HTTPS client. WinCC flexible provides the "InstallCert.exe" tool for importing certificates using Windows CE.

You can implement the installation as follows:

- In Explorer:
  Double click the "Cert.cer" file to install the certificate.
- In the command prompt:
  Enter "InstallCert /[command parameter] [filename]".
  - command parameters:

    Parameter /r must be specified because the certificate used in WinCC flexible Runtime is a root certificate.

    A root certificate is the main certificate and is used to verify the authenticity of all other certificates transferred.
  - filename

    You must specify the certificate file with its complete path
    (e.g. "\Storage Card\Cert.cer")

A status alarm is output when you completed the installation. Runtime has to be restarted after the installation of a certificate on Windows CE- HMI devices with HTTPS clients. It is necessary to restart Runtime so that an HTTPS connection can be established.

The file "Cert.cer" cannot be opened

The "Cert.cer" file generated at the HTTPS server cannot be opened on HMI devices based on Windows CE 5.0 by double-clicking the client.

1. Open the Control Panel.
2. Select "Certificates > My Certificates."
3. Click the "Import" button.

   A dialog box opens.
4. Select the "From a File" menu in the file browser and select the "Cert.cer" file.

Communication via OPC 4

4.1 OPC - OLE for process control

4.1.1 Basic principles

4.1.1.1 OPC

Introduction

OPC (OLE for Process Control) is a uniform, multi-vendor software interface. OPC Data Access (OPC DA) is based on the Windows technology COM (Component Object Model) and DCOM (Distributed Component Object Model). OPC XML, on the other hand, is based on the Internet standards XML, SOAP, and HTTP.

DCOM

DCOM expanded COM by adding the ability to access objects beyond the limits of one computer.

This basis allows a standardized data exchange between applications from industry, office, and manufacturing.

Previously, applications that access process data were restricted to the access mechanisms of the communications network. In OPC, devices and applications of different manufacturers can be uniformly combined.

The OPC client is an application that accesses process data of an OPC server. The OPC server is a program that offers a standardized software interface to applications of different vendors. The OPC server is an intermediate layer between these applications to process the process data, the various network protocols, and the interfaces for access to the data.

When exchanging data with OPC, you can use only HMI devices with operating systems based on the Windows technology of COM and DCOM. Windows XP does currently have this software interface.

XML

Communication with DCOM is restricted to local area networks. Data exchange using XML allows communication with the platform-independent protocol SOAP over the Web or an intranet.

4.1.1.2 OPC over DCOM

Communications concept

An OPC configuration must consist of at least one OPC server and one OPC client. The OPC server is a DCOM application that transfers data to an OPC client for further processing. In the opposite direction, a client can also supply a server with data. The data is exchanged in the form of OPC items. The OPC items are addressed using their symbolic names that you assign during configuration of the OPC server.

Access mechanism

The open interface standard OPC uses the RPC (Remote Procedure Call) access mechanism. RPC is used to forward messages with which a distributed application can call up services on several computers in the network.

The DCOM and firewall settings required for Windows XP can be taken from a White Paper of the OPC Foundation:
"http://www.opcfoundation.org/DownloadFile.aspx?CM=3&RI=326&CN=KEY&CI=282&CU=8".

The OPC client is an application that requests process data from the OPC server over the OPC software interface.

The OPC server is a program that offers a standardized software interface to applications of different vendors. The OPC server is an intermediate layer between these applications to process the process data, the various network protocols, and the interfaces for access to the data.

Protocol profile

OPC can use all standard protocols available to DCOM (Distributed Component Object Model) on a computer to access data of an automation system via an OPC server. OPC is not restricted to any particular standard protocol. The preferred standard protocol for communication is the datagram TCP/IP.

Transport protocols

The following network protocols are available to DCOM for communication:

- TCP/IP tunnel
- Datagram UDP/IP
- Datagram IPX
- Connection-oriented TCP/IP
- Connection-oriented SPX
- Connection-oriented NetBEUI
- Connection-oriented Netbios over IPX

OPC attempts to establish a communication connection over one of the protocols in the order shown in the above list. If the attempt was successful, this protocol is used for communication. Otherwise, OPC continues the procedure until a connection is established using one of the listed protocols.

Note

The protocols in the list are shown in descending priority. To allow the communications connection to be established more quickly over OPC, either set the protocol to the highest priority or remove all unnecessary protocols.

4.1.1.3 OPC via XML

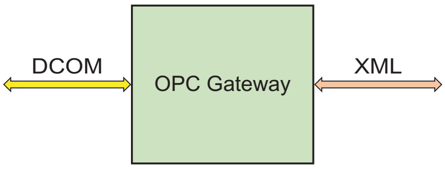
Communications concept

An OPC configuration must consist of at least one OPC XML server and one OPC client.

The OPC XML server supports the OPC XML data access specification. Data access over XML has a range of functions based on OPC data access.

The OPC XML server is a Web service that passes data to an OPC client for further processing and receives data from an OPC client. The OPC XML server is not visible in WinCC flexible. The OPC XML server is started automatically by the Web server when an OPC client requests data.

At the moment, OPC clients are the most commonly used clients for access to OPC DA servers. The OPC client accesses the data on the OPC XML server using an OPC gateway. The OPC gateway handles communication between DCOM and XML. With WinCC flexible, configure the OPC gateway (SIMATIC OPX XML Wrapper), with the OPC XML Manager, by entering the address of the OPC server.



OPC gateway

For the data exchange a connection is set up in the WinCC flexible project of the OPC client. The OPC server is accessed over this connection.

Note the following for OPC XML connections:

- Do not configure the cycle time of the tags for under 1 second. OPC XML connections are designed for the exchange of smaller data quantities. Therefore, only a few tags, c. 30 per screen, should be requested.
- In the case of "String" tags only valid ASCII values of 0x20hex to 0x7Fhex are supported.

  The data is exchanged in the form of OPC items. The OPC items are addressed via their symbolic names. You set the symbolic name of the OPC XML server in the WinCC flexible project. For the OPC-XML servers on Multi Panels the following applies: The tag names may not include any special characters or umlauts.
  This also applies to /,. < >
- In order for the OPC client to access the data, runtime must be enabled on the OPC server.

Access mechanism

Data exchange over XML uses the SOAP (Simple Object Access Protocol). SOAP is a platform-independent XML-based protocol. Using SOAP, applications on the Internet or in heterogeneous computer networks can communicate with each other using HTTP (HyperText Transfer Protocol).

Transport protocols

HTTP is used to transfer the data

Proxy settings for OPC XML Wrapper

OPC XML Wrapper is configured in WinCC flexible by default so that the proxy server configured in the Internet settings of Internet Explorer will be ignored. For this purpose it is entered in the SOPCSRVR.ini section in the [Configuration] NOPROXY=1. When this entry is reset to 0, a configured proxy server will be used again in OPC XML Wrapper for the HTTP connections.

When NOPROXY=0, and an attempt is made to access a panel which is not available at the configured proxy server, a Timeout is generated and the OPC XML Wrapper will use a direct connection. This however takes place for each request and also causes the OPC communication to slow down considerably

Displays of the "DateTime" data type via the OPC XML Wrapper

SIMATIC OPC XML Wrapper always expects values of the "DateTime" data type in UTC (Universal Time Coordinated) format. If a "DateTime" tag is read by the OPC client, the returned value represents a time in UTC. For write operations to the tag, the value is handled as UTC. The time is visualized in "local Time" format (including the time zone and daylight savings time) on the HMI panel.

Example:

Time zone GMT+1 and daylight savings time are set on the HMI panel.

OPC DA client (UTC time): 01.01.2005 16:00 h

Output on the HMI panel (OPC server): 01.01.2005 18:00 h

4.1.2 Using the HMI device

Possible configuration

To communicate using the OPC communication driver, WinCC flexible has a suitable COM interface over which data can be exchanged between automation systems.

An HMI device can be used either as an OPC server or OPC client. As an OPC client, the HMI device can connect to a maximum of 8 OPC servers.

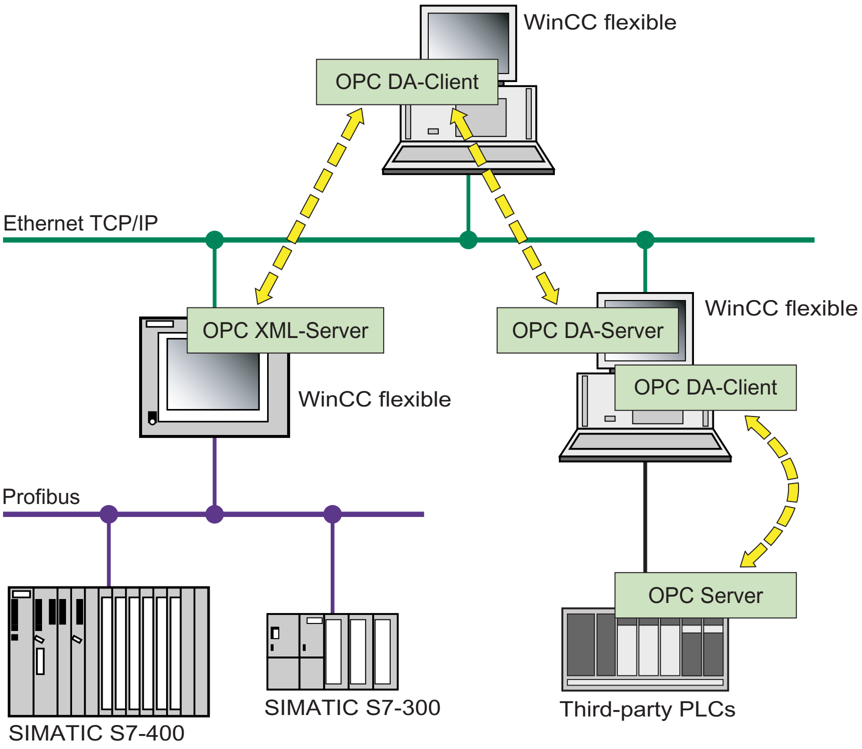
The software guarantees up to eight client HTTP connections for OPC XML servers on a Multi Panel. Some XML-DA clients create several HTTP connections to the OPC-XML server for the exchange of data via an XML connection.

HMI device	Data exchange over	Operating system	OPC server	OPC client
PC, Panel PC	DCOM	Windows XP	OPC DA server	OPC DA client
MP 270B, MP 277, MP 370, MP 377 Mobile Panel 277	XML	Windows CE	OPC-XML Server	-

HMI device as OPC client

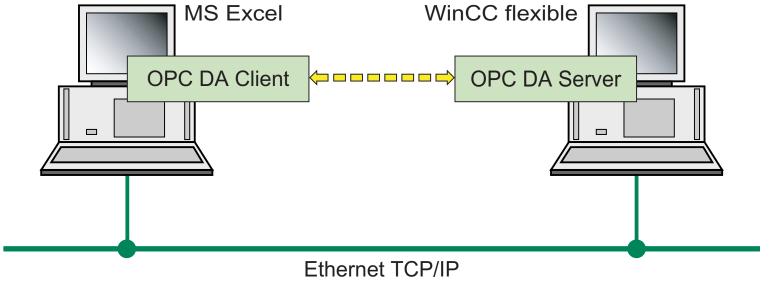
When using an HMI device as an OPC client, the "OPC" communication driver must be included in the WinCC flexible project.

For the data exchange a connection is set up in the WinCC flexible project of the OPC client. The OPC server is accessed over this connection. An HMI device can access several OPC servers. A separate connection is created for each OPC server you want to access. The HMI device can be used as a central operator control station and monitoring station.



HMI device as OPC server

The OPC server makes the data available to other applications. The applications can run on the same computer or on computers in the connected network environment. This means that process values can, for example, be displayed in Microsoft Excel.



4.2 Configuring OPC

4.2.1 Installing OPC

Installing OPC components

The following OPC components are supplied with the WinCC flexible engineering system and installed:

- OPC DA server
- Communication driver OPC (OPC client)
- OPC-XML Server
- OPC server browser
- OPC item browser

For a standard PC or Panel PC, the following must also be installed:

- OPC server
- WinCC flexible Runtime
- OPC XML Manager: Will be installed with the OPC XML Wrappers set up.

Note

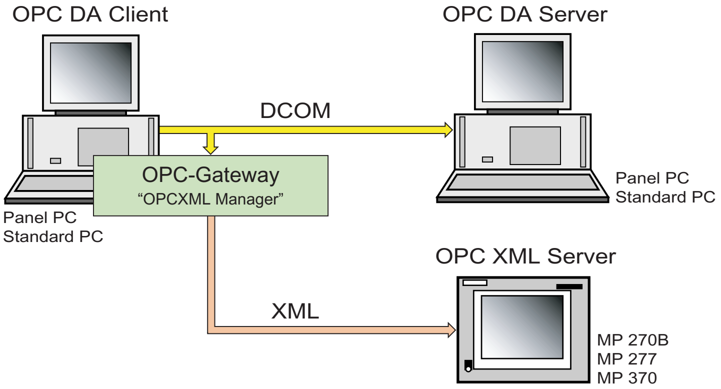
After installing the SIMATIC OPC XML Wrapper, the entry "SimaticShell" is added to Windows Explorer. The "OPC XML Manager" application requires various "SimaticShell" components. Do not edit the settings of the "Settings" dialog box of "SimaticShell".

4.2.2 Configuring OPC server mode for the HMI

4.2.2.1 Configuring OPC server mode for the HMI

Introduction

The OPC server used depends on the HMI device. In the case of HMI devices with Windows XP, the OPC-DA server will be used. In the case of HMI devices with Windows CE, the OPC-XML server will be used.



Procedure

1. Double-click on "Device settings\Device settings" in the project window.
2. Activate "Act as OPC server" in the working area.
3. Save the project.
4. To transfer the project to the HMI device, select the "Transfer" ▸ "Transfer settings" command in the "Project" menu.
5. Click on the "Transfer" button.
6. Start runtime on the HMI device.

4.2.3 Configure the HMI device as OPC client

4.2.3.1 Configure the HMI device as OPC client

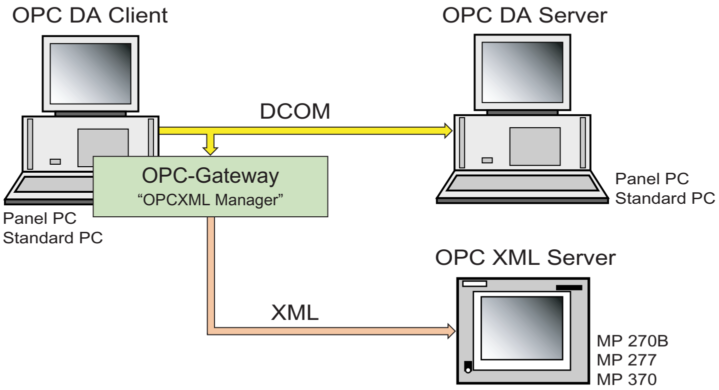
Introduction

HMI devices with the Windows XP operating system are used as the OPC client of WinCC flexible. Data exchange between the OPC DA server and OPC client uses WinCC flexible tags. In order to simplify the configuration of tags, OPC-Item-Browser is added by using the WinCC flexible setup program.

To this purpose you create connections in the project of the OPC client. The OPC server is accessed over this connection.

To enable access of the OPC client to one or several OPC-XML servers, configure OPC XML Manager".

These settings allow communication between DCOM and XML.



Requirement

The HMI device with the OPC server can be reached over its IP address.

WinCC flexible runtime is activated on the HMI device with the OPC server.

The launch and access permissions of DCOM of the OPC DA server must be set appropriately.

At least one tag is configured in the project of the OPC server. For the OPC-XML server on Multi Panels the following applies: The tag names may not contain any special characters or umlauts. This also applies to /,. < >

Procedure

1. Double-click in the project window on "Communication ▸ Connections." Create a new connection.

Note

Note the following for OPC XML connections:

- Do not configure the cycle time of the tags for under 1 second. OPC XML connections are designed for the exchange of smaller data quantities. Therefore, only a few tags, c. 30 per screen, should be requested.
- In the case of "String" tags only valid ASCII values of 0x20hex to 0x7Fhex are supported.

2. Select the OPC communication driver in the "Communication driver" column of the working area.
3. Using the OPC server browser, select the name of the computer you want to use as the OPC server.
4. Select the name of the OPC server from the displayed list, for example, "OPC.SimaticHMI.HmiRTm" for the OPC DA server of WinCC flexible and "OPC.Siemens.XML" for the OPC XML server.
5. Double-click in the project window on "Communication ▸ Tags". Create a new tag. As "Connection", select the connection you just created.
6. Click on "Addressing" in the "Properties group" in the properties view.
7. Select "Symbol" and select the "Item" in the tag management of the OPC server in the OPC item browser.
8. Save the project.
9. To transfer the project to the HMI device, select the "Transfer" ▸ "Transfer settings" command in the "Project" menu.
10. Click on the "Transfer" button.
11. Start runtime on the HMI device.

4.2.3.2 Managing access to OPC XML Server

Introduction

An OPC client may access one or several OPC XML servers. A separate connection has to be created for each OPC server you want to access.

In order for the OPC client to access several OPC XML servers, you must also configure the "OPC XML Manager". These settings allow communication between DCOM and XML. You can add, edit or delete the configuration of OPC XML servers in the "OPC XML Manager".

Use the supplied installation of the "OPC XML Manager". *The OPC XML Manager of WinCC flexible 2008 is downwards compatible and can communicate with the OPC XML Server of earlier WinCC flexible versions.

Installing the "OPC XML Manager"

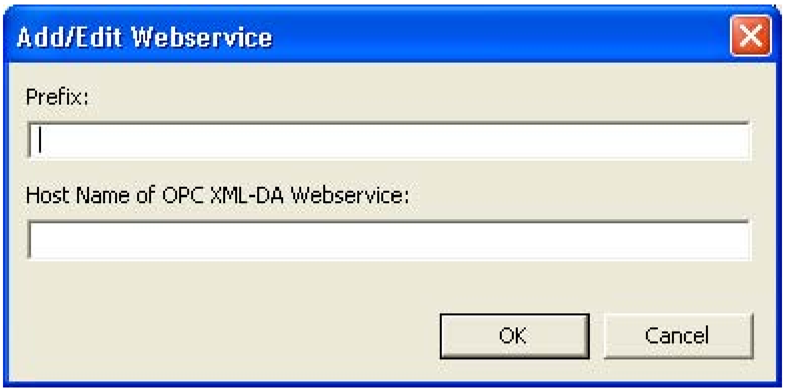
1. "OPC XML Manager" Setup is available in the "WinCCflexible\setup\OPCXMLWrapper\Disk1" folder on WinCC flexible CD2. Double-click "setup.exe".
2. Select the user interface language of the Setup program under "Language".
3. Select "Installation" to run the installation.
4. Follow the setup instructions on the screen.

Opening the "OPC XML Manager"

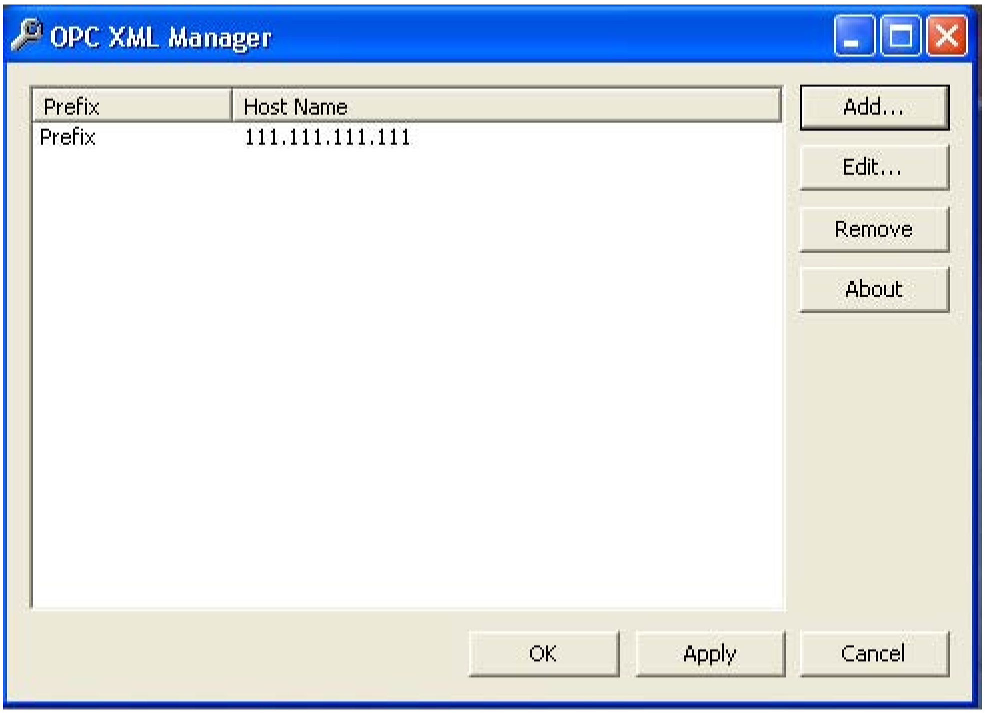
1. Select the "SIMATIC > WinCC flexible 2008 Runtime > "XmlMuxConfig" command in the Start menu.

Adding the configuration of OPC XML servers

1. In the "OPC XML Manager", click on the "Add…" button. The "Add/Edit Webservice" dialog opens.



2. In the "Add/Edit Webservice" dialog, enter a prefix at "Prefix". You can view the prefix in OPC-Item-Browser.
3. Enter the computer name, for example station 2, or the IP address of the HMI device that will be used as the OPC XML server. Click "OK" to close the dialog box.



Prefix	Host Name
Prefix	111.111.111.111

4. Click on the "Apply" button.
5. Click "OK" to close the "OPC XML Manager" dialog box.

Editing the configuration of an OPC XML server

1. Select the entry you want to edit in the "OPC XML Manager".
2. In the "OPC XML Manager", click on the "Edit…" button.
3. Change the computer name, for example "Station-2", or the ID address of the operator device in the "Add/Edit Webservice" dialog box. Edit the prefix as required.
4. Click "OK" to close the dialog box.
5. Click "OK" to close the "OPC XML Manager" dialog box.

Deleting the configuration of an OPC XML server

1. Select the entry you want to edit in the "OPC XML Manager".
2. In the "OPC XML Manager", click on the "Remove" button.
3. Click "OK" to close the "OPC XML Manager" dialog box.

4.2.3.3 Configuring protocol parameters

Parameters to be set

To set the parameters, double-click on "Communication\Connections" in the project window. "OPC" is selected in the "Communication drivers" column in the working area. You can now enter or modify the protocol parameters in the property view:

Communication partners

With "OPC server", you address the OPC server with which the OPC client exchanges data.

- "Name of the OPC server"

  Define the name of the OPC server (ProgID). To make configuration easier, use the "OPC server" browser.

OPC server	OPC server name
OPC DA server	OPC.SimaticHMI.HmiRTm
OPC-XML Server	OPC.Siemens.XML

- "Name of the remote computer"

  Define the name of the computer on which the OPC server runs.

4.2.3.4 Configuring tag parameters

Parameters to be set

To set the parameters, double-click on "Communication ▸ Tags" in the Project view. To communicate over OPC, set the "Name" and "Type of acquisition" for the tags of the OPC client in the Properties view of the "General" group and the following parameters.

Connection parameters

- "Connection"

  Define the "Communication connection".

  Note

  Note the following for OPC XML connections:

  - Do not configure the cycle time of the tags for under 1 second. OPC XML connections are designed for the exchange of smaller data quantities. Therefore, only a few tags, c. 30 per screen, should be requested.
  - In the case of "String" tags only valid ASCII values of 0x20hex to 0x7Fhex are supported.

- "Data type"

  Define the data type of the tag to be read from the OPC server or written to the OPC server.
  The data type defined on the OPC client must be identical to the data type used on the OPC server.

  Note

  The "SHORT" data type is used by default in the OPC communication connection. The OPC item browser automatically sets the data type, name and address parameters of the tag. If access is made to a tag without using the OPC item browser, the data type must be adapted manually. The data type on the OPC client must be the same as the data type on the OPC server.

  Note

  SIMATIC OPC-XML wrapper always expects values of the "DateTime" data type in UTC (Universal Time Coordinated) format. If a "DateTime" tag is read by the OPC client, the returned value represents a time in UTC. For write operations to the tag, the value is handled as UTC. The time is visualized in "local Time" format (including the time zone and daylight savings time) on the HMI panel.

  Example:

  Time zone GMT+1 and daylight savings time are set on the HMI panel.

  OPC DA client (UTC time): 01.01.2005 16:00 h

  Output on the HMI panel (OPC XML server): 01.01.2005 18:00 h

Tags of data type "String"

If an I/O field is used to access an OPC tag of data type "String" and the configured field length exceeds the tags "Length," all entries in the I/O field are truncated to the "Length" of the OPC string tag.

e.g.

- the I/O field has a length of 20 characters

- the OPC string tag has a string length of 10 characters.

This configuration allows to you enter 20 characters in this I/O field. The string entered is truncated to a length of 10 characters and is written to the OPC tag with this length after you have accepted the entries made.

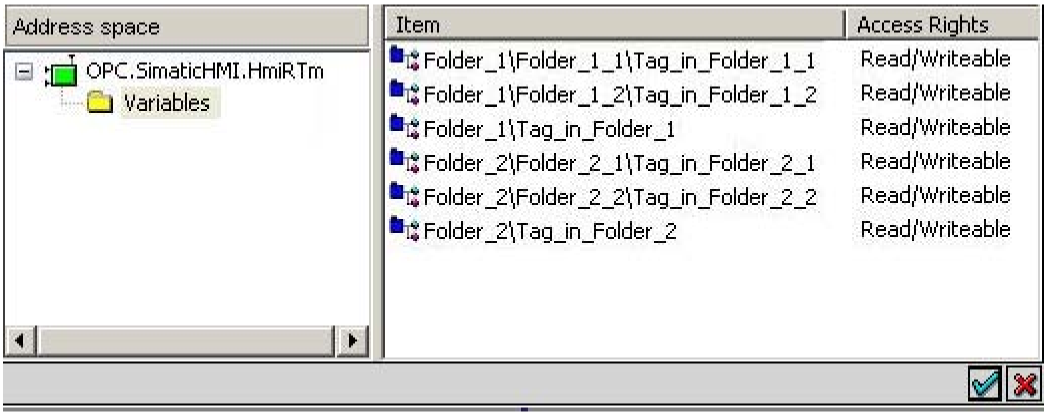
Address parameters

Click on "Addressing" in the Properties view to define the address parameters.

- "Icon"

  Select "symbol". The OPC item browser opens. In the OPC item browser, select the "item" in the tag group of the OPC server.

  If numerous tags are created in the project, they can be collated in folders. The "item" then has the following syntax in the OPC item browser: "Foldername(1-n)\Tagname".



Item	Access Rights
Folder_1\Folder_1_1\Tag_in_Folder_1_1	Read/Writeable
Folder_1\Folder_1_2\Tag_in_Folder_1_2	Read/Writeable
Folder_1\Tag_in_Folder_1	Read/Writeable
Folder_2\Folder_2_1\Tag_in_Folder_2_1	Read/Writeable
Folder_2\Folder_2_2\Tag_in_Folder_2_2	Read/Writeable
Folder_2\Tag_in_Folder_2	Read/Writeable

- "Item name"

  Enter the name of the tag of the OPC server in the "Item Name" field. Please take the tag name from the documentation of the OPC server.

  On OPC XML Server, the item name is <prefix>:WinCC Flexible RT<@>Tag_1. The <prefix> defines the OPC XML Server to which the tag is assigned. In OPC XML Manager, define the <prefix>.

  In WinCC flexible, the tag name is the symbolic name of the tag.
  In SIMATIC NET, the tag name might be as follows:
  "S7:[CPU416-2DP|S7-OPC-Server|CP_L2_1:]DB100,REAL0,1"
  or
  "S7:[CPU416-2DP|S7-OPC-Server|CP_L2_1:]MB0"

- "Access path"

  Enter the path for access to the OPC server. When connected to the OPC server of WinCC flexible, no access path needs to be specified.

  In the case of communication to an external OPC server, an access path may be necessary. Further information is provided by the respective OPC server manufacturer.

4.2.4 Permitted data types (OPC)

Permitted data types

When OPC servers are connected to WinCC flexible, only certain data types are supported.

OPC data type	WinCC flexible data type
VT_BOOL	BOOL
VT_I1	CHAR
VT_UI1	BYTE
VT_I2	SHORT
VT_UI2	WORD
VT_UI4	DWORD
VT_I4	LONG
VT_R4	FLOAT
VT_R8	DOUBLE
VT_DATE	DATE
VT_BSTR	STRING

The data types have the following value ranges:

OPC data type	Range of values
VT_BOOL	0 or 1
VT_I1	-128 to 127
VT_UI1	0 to 255
VT_I2	-32768 to 32767
VT_UI2	0 to 65535
VT_UI4	-2147483648 to 2147483647
VT_I4	0 to 4294967295
VT_R4	3.402823466 e-38 through 3.402823466 e+38
VT_R8	1.7976931486231e-308 to 1.7976931486231e+308
VT_Date	1 January 100 to 31 December 9999

Special features in communication with the OPC-DA server

The array tag in the OPC-DA server belonging to the area pointer must be of the data type SHORT (VT_I2).

Special features in communication with the OPC-XML server

Array tags are not supported by OPC-XML servers.

4.3 Commissioning OPC

4.3.1 DCOM

4.3.1.1 DCOM settings

DCOM settings

Data is exchanged between an OPC DA server and OPC client over the DCOM interface. Before communication is possible, the launch and access permissions of DCOM must be set correctly.

The DCOM settings depend, for example, on the network configuration and security aspects.

NOTICE
The description below deals with the full enabling of the OPC DA server without considering safety aspects. With these settings, it is possible to communicate over OPC. There is, however, no guarantee that the functionality of other modules will not be impaired. We recommend that you ask your network administrator to make these settings. To configure DCOM, you require fundamental knowledge of the network technology of Windows XP. For more detailed information on DCOM, refer to the documentation on Windows XP.

You configure DCOM using the program "dcomcnfg.exe".

DCOM and firewall settings in Windows XP

The DCOM and firewall settings required for Windows XP can be taken from a White Paper of the OPC Foundation:
"http://www.opcfoundation.org/DownloadFile.aspx?CM=3&RI=326&CN=KEY&CI=282&CU=8".

4.3.1.2 Starting the "dcomcnfg" program

Introduction

You modify DCOM settings using the "dcomcnfg" program.

Starting dcomcnfg in Windows XP

Windows XP basically provides the same configuration options for DCOM as the other versions of Windows. The difference is that the dialog layouts have changed.

1. Go to the Start menu of the operating system and select the command "Settings ▸ Control Panel".
2. Double-click on "Administrative tools ▸ Component services". The "Component services" dialog opens.
3. In the structure tree, expand "Console Root\Component\Services\Computers\My Computer\DCOM Configuration".
4. Select "OPC.SimaticHMI.HmiRT" as "Applications". Open the context-sensitive menu of "OPC.SimaticHMI.HmiRT" and select "Properties". The "OPC.SimaticHMI.HmiRTm properties" dialog opens. Set the properties of the application.

4.3.1.3 Configuring DCOM on the OPC DA server

Introduction

Before the OPC client can launch the OPC DA server and establish the process communications connection successfully, the launch and access permissions of the OPC server must be set correctly.

Requirement

- You have started the "dcomncfg.exe" program.
- The "OPC.SimaticHMI.HmiRTm properties" dialog is open.

Procedure

1. Click on the "General" tab.
2. As the "Authentication level", select "None".
3. Click on the "Security" tab.
4. Click "Use custom access permissions".
5. Click the "Edit" button. The "Registry value permissions" dialog opens.
6. Add the users "Administrators", "Interactive", "Everyone", "Network", and "System" and select "Allow Access" as the "Type of Access". Click "OK" to close the dialog box.
7. Click "Use custom launch permissions".
8. Click the "Edit" button. The "Registry value permissions" dialog opens.
9. Add the users "Everyone" and "Network" and select "Allow Launch" as the "Type of Access". Click "OK" to close the dialog box.
10. Click on the "Location" tab. Click "Run application on this computer".
11. Click "OK" to close all open dialogs.

Communication with SIMOTION controllers 5

5.1 Requirements for communication with SIMOTION

Introduction

WinCC flexible enables communication with a SIMOTION PLC (Siemens Motion Control System) over PROFIBUS DP, Ethernet and MPI networks. The protocol SIMOTION is used for this.

Requirements

The following products are required for creating SIMOTION PLC projects using WinCC flexible:

- Configuration software SIMATIC STEP 7 V5.4 SP1 or later
- Configuration software SIMOTION SCOUT V4.1 SP1
- Configuration software WinCC flexible 2008

Connectable HMI devices

The following HMI devices can be connected to a SIMOTION:

	HMI device	Operating system
Panel PC	Panel PC 877 Panel PC 870 Panel PC 677 Panel PC 670 Panel PC 577 Panel PC IL 77 Panel PC IL 70	Windows XP
	Panel PC 477	Windows XP Embedded
Standard PC	WinCC flexible Runtime	Windows XP
Multi Panel	MP 270B MP 277 MP 370	Windows CE
Mobile Panel	Mobile Panel 170 Mobile Panel 177 Mobile Panel 277	Windows CE
Panel	OP 277 TP 277 OP 270 TP 270 OP 177B TP 177B OP 170B TP 170B	Windows CE
SIMOTION Panel	PC-R P015K P015T P012K P012T	Windows XP

Configuring an HMI station with SIMOTION

Requirement:

- To be able to configure an HMI station for a SIMOTION PLC, WinCC flexible has to be operated after being integrated in STEP 7.
- There must be a project with SIMOTION PLC.

Procedure:

1. Two different methods are available for performing the configuration:
   - The HMI project is generated integrated in SIMOTION. The WinCC flexible editors in SIMOTION Scout are available for this purpose.
   - The HMI project is generated separate from SIMOTION. To do this, in WinCC flexible use the project wizard to select your SIMOTION project in the selection field "Integrate S7 project". Your HMI project will be integrated in this project.
2. Open the HW configuration of the HMI station created and connect the HMI station to SIMOTION PLC network.

   You can select this as a network:
   - MPI
   - PROFIBUS DP
   - Ethernet

The symbolic addresses used in SIMOTION are then available in the HMI project.

Further information on communication

For further information on communication with SIMOTION, please refer to the chapter "Communication with SIMATIC S7".

Communication with WinAC controllers 6

6.1 PC-based automation solution

6.1.1 Valid data types and user data areas

Valid data types and user data areas

Permissible data types and user data areas for WinAC MP are specified in chapter "Communication with SIMATIC S7".

6.1.2 Requirements for communication with WinAC

Introduction

Communication with a SIMATIC WinAC (Windows Automation Center) PLC is possible with WinCC flexible. The SIMATIC S7 - 300/400 protocol is used for this.

Requirements

You need the following products for configuring communication between WinCC flexible and a WinAC PLC:

- One of the WinAC products:
  - WinAC Basic
  - WinAC RTX
  - WinAC Slot
- WinCC flexible Advanced
- Configuration software SIMATIC STEP 7 V5.3 or later
- Configuration software SIMATIC NET 11/2003 or later (optional).

When selecting these products, take into consideration their release for the various operating systems.

WinCC flexible must also be integrated in STEP 7. WinCC flexible can independently read the parameters for the PLC from STEP 7.

Note

External communication requires the configuration software SIMATIC NET 11/2003 or later to be installed. If you have not installed the configuration software SIMATIC NET version 11/2003 or later, the WinCC flexible Runtime will communicate only internally.

6.2 Multi panel-based automation solution

6.2.1 WinAC MP basics

WinAC MP basics

WinAC MP is a software package for HMI devices. WinAC MP integrates a SIMATIC S7 compatible software PLC in WinCC flexible Runtime.

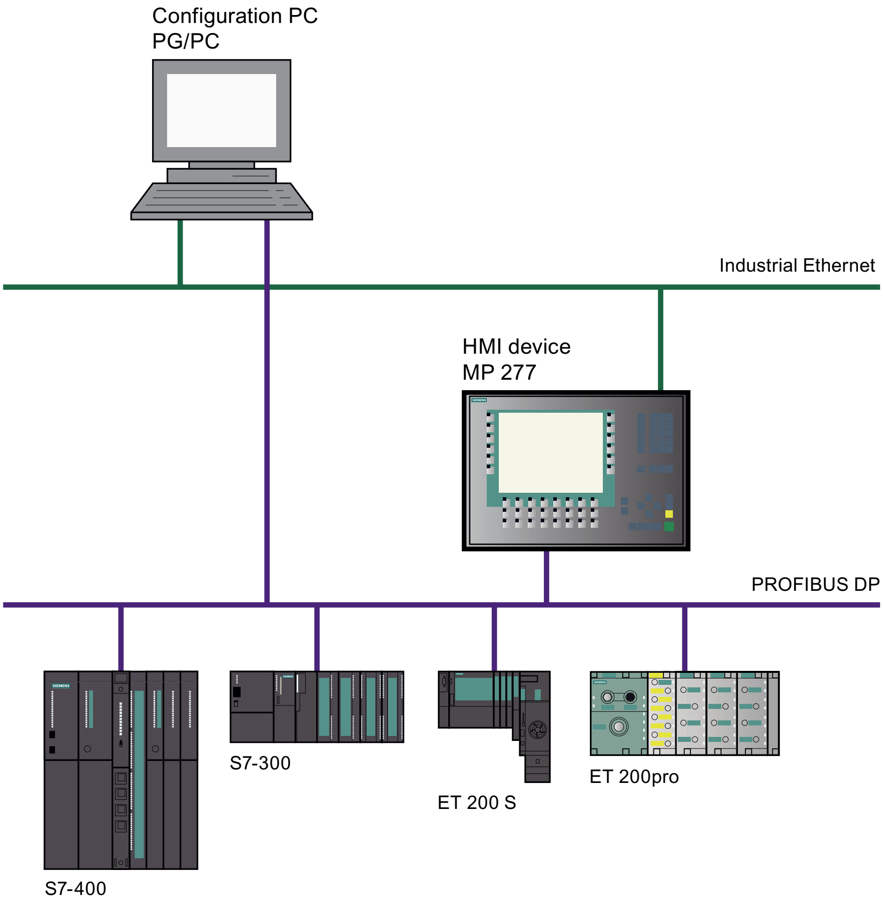
Using WinAC MP you can execute STEP 7 programs on the HMI device.

The mutual use of WinAC MP and WinCC flexible offers process controlling and process visualization from one HMI device.

The communications driver for WinAC MP supports the following protocols for controlling the process components:

- Industrial Ethernet
- PROFIBUS DP

The following screen shows the principal connection of the process components on the PROFIBUS DP example.



If you wish to control your process using an HMI device and WinAC MP, then you must install WinAC MP on your configuration PC. Then transfer WinAC MP and the project to your HMI device.

Note

Notes about instructions

The following describes how to install WinAC MP and transfer WinAC MP to an HMI device.

To transfer a STEP 7 project with a WinAC MP control to an HMI device, a knowledge of STEP 7 is a basic prerequisite. Refer to the WinAC MP operating manual for more detailed information on STEP 7 projects.

6.2.2 System requirements

System requirements

To install and use WinAC MP you require a configuration PC with the following operating system:

- Microsoft Windows XP Professional with Service Pack 2

The following HMI devices are permitted for use with WinAC MP:

- MP 177 6" Touch
- MP 277 8" Key
- MP 277 8" Touch
- MP 277 10" Key
- MP 277 10" Touch
- MP 377 12" Key
- MP 377 12" Touch
- MP 377 15" Touch
- MP 377 19" Touch

The following system resources are required:

- At least 40 MB free disk space

The following software must be installed on the configuration PC:

- STEP 7 V 5.4 SP1
- WinCC flexible 2008

You also require the following:

- A Multi Panel in accordance with the system requirements.
- If you want to use Ethernet communication, SIMATIC NET with SIMATIC NET CD V6.4.
- On the devices connected to your Multi Panel for process control via a PROFIBUS DP network.

6.2.3 Valid data types and user data areas

Valid data types and user data areas

Permissible data types and user data areas for WinAC MP are specified in chapter "Communication with SIMATIC S7".

Communication with SIMATIC S5 controllers 7

7.1 Communication with SIMATIC S5

7.1.1 Communications partner (SIMATIC S5)

Introduction

This section describes communication between an HMI device and the SIMATIC S5 PLC.

These PLCs communicate by means of their PLC-specific protocols:

- AS511
- PROFIBUS DP

Connectable controllers

A connection using AS511 and PROFIBUS DP is supported by the following PLCs:

PLC	AS511	PROFIBUS DP
AG 90U	x	–
AG 95U	x	–
PLC 95U DP master	x	x
AG 100U (CPU 100, CPU 102, CPU 103)	x	–
AG 115U (CPU 941, CPU 942, CPU 943, CPU 944, CPU 945)	x	x
AG 135U (CPU 922, CPU 928A, CPU 928B)	x	x
AG 155U (CPU 946/947, CPU 948)	x	x

7.1.2 Communication between the HMI and the PLC

Communications principle

The HMI device and the PLC communicate using tags and the user data areas.

Tags

The PLC and the HMI device exchange data using process values. In your configuration, create tags that point to an address on the PLC. The HMI device reads and displays the value from the defined address. The operator can also make an entry on the HMI device that is then written to the address on the PLC.

User data areas

User data areas are intended for the exchange of special data and are set up only when such data is used.

Data for which user data areas are required, for example:

- Job mailboxes
- Transfer of data records
- Date/time synchronization
- Sign-of-life monitoring

The user data areas are created while configuring in WinCC flexible. You assign the corresponding addresses in the PLC.

7.2 Configuring the communication driver for SIMATIC S5

7.2.1 Communication over AS511

7.2.1.1 Requirements of communication

Connector

Connecting the HMI device to a SIMATIC S5 PLC effectively involves setting the interface parameters. No special blocks are required on the PLC for the connection.

The HMI device is connected directly to the CPU.

Ideally, the SI1 CPU interface should be used with TTY (current loop) electrical characteristics. If available, you can also use the SI2 CPU interface with TTY electrical characteristics. However, with the SI2 interface, note the specific performance restrictions.

7.2.1.2 Installing the communication driver

Driver for the HMI device

The communication driver for SIMATIC S5 controllers for which WinCC flexible supports a connection utilizing the AS511 protocol is supplied with WinCC flexible and installed automatically.

No special blocks are required on the PLC for communication.

7.2.1.3 Configuring the controller type and protocol

Select the PLC

For a connection to a SIMATIC S5 PLC over the AS511 protocol, double-click on "Communication ▸ Connections" in the project view of the HMI device. Select the SIMATIC S5 AS511 protocol from the "Communication drivers" column in the working area.

The property view displays the parameters of the selected protocol.

The settings for the HMI device are made by WinCC flexible and must be transferred to the HMI device.

Note

Please remember that remote transfer over the serial port must be disabled.

You do this on the HMI device in the "Loader ▸ Control panel ▸ Transfer" menu by selecting the "Transfer settings" command. Deactivate "Remote Control".

You can edit the parameters at any time by double-clicking "Communication ▸ Connections" in the project window of the HMI device. Select the connection and edit its parameters in the properties dialog box.

7.2.1.4 Configuring protocol parameters

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC S5 AS511" is selected in the "Communication drivers" column in the project view. Change the protocol parameters of the connection in the Properties window.

Device-dependent parameters

- Interface

  Select the HMI interface to which the SIMATIC S5 PLC is connected at the "Interface" entry.

  For more detailed information, refer to the HMI device manual.

- Type

  Under "Type", the physical TTY interface (current loop) is set as default and cannot be changed.

- Baud rate

  Under "Baud rate", the transmission rate of 9600 baud is set as default and cannot be changed.

Note

The highest station address must be less than or equal to 63 if you set a transmission rate of 1.5 Mbaud at OP 73 or OP 77A.

If connecting a TP 170A to a SIMATIC S7 station at a transmision rate of 1.5 MBaud on PROFIBUS DP, set a value less than or equal to 63 for the highest station address (HSA).

- Data bits

  Under "Data bits", "8 bits" is the default and cannot be changed.

- Parity

  Under "Parity", "Even" is the default and cannot be changed.

- Stop bits

  Under "Stop bits", "1" is the default value.

  If this value is changed in the S5 PLC, it has to be adapted here in the WinCC flexible project.

PLC-dependent parameters

- CPU type

  Define the CPU type of your PLC under "CPU type".

- Reading the DB address list cyclically

  If you select "Read DB address list cyclically", each time the HMI device writes or reads, the address list is read again in the PLC.

  This is important when blocks are set up, modified, or deleted on the PLC.

Note

The HMI device can only access a DB if the address list was read previously. Activate "Read DB address list cyclically" only when commissioning, as this setting has a considerable effect on the performance of the HMI device.

7.2.1.5 Permitted data types (SIMATIC S5 AS511)

Permitted data types

The data types have the following value ranges:

Data type	Range of values
KF	- 32768 to 32767
KH	0000 through FFFF
KM	0000000000000000 through 1111111111111111
KY	0.0 to 255.255
KG	3.402823466 e-38 through 3.402823466 e+38
DF	- 2147483648 to 2147483647
DH	00000000 through FFFFFFFF
KS	1 to 80 characters
KC	0 to 999
KT	10 ms to 9990 s
Bit	0 or 1

Note

The representation of the tags on the HMI device is selected in the property view of the particular screen object, "General" group, in the "Format pattern" field.

7.2.2 Communication over PROFIBUS DP

7.2.2.1 Requirements of communication

Hardware requirements

To include the HMI devices in an existing PROFIBUS DP network, you require the following hardware components:

- An HMI device released for communication with a SIMATIC S5 PLC

  When using a standard PC, this must have a CP 5611 or CP 5511 communications processor installed.
- The PLC must have a communications module (CP 5431 or IM308C).
- Every device (HMI device or PLC) requires a PROFIBUS DP bus connector or other approved component (except for an FSK bus terminal, refer to the configurator in the SIMATIC HMI catalog ST80.1).

Software Requirements

For the PROFIBUS DP connection, you require the following software components:
COM PROFIBUS 3.x or higher

- WinCC flexible Engineering System version 1.0 or higher

System limits

When networking over PROFIBUS DP, a maximum of 122 HMI devices can be attached as slaves.

This value is a theoretical limit value. The actual limit is decided by the memory capacity and performance of the PLC.

Note

For more detailed information on the individual components, refer to the communication manual for Windows-based systems.

7.2.2.2 Communication driver for HMI device

Installing the communication driver

Driver for the HMI device

For communication on PROFIBUS DP, you require the function blocks "FB158" and "FB159".

"FB159" must only be loaded on the PLC and must not be called in the user program.

The required parameter settings are transferred with the "FB158" call.

These function blocks are examples and support linear P addressing. You can expand these function blocks at any time to adapt to your requirements.

The function blocks you require depend on the PLC.

PLC	Folder SimaticS5\...
PLC 95U DP master	..\PLC95UDP
PLC 115U	..\PLC115UDP\CPU941_4 for CPU 941 through 944 ..\PLC115UDP\CPU945 for CPU 945
PLC 135U	..\PLC135U
PLC 155U	..\PLC135U

Configuring function block FB 158

Addressing the function block

The function blocks provided with WinCC flexible are examples and support linear P addressing. You can expand these function blocks at any time to adapt to your requirements.

The following table explains the changes required for the respective types of addressing when the two supplied function blocks, FB 158 and FB 159, are used.

Type of addressing	Changes
linear P range	Not necessary
linear Q range	The P addresses and Q addresses must be changed in FB 158 and FB 159.
P frame	The page frame number must be entered into the I/O byte 255 before FB 158 is called. Example: L KB x T PY 255
Q frame	The page frame number must be entered into the I/O byte 255 before FB 158 is called. The P addresses and Q addresses must be changed in FB 158 and FB 159. Example: L KB x T QB 255

The following table shows the allowed address range in relation to the type of addressing for all PLCs except S5 95U.

Type of addressing	Allowed address range
Linear P range	128 to 255
Linear Q range [1]	0 to 255
P frame	192 to 254
Q frame [1]	0 to 254
[1] Only possible for S5 115U with CPU 945, S5 135U and S5 155U.	

For S5 95U, only the area between 64 and 127 is allowed. The FB 158 creates an error message for addresses larger than 127.

Calling FB 158

FB 158 must be called in the cyclic program, e.g. OB 1, with the following parameters:

- PERA:

  I/O start address It must match with the setting in COM PROFIBUS.
- BLEN:

  Block length (not for PLC 95U since only tiny is possible.)

  0: tiny

  1: small

  2: middle

  3: big

  The block length must match with the setting in WinCC flexible ("Communication > Connections > Communication Driver > SIMATIC S5 DP").
- CADB:

  An available DB that is used by FB 158 as working memory. FB 158 uses the first 11 words of the DB to buffer data. The user can use this DB after the 11th data word.

After FB 158 has been called, AKKU 1 contains the number of any error that has occurred. This error needs to be evaluated in the STEP 5 program since the error number is reset the next time the FB is called.

Example of a call for FB 158:	
	:JU FB 158
NAME	:DPHMI
PERA:	:KF 128
BLEN:	:KF 0
CADB:	:DB 58

Note

FB158 is responsible for recording the process, FB159 reads the data in and out of the memory. FB 159 should only be available in the PLC and may not be called by the user.

Multiple calling of FB158

When using several units, the FB must be called once for each unit.

Note

The performance is increased considerably when the FB158 is called from an Alarm OB and the PLC polling time is greater than the alarm time.

7.2.2.3 Configuring the controller type and protocol

Select the PLC

For a connection to a SIMATIC S5 PLC via the PROFIBUS DP protocol, double-click on "Communication ▸ Connections" in the project view of the HMI device. Select the "Communication drivers" column and select the protocol.

- SIMATIC S5 DP

The property view displays the parameters of the selected protocol.

You can edit the parameters at any time by double-clicking "Communication ▸ Connections" in the project view of the HMI device. Select the connection and edit its parameters in the properties dialog box.

Note

The settings on the HMI device and on the PLC must match.

7.2.2.4 Configuring protocol parameters

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC S5 DP" is selected in the "Communication drivers" column in the project window. Change the protocol parameters of the connection in the Properties window.

Device-dependent parameters

- Interface

  Select the HMI interface to which the SIMATIC S5 PLC is connected at the "Interface" entry.

  For more detailed information, refer to the HMI device manual.

- Type

  Under "Type" the physical interface "Simatic" is set as default and cannot be changed.

- Baud rate

  Under "Baud rate" select the transmission speed.

  Note

  The highest station address must be less than or equal to 63 if you set a transmission rate of 1.5 Mbaud at OP 73 or OP 77A.

PLC-dependent parameters

- HMI address

  Under "HMI address" set the PROFIBUS DP address of the HMI device.
  Value range: 3 to 125

- Block length

  Under "Block length" you specify the assignment of the I/O area used for communication between the HMI device and PLC. The size of the I/O area influences performance.

  The desired configuration is implemented according to class B (basic DP slave complying with EN 50170). You can select four different desired configurations:

  – Class B tiny

  – Class B small

  – Class B middle

  – Class B big

  The Class B configuration is set by the system.

  The assignment of the I/O areas is fixed with the four various settings. The following table shows the assignment of the I/O areas:

Class	Inputs (bytes)	Outputs (bytes)
Class B tiny	32	22
Class B small	42	22
Class B middle	64	32
Class B big	128	64

The settings in WinCC flexible must match the configuration data of the interface module CP 5431 or IM308C.

Note

To transfer large amounts of data, it is advisable to set a large I/O area. This means that the displays on the HMI device are updated more quickly since the data is fetched in one cycle.

7.2.2.5 Permitted data types (SIMATIC S5 PROFIBUS DP)

Permitted data types

The data types have the following value ranges:

Data type	Range of values
KF	- 32768 to 32767
KH	0000 through FFFF
KM	0000000000000000 through 1111111111111111
KY	0.0 through 255.255
KG	3.402823466 e-38 through 3.402823466 e+38
DF	- 2147483648 to 2147483647
DH	00000000 through FFFFFFFF
KS	1 to 80 characters
KC	0 to 999
KT	10 ms to 9990 s
Bit	0 or 1

Note

The representation of the tags on the HMI device is selected in the property view of the particular screen object, "General" group, in the "Format pattern" field.

7.2.3 Notes on avoiding errors

Changes during operation

To avoid errors, please note the following:

- Modifying data blocks during operation is not permitted.
- Compressing the internal program memory of the PLC ("Compress" PG function, integrated FB COMPR) is not permitted if an operator device is connected.

Note

When memory is compressed, the absolute addresses of the blocks in the program memory change. Since the HMI device only reads the address list during startup, it does not recognize the address change and accesses the wrong memory areas.

If you cannot avoid compressing memory during operation, turn off the HMI device before running the compress function.

NOTICE

In hazardous areas, turn off the power to the HMI device when disconnecting the connectors.

HMI device is connected to SI2 of the CPU

If communication using AS511 is active over both interfaces of the CPU, the second interface is serviced with low priority.

A possible configuration could be, for example: PG on SI1 and HMI device on SI2. In this case, error messages may occur on the HMI device indicating communication problems. This problem can be particularly extreme with the CPU 928B.

7.2.4 Optimizing the configuration

Acquisition cycle and update time

The acquisition cycles for the "Area pointers" and the acquisition cycles of the tags specified in the configuration software are decisive factors for the actual update times that can be achieved.

The update time is the sum of the acquisition cycle + transmission time + processing time.

To achieve optimum update times, remember the following points during configuration:

- Keep the individual data areas as small as possible and as large as necessary.
- Define data areas that belong together as belonging together. You can improve the update time by setting up one large data area instead of several small areas.
- If the acquisition cycles you select are too short, this is detrimental to the overall performance. Set the acquisition cycle to suit the rate of change of the process values. The rate of temperature changes at a furnace, for example, is significantly slower compared to the speed rate of an electrical drive. As a general guideline, the acquisition cycle should be approx. 1 second.
- Put the tags of an alarm or a screen in one data area without gaps.
- To allow changes in the PLC to be recognized reliably, these must be available at least during the actual acquisition cycle.
- Set the transmission rate to the highest possible value.

Screens

With screens, the update rate that can actually be achieved depends on the type and amount of data to be displayed.

Configure short acquisition cycles only for objects which actually require shorter refresh cycles.

Trends

When using bit-triggered trends, if the group bit is set in the "Trend transfer area", the HMI device always updates all the trends whose bit is set in this area. It then resets the bits.

The group bit in the S5 program can only be set again after all bits have been reset by the HMI device.

Job mailboxes

If large numbers of job mailboxes are sent in quick succession, this can lead to overload in the communication between the HMI device and PLC.

The HMI device confirms acceptance of the job mailbox by entering the value zero in the first data word of the job mailbox. The HMI device now processes the job for which it requires time. If a new job mailbox is entered again immediately in the job mailbox, it may take some time before the HMI device can process the next job mailbox. The next job mailbox will only be accepted when there is computing capacity available.

Reading the DB address list cyclically (AS511 only)

Reading the DB address list each time the PLC is accessed is necessary only when, for example, the user data areas have not yet been set up during the commissioning phase. For performance reasons, disable the setting "Read DB address list cyclically" in later operation.

7.3 User data areas

7.3.1 Area pointer

7.3.1.1 General information on area pointers (SIMATIC S5)

Introduction

Area pointers are parameter fields. WinCC flexible Runtime reads these parameter fields in order to obtain information about the location and size of data areas in the PLC. The PLC and the HMI device interactively communicate read and write data for these data areas . The PLC and the HMI device trigger defined interactions based on the evaluation of stored data.

The area pointers reside in PLC memory. Their addresses are configured in the "Area pointers" dialog of the "Connections" editor.

Area pointers used in WinCC flexible:

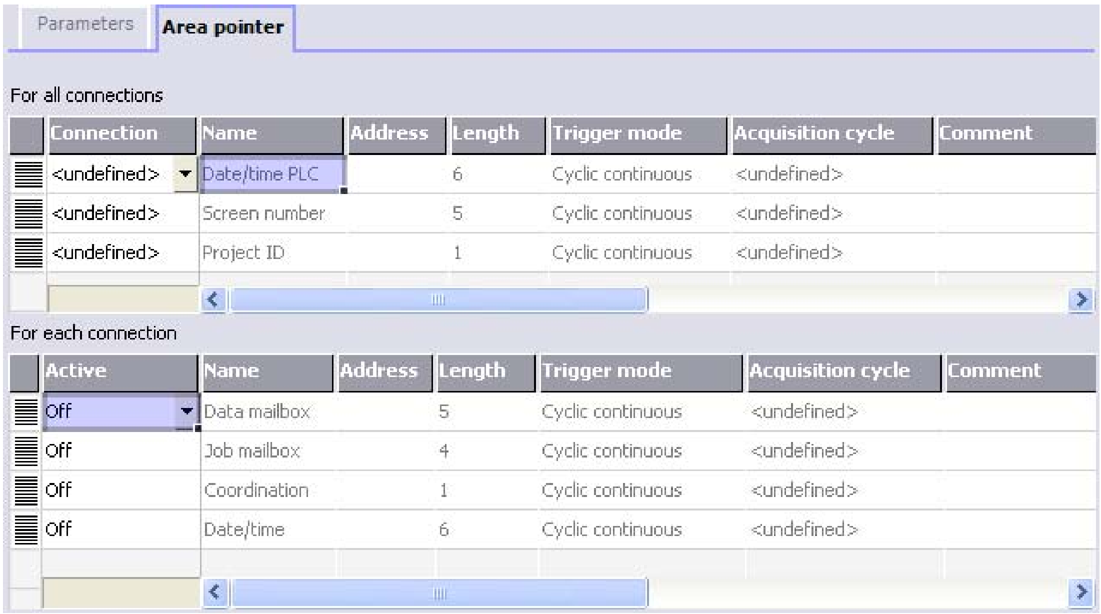
- PLC job
- Project ID
- Screen number
- Data record
- Date/time
- Date/time PLC
- Coordination

Device-dependency

Availability of the area pointer depends on the HMI device used.

Application

Configure and enable the area pointer in "Communication ▸ Connections" before you put it into use.



For all connections

Connection	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
<undefined>	Date/time PLC		6	Cyclic continuous	<undefined>	
<undefined>	Screen number		5	Cyclic continuous	<undefined>	
<undefined>	Project ID		1	Cyclic continuous	<undefined>	

For each connection

Active	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
Off	Data mailbox		5	Cyclic continuous	<undefined>	
Off	Job mailbox		4	Cyclic continuous	<undefined>	
Off	Coordination		1	Cyclic continuous	<undefined>	
Off	Date/time		6	Cyclic continuous	<undefined>	

Enabling an area pointer based on the example of a SIMATIC S7 PLC

- Active

  Enables the area pointer.
- Name

  Name of the area pointer defined by WinCC flexible.
- Address

  Tag address of the area pointer in the PLC.
- Length

  WinCC flexible defines the default length of the area pointer.
- Acquisition cycle

  Define an acquisition cycle in this field to allow cyclic reading of the area pointer in Runtime. An extremely short acquisition time may have a negative impact on HMI device performance.
- Comment

  Save a comment, for example, to describe the purpose of the area pointer.

Accessing data areas

The table shows how the PLC and HMI device handle read (R) and write (W) access to the data areas.

Data area	Required for	HMI device	PLC
Screen number	Evaluation by the PLC in order to determine the active screen.	W	R
Data record	Transfer of data records with synchronization	R/W	R/W
Date/time	Transfer of the date and time from the HMI device to the PLC	W	R
Date/time PLC	Transfer of the date and time from the PLC to the HMI device	R	W
Coordination	Requesting the HMI device status in the control program	W	R
Project ID	Runtime checks consistency between the WinCC flexible project ID and the project in the PLC.	R	W
PLC job	Triggering of HMI device functions by the control program	R/W	R/W

The next sections describe the area pointers and their associated PLC jobs.

7.3.1.2 "Screen number" area pointer

Function

The HMI device saves information about the screen called on the HMI device to the "Screen number" area pointer.

This allows the transfer of the current screen contents from the HMI device to the PLC. The PLC can trigger specific reactions such as the call of a different screen.

Application

Configure and enable the area pointer in "Communication ▸ Connections" before you put it into use. You can create only **one** instance of the "Screen number" area pointer and only on **one** PLC.

The screen number is transferred spontaneously to the PLC. That is, it is always transferred when a new screen is activated on the HMI device. It is therefore unnecessary to configure an acquisition cycle.

Structure

The area pointer is a data area in the memory of the PLC with a fixed length of 5 words.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1st word	Current screen type															
2nd word	Current screen number															
3rd word	Reserved															
4th word	Current field number															
5th word	Reserved															

- Current screen type

  "1" for the root screen or
  "4" for the permanent window
- Current screen number

  1 to 32767
- Current field number

  1 to 32767

7.3.1.3 "Date/time" area pointer

Function

This area pointer is used to transfer the date and time from the HMI device to the PLC.

The PLC writes control job "41" to the job mailbox.

When it evaluating the control job, the HMI device saves its current date and time to the data area configured in the "Date/time" area pointer. All definitions are coded in BCD format.

The "Date/Time" area pointer when used in a project which contains multiple connections must be enabled for each configured connection.

The date/time data area has the following structure:

Data word	Left byte								Right byte								
	15							8	7							0	
n+0	Reserved								Hour (0 to 23)								Time
n+1	Minute (0 to 59)								Second (0 to 59)								
n+2	Reserved								Reserved								
n+3	Reserved								Weekday (1 to 7, 1 = Sunday)								Date
n+4	Day (1 to 31)								Month (1 to 12)								
n+5	Year (80 to 99/0 to 29)								Reserved								

Note

The entry of values from 80 to 99 in the "Year" data area returns the years 1980 through 1999; values from 0 to 29 return the years 2000 through 2029.

7.3.1.4 "Date/time controller" area pointer

Function

This area pointer is used to transfer the date and time from the PLC to the HMI device. Use this area pointer if the PLC is the time master.

The PLC loads the data area of the area pointer. All definitions are coded in BCD format.

The HMI device reads the data cyclically within the configured acquisition cycle and synchronizes itself.

Note

Set an acquisition cycle of sufficient length for the date/time area pointer in order to avoid any negative impact on HMI device performance.
Recommended: Acquisition cycle of 1 minute if your process can handle it.

The date/time data area has the following structure:

DATE_AND_TIME format (in BCD code)

<table>
<tr><th rowspan="2">Data word</th><th colspan="3">Left byte</th><th colspan="3">Right byte</th></tr>
<tr><th>15</th><th>. . . . . .</th><th>8</th><th>7</th><th>. . . . . .</th><th>0</th></tr>
<tr><td>n+0</td><td colspan="3">Year (80 to 99/0 to 29)</td><td colspan="3">Month (1 to 12)</td></tr>
<tr><td>n+1</td><td colspan="3">Day (1 to 31)</td><td colspan="3">Hour (0 to 23)</td></tr>
<tr><td>n+2</td><td colspan="3">Minute (0 to 59)</td><td colspan="3">Second (0 to 59)</td></tr>
<tr><td>n+3</td><td colspan="3">Reserved</td><td colspan="2">Reserved</td><td>Weekday
(1 to 7, 1 = Sunday)</td></tr>
<tr><td>n+4 1)</td><td colspan="3">Reserved</td><td colspan="3">Reserved</td></tr>
<tr><td>n+5 1)</td><td colspan="3">Reserved</td><td colspan="3">Reserved</td></tr>
</table>

1) The two data words must be available in the data area in order to ensure compliance of the data format with WinCC flexible and to avoid the reading of incorrect information.

Note

Note that when you enter the year, values 80-99 result in years 1980 through 1999 and the values 0-29 result in the years 2000 through 2029.

7.3.1.5 "Coordination" area pointer

Function

The "Coordination" area pointer is used to implement the following functionality:

- detection in the control program of HMI device startup
- detection in the control program of the current HMI device operating mode
- detection in the control program of the HMI devices ready to communicate state

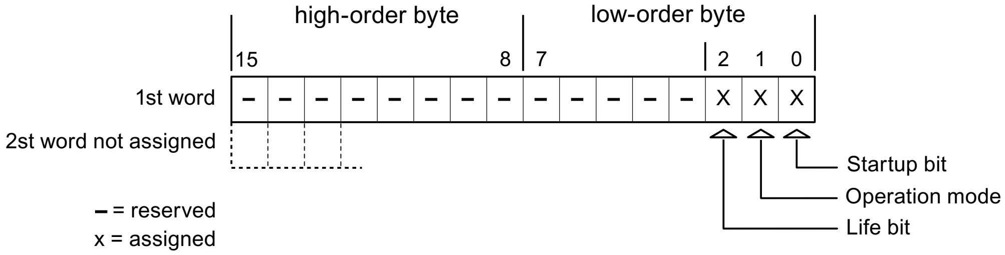
The "Coordination" area pointer has a length of two words.

Application

Note

The HMI device always writes the entire coordination area when updating the area pointer. The control program may not make changes to the coordination area for this reason.

Assignment of bits in the "Coordination" area pointer



Startup bit

The startup bit is set briefly to "0" by the HMI device during startup. It sets the bit permanently to "1" when startup is completed.

Operating mode

The operating mode bit is set to 1 as soon as the user switches the HMI device offline. The state of the operating mode bit is "0" during normal operation of the HMI device. You can determine the current operating mode of the HMI device by reading this bit.

Life bit

The HMI device inverts the life bit at intervals of approximately one second. You can check whether or not the connection to the HMI device is still up by querying this bit in the control program.

7.3.1.6 "User version" area pointer

Function

You can check whether the HMI device is connected to the correct PLC at the start of runtime. This check is important when operating with several HMI devices.

The HMI device compares a value stored on the PLC with the value specified in configuration data. This ensures compatibility of configuration data with the control program. If discrepancy is detected, a system alarm is displayed on the HMI device and runtime is stopped.

Application

Settings in configuration data required when using this area pointer:

- Define the version of configuration data. Possible values between 1 and 255.

  Enter the version in the "Device settings ▸ Device settings" editor in "Project ID."
- Data address of the value for the version that is stored in the PLC:

  Enter the data address in the "Communication ▸ Connections" editor in "Address."

Connection failure

A connection failure to a device on which the "project ID" area pointer is configured results in all the other connections in the project being switched to "offline".

This behavior has the following prerequisites:

- You have several configured connections in a project.
- You are using the "project ID" area pointer in at least one connection.

Causes which may set connections "offline":

- The PLC is not available.
- The connection has been switched offline in the engineering system.

7.3.1.7 "Job mailbox" area pointer

Function

The PLC can use the job mailbox to transfer jobs to the HMI device to trigger corresponding actions on the HMI device. These functions include, for example:

- Display screen
- Set date and time

Data structure

The first word of the job mailbox contains the job number. Depending on the job mailbox, up to three parameters can be transferred.

Word	Left byte	Right byte
n+0	0	Job number
n+1	Parameter 1	
n+2	Parameter 2	
n+3	Parameter 3	

The HMI device evaluates the job mailbox if the first word of this job is unequal to zero. This means that the parameters must be entered in the job mailbox first, followed by the job number.

When the HMI device accepts the job mailbox, the first word is set to 0 again. The execution of the job mailbox is generally not completed at this point in time.

Job mailboxes

All job mailboxes and their parameters are listed below. The "No." column contains the job number of the job mailbox. Job mailboxes can only be triggered by the PLC when the HMI device is online.

Note

Please note that not all HMI devices support job mailboxes. TP 170A and Micro Panel do not support PLC jobs, for example.

No.	Function	
14	Setting the time (BCD coded)	
	Parameter 1	Left byte: - Right byte: hours (0-23)
	Parameter 2	Left byte: minutes (0-59) Right byte: seconds (0-59)
	Parameter 3	-
15	Setting the date (BCD coded)	
	Parameter 1	Left byte: - Right byte: weekday (1-7: Sunday-Saturday)
	Parameter 2	Left byte: day (1-31) Right byte: month (1-12)
	Parameter 3	Left byte: year
23	User logon	
	Logs the user on with the name "PLC user" at the HMI device with the group number transferred in Parameter 1. The logon is possible only when the transferred group number exists in the project.	
	Parameter 1	Group number 1 to 255
	Parameter 2, 3	-

No.	Function	
24	**User logoff**	
	Logs off the current user. (The function corresponds to the "logoff" system function)	
	Parameter 1, 2, 3	-
40	**Transfer date/time to PLC**	
	(in the S7 format DATE_AND_TIME) An interval of at least 5 seconds must be maintained between two successive jobs to prevent overload of the HMI device.	
	Parameter 1, 2, 3	-
41	**Transfer date/time to PLC**	
	(In OP/MP format) An interval of at least 5 seconds must be maintained between successive jobs in order to prevent overload of the HMI device.	
	Parameter 1, 2, 3	-
46	**Update tags**	
	Causes the HMI device to read the current value of the PLC tags whose update ID matches the value transferred in Parameter 1. (Function corresponds to the "UpdateTag" system function.)	
	Parameter 1	1 - 100
49	**Clear process alarm buffer**	
	Parameter 1, 2, 3	-
50	**Clear alarm buffer**	
	Parameter 1, 2, 3	-
51	**Screen selection** [1)]	
	Parameter 1	Screen number
	Parameter 2	-
	Parameter 3	Field number
69	**Read data record from PLC**	
	Parameter 1	Recipe number (1-999)
	Parameter 2	Data record number (1-65535)
	Parameter 3	0: Do not overwrite existing data record 1: Overwrite existing data record
70	**Write data record to PLC**	
	Parameter 1	Recipe number (1-999)
	Parameter 2	Data record number (1-65535)
	Parameter 3	-

[1)] OP 73, OP 77A and TP 177A HMI devices also execute the "Screen selection" job mailbox if the on-screen keyboard is active.

7.3.1.8 "Data mailbox" area pointer

"Data mailbox" area pointer

Function

When data records are transferred between the HMI device and PLC, both partners access common communications areas on the PLC.

Data transfer types

There are two ways of transferring data records between the HMI device and PLC:

- Transfer without synchronization
- Transfer with synchronization over the data record

Data records are always transferred directly. That is, the tag values are read from an address or written to an address configured for this tag directly, without redirecting the values by means of interim memory.

Initiating the transfer of data records

There are three ways of triggering the transfer:

- Operator input in the recipe view
- PLC jobs

  The transfer of data records can also be triggered by the PLC.
- Triggering by configured functions

If the transfer of data records is triggered by a configured function or by a PLC job, the recipe display on the HMI device remains operable. The data records are transferred in the background.

Simultaneous processing of several transfer requests is, however, not possible. In this case, the HMI device rejects the other transfer requests with a system alarm.

Transfer without synchronization

If you select asynchronous transfer of data records between the HMI device and PLC, there is no coordination over the common data areas. It is therefore unnecessary to set up a data area during configuration.

Asynchronous data record transfer can be a useful alternative, for example, when:

- The system is capable of excluding the risk of uncontrolled overwriting of data by the communication peer.
- The PLC does not require information about the recipe number and data record number.
- The transfer of data records is triggered by the operator of the HMI device.

Reading values

When a read job is triggered, the values are read from the PLC addresses and transferred to the HMI device.

- Triggering by the operator in the recipe view:

  The values are downloaded to the HMI device. You can then process, edit, or save these values, for example.

- Triggering by a function or PLC job:

  The values are saved immediately to the data volume.

Writing values

When a write job is triggered, the values are written to the PLC addresses.

- Triggering by the operator in the recipe view:

  The current values are written to the PLC.

- Triggering by a function or PLC job:

  The current values are written to the PLC from the data medium.

Transfer with synchronization (SIMATIC S5)

If you select synchronous transfer, both communication partners set status bits in the common data area. You can use this mechanism to prevent uncontrolled overwriting of data in either direction in your control program.

Application

Synchronous data record transfer can be a useful solution, for example, when:

- The PLC is the "active partner" in the transfer of data records.
- The PLC evaluates the information about the recipe number and data record number.
- The transfer of data records is triggered by means of a Job mailbox.

Requirements

In order to synchronize transfer of data records between the HMI device and the PLC, the following requirements must be met during configuration:

- An area pointer has been set up: "Communication ▸ Connections" editor in "Area pointer"
- The PLC with which the HMI device synchronizes transfer of data records is specified in the recipe: "Recipes" editor, properties view of the recipe, "Properties" group in "Transfer".

Structure of the data area

The data area has a fixed length of 5 words. Structure of the data area:

	15		0
1. Word	Current recipe number (1 - 999)		
2. Word	Current data record number (0 - 65535)		
3. Word	Reserved		
4. Word	Status (0, 2, 4, 12)		
5. Word	Reserved		

- Status

  The status word (word 4) can adopt the following values:

Value		Meaning
Decimal	Binary	
0	0000 0000	Transfer permitted, data record free
2	0000 0010	Transfer is busy
4	0000 0100	Transfer completed without error
12	0000 1100	Transfer completed with error

Sequence of a transfer started by the operator in the recipe display

Reading from the PLC started by the operator in the recipe display

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe number to be read and the status "Transfer active" in the data record and sets the data record number to 0.	Abort with system alarm.
3	The HMI device reads the values from the PLC and displays them in the recipe display. If the recipes have synchronized tags, the values from the PLC are also written to the tags.	
4	The HMI device sets the status "Transfer completed."	
5	The control program must reset the status word to zero in order to enable further transfers.	

Writing to the PLC started by the operator in the recipe display

Step	Action	
	Check: Status word = 0?	
1	Yes	No
	The HMI device enters the recipe and data record number to be written and the status "Transfer active" in the data record.	Abort with system alarm.
2	The HMI device writes the current values to the PLC. If the recipes have synchronized tags, the changed values are synchronized between the recipe display and tags and then written to the PLC.	
3	The HMI device sets the status "Transfer completed."	
4	If required, the control program can now evaluate the transferred data.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Note

The status word may only be set by the HMI device. The PLC may only reset the status word to zero.

Note

The PLC may only evaluate the recipe and data record numbers when data inconsistency is detected if one of the conditions outlined below has been met:

- The data mailbox status is set to "Transfer completed".
- The data mailbox status is set to "Transfer completed with error".

Sequence of the transfer triggered by a job mailbox

The transfer of data records between the HMI device and the PLC can be initiated by either one of these stations.

The two PLC jobs No. 69 and No. 70 are available for this type of transfer.

No. 69: Read data record from PLC ("PLC → DAT")

PLC job no. 69 transfers data records from the PLC to the HMI device. The PLC job is structured as follows:

	Left byte (LB)	Right byte (RB)
Word 1	0	69
Word 2	Recipe number (1-999)	
Word 3	Data record number (1 to 65535)	
Word 4	Do not overwrite existing data record: 0 Overwrite existing data record: 1	

No. 70: Write data record to PLC ("DAT → PLC")

PLC job No. 70 transfers data records from the HMI device to the PLC. The PLC job is structured as follows:

	Left byte (LB)	Right byte (RB)
Word 1	0	70
Word 2	Recipe number (1-999)	
Word 3	Data record number (1 to 65535)	
Word 4	—	

Sequence when reading from the PLC with PLC job "PLC → DAT" (no. 69)

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the job and the status "Transfer active" in the data record.	Abort without return message.
3	The HMI device reads the values from the PLC and saves these to the data record defined in the PLC job.	
4	• If "Overwrite" was selected in the job, an existing data record is overwritten without any prompt for confirmation. The HMI device sets the status "Transfer completed." • If "Do not overwrite" was selected in the job, and the data record already exists, the HMI device aborts the job and enters 0000 1100 in the status word of the data record.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Sequence of writing to the PLC using PLC job "DAT → PLC" (no. 70)

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the job and the status "Transfer active" in the data record.	Abort without return message.
3	The HMI device fetches the values of the data record specified in the function from the data medium and writes the values to the PLC.	
4	The HMI device sets the status "Transfer completed."	
5	The control program can now evaluate the transferred data. The control program must reset the status word to zero in order to enable further transfers.	

Sequence of the transfer when triggered by a configured function

Reading from the PLC using a configured function

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the function and the status "Transfer active" in the data record.	Abort with system alarm.
3	The HMI device reads the values from the PLC and stores them in the data record specified in the function.	
4	• If "Yes" was selected for the "Overwrite" function, an existing data record is overwritten without any prompt for confirmation. The HMI device sets the status "Transfer completed." • If "No" was selected for the "Overwrite" function and the data record already exists, the HMI device aborts the job and enters 0000 1100 in the status word of the data record.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Writing to the PLC by means of configured function

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the function and the status "Transfer active" in the data record.	Abort with system alarm.
3	The HMI device fetches the values of the data record specified in the function from the data medium and transfers the values to the PLC.	
4	The HMI device sets the status "Transfer completed."	
5	The control program can now evaluate the transferred data. The control program must reset the status word to zero in order to enable further transfers.	

Possible causes of error when transferring data records

Possible causes of error

The section below shows possible error causes which lead to the cancellation of data record transfer:

- Tag address not set up on the PLC
- Overwriting data records not possible
- Recipe number does not exist
- Data record number does not exist

Note

The status word may only be set by the HMI device. The PLC may only reset the status word to zero.

Note

The PLC may only evaluate the recipe and data record numbers when data inconsistency is detected if one of the conditions outlined below has been met:

- The data mailbox status is set to "Transfer completed".
- The data mailbox status is set to "Transfer completed with error".

Reaction to an aborted transfer due to errors

If the transfer of data records is aborted due to errors, the HMI device reacts as follows:

- Triggering by the operator in the recipe display

  Information in the status bar of the recipe view and output of system alarms
- Triggered by function

  Output of system alarms
- Triggering by PLC job

  No feedback message on the HMI device

You can nonetheless evaluate the status of the transfer by querying the status word in the data record.

7.3.2 Events, alarms, and acknowledgments

7.3.2.1 General information on events, alarms, and acknowledgments

Function

Messages return information about the PLC or HMI device operating states or problems to the user on the HMI device. The message texts consist of configurable texts and/or tags with actual values.

Operational messages and events must be distinguished. The programmer defines what is an operational message and what is an error alarm.

Operational message

An operational message indicates a state. Example:

- Motor on
- PLC in manual mode

Alarm message

An error alarm indicates a malfunction. Example:

- Valve does not open.
- Excess motor temperature

Alarms indicate exceptional operational states, and must therefore be acknowledged.

Acknowledgment

To acknowledge error alarms:

- Operator input on the HMI device
- The PLC sets an acknowledgment bit.

Triggering alarms

Triggering of an alarm in the PLC:

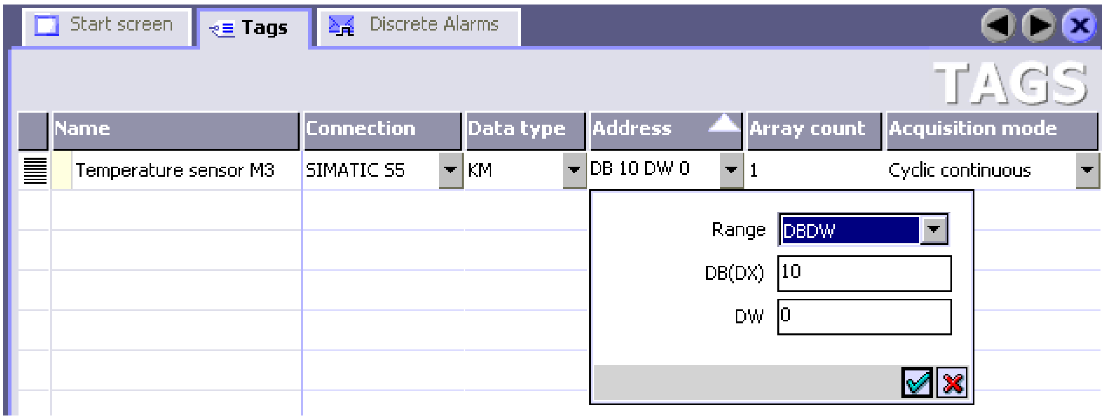
- Setting a tag bit
- Measured value limits exceeded

The location of tags, or of the tag array, is defined in WinCC flexible ES. The tag or array must be set up on the PLC.

7.3.2.2 Step 1: Creating tags or an array

Procedure

You create tags or arrays in the "Tags" editor. The dialog box is shown below.



Name	Connection	Data type	Address	Array count	Acquisition mode
Temperature sensor M3	SIMATIC S5	KM	DB 10 DW 0	1	Cyclic continuous

Range DBDW
DB(DX) 10
DW 0

- Specifying the names of the tags or the name of the array
- Select the connection to the PLC

  The connection must already be configured in the "Connections" editor.
- Select the data type

  The available data types depend on the PLC being used. If you select an illegal data type, the tag will not be available in the "Discrete alarms" and "Analog alarms" editors.

  The following data types are supported for SIMATIC S5 controllers:

PLC	Permitted data types	
	Discrete alarms	Analog alarms
S5-90U, S5-95U, S5-95 DP master, S5-100U, S5-115U, S5-135U, S5-155U	KF	KF, KH, KM, KY, KS, KC

- Specify the address

  The tag addressed here contains the bit that triggers the alarm.

  As soon as the bit of the tag is set on the PLC and is transferred to the HMI device in the configured acquisition cycle, the HMI device recognizes the alarm as "incoming".

  After the same bit is reset on the PLC, the HMI device recognizes the alarm as "outgoing".

Note

In a SIMATIC S5 PLC, the data blocks DB0 to DB9 are reserved internally for the CPU:
DB0 includes the internal list of block start addresses.
DB1 includes the internal list of periphery assignment.
DB2 is used internally for multi-processor use.
DB3 to DB9 are internal working DBs from GRAPH5.

These data blocks should not be used when connecting to a SIMATIC S5 PLC in WinCC flexible. The data blocks are therefore blocked in the "Tags" editors.

- Specify array elements

  If the number of array elements is increased, you can select more bit numbers in the "Discrete alarms" editor. An array with a length of three words provides 48 alarm bits, for example.

7.3.2.3 Step 2: Configuring an alarm

Procedure

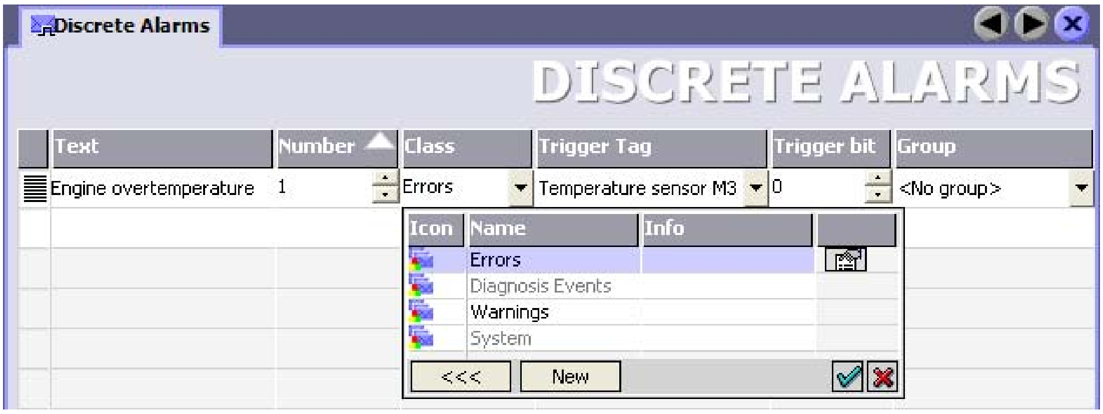
We differentiate between the following alarms:

- Discrete alarms
- Analog alarms

You create alarms in the "Discrete alarms" and "Analog alarms" editors.

Discrete alarms

The editor is shown in the figure below.



Text	Number	Class	Trigger Tag	Trigger bit	Group
Engine overtemperature	1	Errors	Temperature sensor M3	0	<No group>

Icon	Name	Info
	Errors	
	Diagnosis Events	
	Warnings	
	System	

- Edit text

  Enter the text to be displayed in runtime. You can format the text characters. The text may contain fields for the output of tags.

  The text is output to the alarm view if this view was configured in the "Screens" editor.

- Specify number

  Every alarm has a number that must only occur once within the project. It is used to uniquely identify the alarm and is indicated with the alarm in runtime.

  The permitted range of values is 1 to 100,000.

  The WinCC flexible engineering system assigns consecutive numbers. You can change the alarm numbers when assigning these to groups, for example.

- Specify the alarm class

  Available alarm classes:

  – Error alarms

    This class must be acknowledged.

  – Warning alarms

    This class signals events with incoming and outgoing alarms.

  – User-defined alarm classes

- Assign trigger tag

  In the "Trigger tag" column, you link the configured alarm with the tag created in step 1. All tags with permitted data types are shown in the selection list.

- Specify the bit number

  In the "bit number" column, specify the relevant bit position in the created tag.

  Remember that the way the bit positions are counted depends on the particular PLC. With SIMATIC S5 controllers, the bit positions are counted as follows:

Counting mode in the data block

How the bit positions are counted	Data word															
in SIMATIC S5 controllers	15							8	7							0
In WinCC flexible, you configure the following:	15							8	7							0

Counting mode in the flag area

How the bit positions are counted	Flag byte 0								Flag byte 1							
	Left byte								Right byte							
in SIMATIC S5 PLCs	7							0	7							0
In the WinCC flexible, you configure the following:	15							8	7							0

Analog alarms

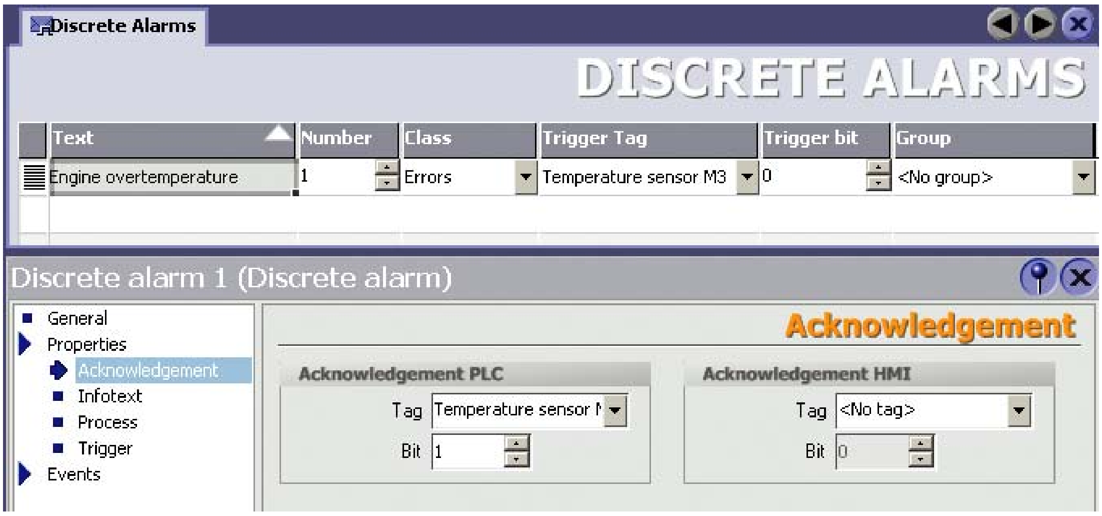
The only difference between discrete alarms and analog alarms is that you configure a limit value, rather than a bit number. The alarm is triggered when this limit is exceeded. The outgoing alarm is triggered when the low limit is violated, and where applicable, taking into account any configured hysteresis.

7.3.2.4 Step 3: Configure the acknowledgment

Procedure

Create suitable tags on the PLC to acknowledge an error alarm. You assign these tags to an alarm in the "Bit messages" editor. You make the assignment in "Properties ▸ Acknowledgment."

The following figure shows the dialog for configuring an acknowledgment.



Text	Number	Class	Trigger Tag	Trigger bit	Group
Engine overtemperature	1	Errors	Temperature sensor M3	0	<No group>

Acknowledgement PLC
Tag Temperature sensor M
Bit 1

Acknowledgement HMI
Tag <No tag>
Bit 0

Distinction in terms of acknowledgment:

- Acknowledgment on the HMI device
- Acknowledgment by the PLC

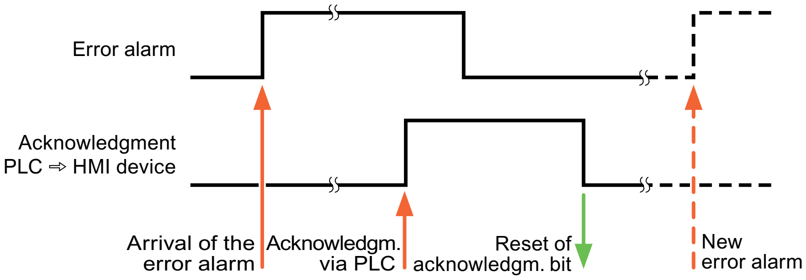
Acknowledgment by the PLC

In "Acknowledgment PLC tag", you configure the tag or the array tag and the bit number based on which the HMI device can recognize an acknowledgment by the PLC.

A bit set in the tag triggers acknowledgment of the assigned error alarm bit at the HMI device. This tag bit returns a function similar to acknowledgment on the HMI device which is triggered by pressing the "ACK" button, for example.

The acknowledgment bit must be located in the same tag as the bit for the error alarm.

Reset the acknowledgment bit before setting the bit in the alarm area again. The figure below shows the pulse diagram.



Acknowledgment on the HMI device

In "Ack read tag", you configure the tag or the array tag and the bit number that is written to the PLC after acknowledgment from the HMI device. Make sure when you use an array tag that it is not longer than 6 words.

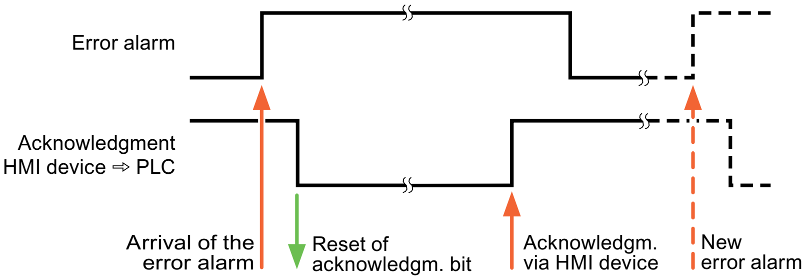
In order to ensure that a signal transition is generated as soon as the acknowledgment bit is set, the HMI device first resets the acknowledgment bit assigned to an error alarm. There is a certain time-based offset between these two operations, due to the processing time of the HMI device.

Note

The reset includes all alarm bits acknowledged since the last restart of Runtime. The PLC may only read this area once.

If the alarm is acknowledged on the HMI device, the bit is then set in the assigned acknowledgment tag on the PLC. This allows the PLC to recognize that the error alarm has been acknowledged.

The figure below shows the pulse diagram.



7.3.3 Trend request and trend transfer

Function

A trend is the graphic visualization of one or more values from the PLC. The value is read either time- or bit-triggered, depending on the configuration.

Time-triggered trends

The HMI device reads in the trend values cyclically at an interval specified in the configuration. Time-triggered trends are suitable for continuous processes, for example, the operating temperature of a motor.

Bit-triggered trends

By setting a trigger bit in the tag trend transfer, the HMI device either reads in a trend value or an entire trend buffer. This setting is defined in configuration data. Bit-triggered trends are normally used to visualize rapidly changing values. One example might be the injection pressure in the production of plastic parts.

To trigger bit-triggered trends, create suitable external tags in the "Tags" editor of WinCC flexible. The external tags must be linked with the trend areas. The HMI device and PLC then communicate with each other over these trend areas.

The following areas are available for trends:

- Trend request area
- Trend transfer area 1
- Trend transfer area 2 (required only with switch buffers)

Assign a bit to each trend. Valid are tags and array tags of the data type "KH" or "KF".

Trend request area

The HMI device sets corresponding bits in the trend request area when you open a screen which contains one or several trends on the HMI device. After deselecting the screen, the HMI device resets the relevant bits in the trend request area.

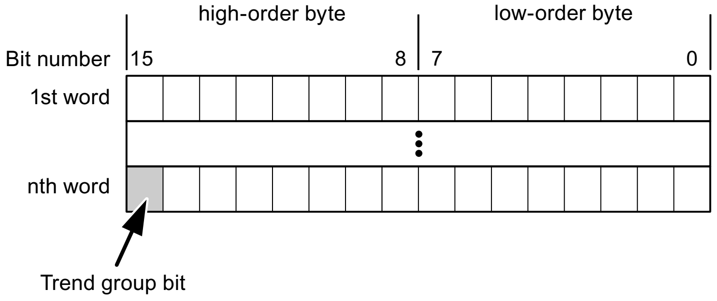
Using the trend request area, the PLC can recognize which trend is currently displayed on the HMI device. Trends can also be triggered without evaluation of the trend request area.

Trend transfer area 1

This area is used to trigger trends. In your PLC program, you set the bit assigned to the trend in the trend transfer area and set the trend group bit. The trend group bit is the last bit in the trend transfer area.

The HMI device recognizes the trigger and either reads a value or the entire buffer from the PLC. It then resets the trend bit and the trend group bit.

The following picture shows the structure of a trend transfer area.



The trend transfer area must not be modified by the PLC program until the trend group bit has been reset.

Trend transfer area 2

Trend transfer area 2 is required for trends configured with a switch buffer. The trend transfer areas 1 and 2 have a similar structure.

Switch buffers

The switch buffer is a second buffer for the same trend that can be set up during configuration.

While the HMI device reads the values from buffer 1, the PLC writes to buffer 2. If the HMI device is reading buffer 2, the PLC writes to buffer 1. This prevents the trend values being overwritten by the PLC while the trend is being read out by the HMI device.

7.3.4 LED mapping

Function

The function keys of the keyboard units of the Operator Panel (OP), Multi Panel (MP) and Panel PC are equipped with LEDs. These LEDs can be controlled by the PLC. This functionality can be used to activate an LED in order to tell the operator which key to press in a specific situation, for example.

Requirements

In order to enable control of an LED, you must set up an LED tag or array tag in the PLC and declare this as the LED tag in the configuration data.

LED assignment

Assign the LEDs to the LED tag bits when you configure the function keys. Define the "LED tag" and the corresponding "bit" for each function key in the "General" group of the properties view.

The bit number "bit" identifies the first of two consecutive bits that control the following LED states:

		LED function	
Bit n+ 1	Bit n	all Mobile Panels, Operator Panels, and Multi Panels	Panel PCs
0	0	Off	Off
0	1	Rapid flashing	Flashing
1	0	Slow flashing	Flashing
1	1	Permanent signal	Permanent signal

7.4 Commissioning components

7.4.1 Commissioning components

Transferring the PLC program to the PLC

1. Interconnect the PC with the CPU using the appropriate cable.
2. Download the program files to the CPU.
3. Then set the CPU to RUN.

Transferring project data to the HMI device

1. The HMI device must be in transfer mode in order to accept the project transfer.

   Possible scenarios:

   – Initial startup

     The HMI device does not yet contain any configuration data in the initial startup phase. The project data and runtime software required for operation must be transferred from the configuration computer to the device: The HMI device automatically changes to transfer mode.
     The transfer dialog box opens with a connection message on the HMI device.

   – Recommissioning

     Recommissioning means that you overwrite existing project data on the HMI device.

   For corresponding detailed instructions, refer to the HMI device manual.

2. Check whether the alarm settings meet requirements of your WinCC flexible project.
3. Select "Project > Transfer > Transfer settings" to configure the transfer parameters before you transfer project data to the HMI device:

   – Select the used port.

   – Set the transfer parameters.

   – Select the target storage location.

4. Initiate the transfer of project data by clicking "Transfer".

   – The project is compiled automatically.

   – All compilation and transfer steps are logged to a message window.

   Message output on the configuration computer on successful completion of the transfer: "Transfer completed successfully".

   The start screen appears on the HMI device.

Interconnecting the PLC with the HMI device

1. Interconnect the PLC with the HMI device using a suitable cable.
2. The message "Connection to PLC .... is established" is output to the HMI device.
   Note that users can edit the system alarm texts in WinCC flexible.

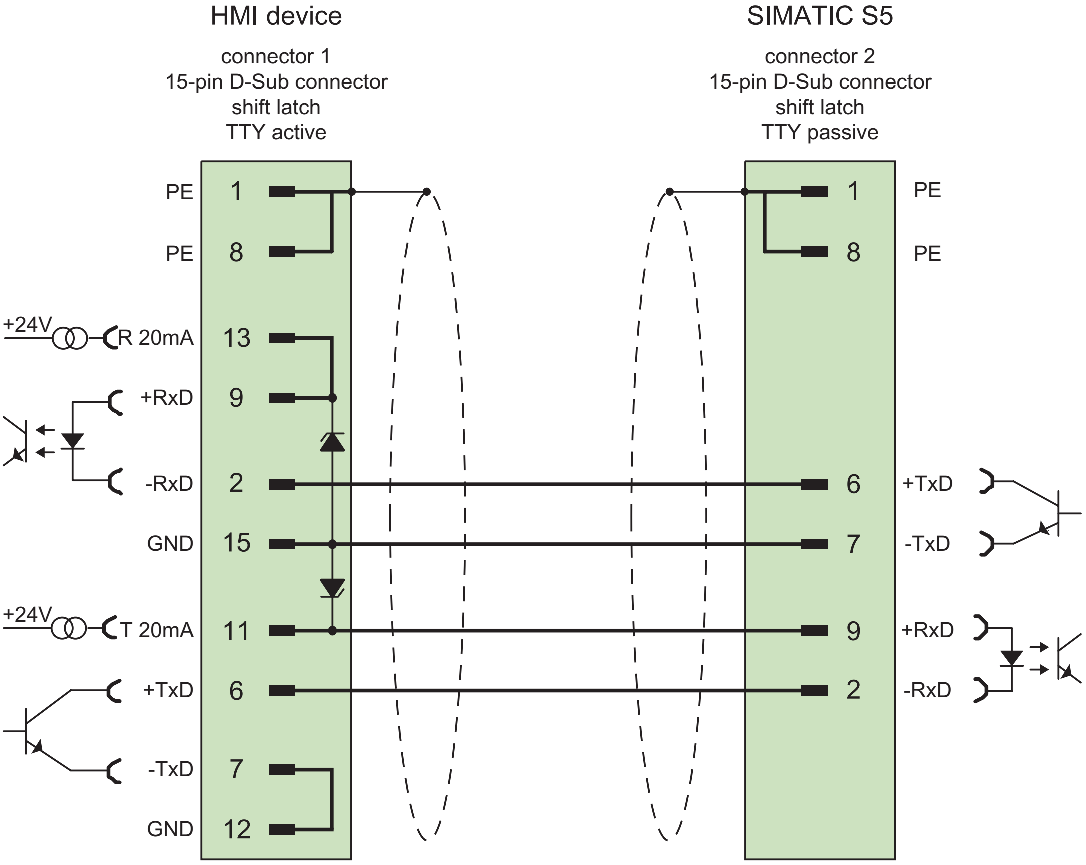
NOTICE
Always observe the safety-related information in the HMI device Manual when commissioning the device. RF radiation emitted from devices such as mobile phones may cause unwanted operating states.

7.5 Connecting cables for SIMATIC S5

7.5.1 Connecting cable 6XV1 440-2A, TTY, for SIMATIC S5

6XV1 440 - 2A _ _ _

Length key, see catalog ST 80



Shield with large-area contact to casing at both ends
Cable: 5 x 0.14 mm2, shielded,
length: max. 1,000 m

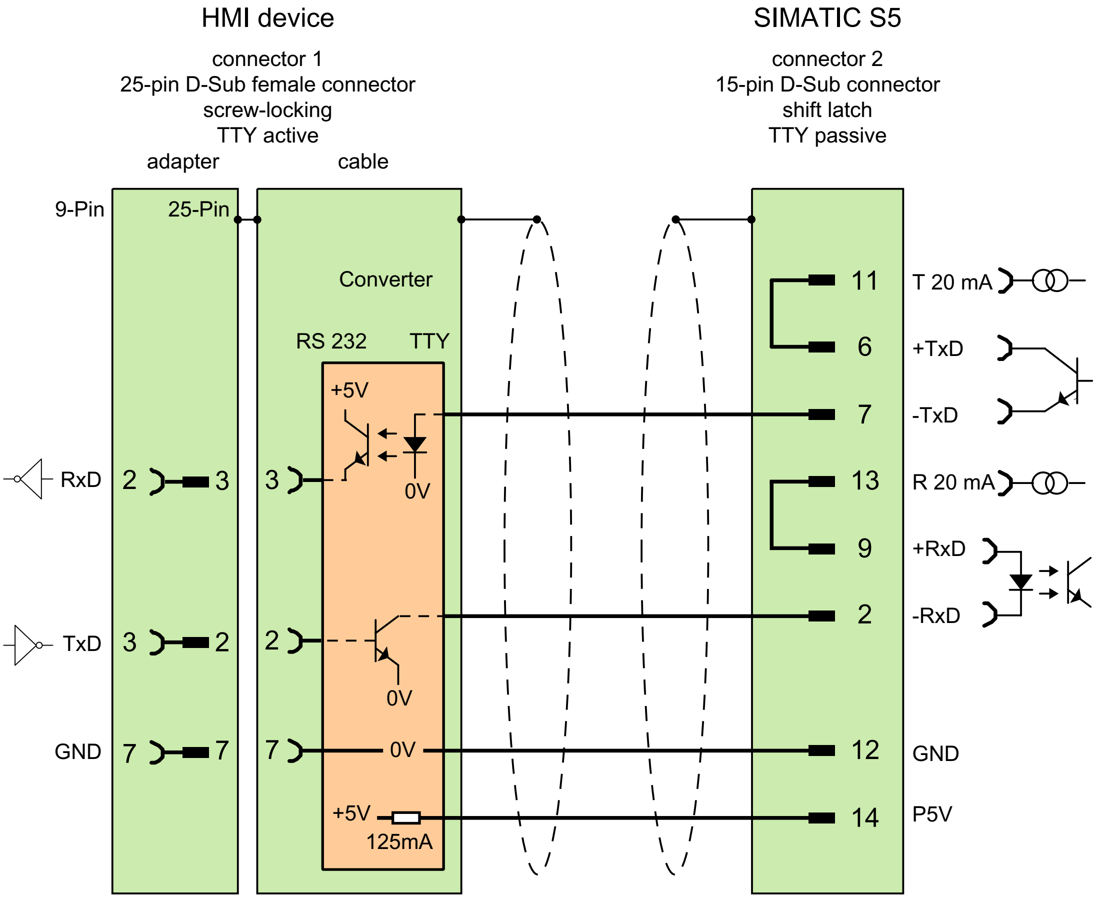
For TTY cables with a special length > 10 m, 2 zener diodes BZX 55 C12 (12 V) must be soldered into the 15-pin connector to the HMI device (TTY active).

7.5.2 Connecting cable 6ES5 734-1BD20, TTY, for SIMATIC S5

6ES5 734-1BD20

To connect HMI device (RS-232, 9-pin sub D) - SIMATIC S5 (PG interface, TTY)

For the connection to the HMI device, a cable adapter 9-pin (female) > 25-pin (male) is required.

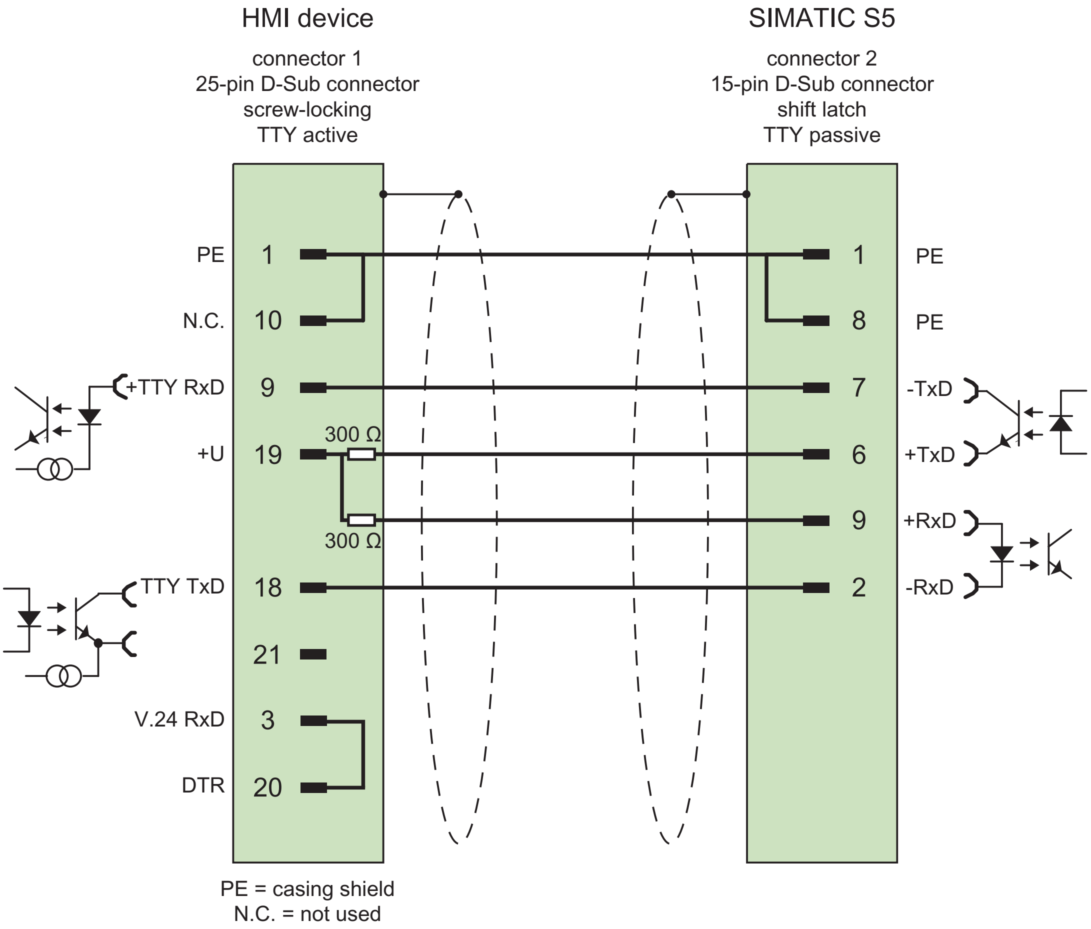


Shield with large-area contact to casing at both ends
Cable: 5 x 0.14 mm², shielded,
max. length 3,2 m

7.5.3 Connecting cable 6ES5 734-2BD20, TTY, for SIMATIC S5

6ES5 734-2BD20

To connect HMI device (TTY, 25-pin sub D) - SIMATIC S5 (PG interface, TTY)



Shield with large-area contact to casing at both ends
Cable: 5 x 0.14 mm², shielded,
length: 3.2 m

Note

You can obtain lengths differing from the standard connecting cable (6ES5 734-2BD20) under order number 6ES5 734-2 _ _ _ 0, where "_" stands for the length key.

Communication with SIMATIC 500/505 controllers 8

8.1 Communication with SIMATIC 500/505

8.1.1 Communication partner (SIMATIC 500/505)

Introduction

This section describes communication between HMI device and SIMATIC 500/505 controllers.

With SIMATIC 500/505, the connections use protocols that are specific to the PLCs:

- NITP

  Serial connection over the RS-232/RS-422 interface with the NITP protocol (Non-intelligent terminal protocol)

- PROFIBUS DP

  PROFIBUS DP is master-slave fieldbus with up to 122 slaves. Normally, a PROFIBUS DP network is operated by one master. This master polls all slaves cyclically. The master could, for example, be a PLC with interface module that is compatible with the DP standard. Each HMI device is a slave and is assigned permanently to a master.

Released communication types

The TP 170A can only connect to SIMATIC 500/505 over NITP.

Known restrictions

An RS 422 connection to the SIMATIC 575-VME is not currently supported.

When using the special function with the CPU 560-2120 and CPU 560-2820, access to the S memory data types (special user data types) is not possible. The standard data types can be used as normal.

Communication with SIMATIC 500/505 DP:

The function block for communicating with the SIMATIC 500/505 DP cannot read or write bit tags.

8.1.2 Communication between HMI device and controller (SIMATIC 500/505)

Communications principle

The HMI device and the PLC communicate using tags and the user data areas.

Tags

The PLC and the HMI device exchange data using process values. In your configuration, create tags that point to an address on the PLC. The HMI device reads and displays the value from the defined address. The operator can also make an entry on the HMI device that is then written to the address on the PLC.

User data areas

User data areas are intended for the exchange of special data and are set up only when such data is used.

Data for which user data areas are required, for example:

- Job mailboxes
- Transfer of data records
- Date/time synchronization
- Sign-of-life monitoring

The user data areas are created while configuring in WinCC flexible. You assign the corresponding addresses in the PLC.

8.2 Configuring the communication driver SIMATIC 500/505

8.2.1 Permitted data types (SIMATIC 500/505)

Permitted data types

When configuring tags and area pointers, you can use the user data types listed in the following table. It is essential that these data areas are also set up for the CPU with TISOFT.

The following table lists the data types for the HMI device:

Name	Range	Data type
Discrete input	X	BIT
Discrete output	Y	BIT
Control relay	C	BIT
Variable memory	V	BIT [1] +/– INT INT +/– DOUBLE DOUBLE REAL ASCII
Word input	WX	
Word output	WY	
Constant memory	K	
Status word memory	STW	
Timer/counter preset	TCP	+/– INT INT
Timer/counter current	TCC	
Analog alarm/alarm acknowledge flags	AACK	+/–INT, INT
Analog alarm deadband	AADB	+/–INT, INT, REAL
Most significant word of analog alarm C flags	ACFH	+/–INT, INT
Least significant word of analog alarm C flags	ACFL	+/–INT, INT
Analog alarm error	AERR	+/–INT, INT, REAL
Analog alarm high alarm limit	AHA	+/–INT, INT, REAL
Analog alarm high-high alarm limit	AHHA	+/–INT, INT, REAL
Analog alarm low alarm limit	ALA	+/–INT, INT, REAL
Analog alarm low-low alarm limit	ALLA	+/–INT, INT, REAL
Analog alarm orange deviation alarm limit	AODA	+/–INT, INT, REAL
Analog alarm process variable	APV	+/–INT, INT, REAL
Analog alarm process variable high limit	APVH	REAL
Analog alarm process variable low limit	APVL	REAL
Analog alarm rate of change alarm limit	ARCA	REAL
Analog alarm setpoint	ASP	+/–INT, INT, REAL
Analog alarm SP high limit	ASPH	+/–INT, INT, REAL
Analog alarm SP low limit	ASPL	+/–INT, INT, REAL
Analog alarm sample rate	ATS	REAL
Analog alarm flags	AVF	+/–INT, INT
Analog alarm yellow deviation alarm limit	AYDA	+/–INT, INT, REAL

Name	Range	Data type
Alarm peak elapsed time	APET	+/–INT, INT
Loop alarm/alarm acknowledge flags	LACK	+/–INT, INT
Loop alarm deadband	LADB	+/–INT, INT, REAL
Most significant word of loop C flags	LCFH	+/–INT, INT
Least significant word of loop C flags	LCFL	+/–INT, INT
Loop error	LERR	+/–INT, INT, REAL
Loop alarm high limit	LHA	+/–INT, INT, REAL
Loop alarm high-high limit	LHHA	+/–INT, INT, REAL
Loop gain	LKC	REAL
Loop derivative gain limiting coefficient	LKD	REAL
Loop low alarm limit	LLA	+/–INT, INT, REAL
Loop low-low alarm limit	LLLA	+/–INT, INT, REAL
Loop output	LMN	+/–INT, INT, REAL
Loop bias	LMX	+/–INT, INT, REAL
Loop orange deviation limit	LODA	+/–INT, INT, REAL
Loop process variable	LPV	+/–INT, INT, REAL
Loop PV high limit	LPVH	REAL
Loop PV low limit	LPVL	REAL
Loop rate of change alarm limit	LRCA	REAL
Loop ramp/soak flags	LRSF	+/–INT, INT
Loop ramp/soak step number	LRSN	+/–INT, INT
Loop setpoint	LSP	+/–INT, INT, REAL
Loop setpoint high point	LSPH	+/–INT, INT, REAL
Loop setpoint low limit	LSPL	+/–INT, INT, REAL
Loop rate	LTD	REAL
Loop reset	LTI	REAL
Loop sample rate	LTS	REAL
Loop V flags	LVF	+/–INT, INT
Loop yellow deviation alarm limit	LYDA	+/–INT, INT, REAL
Loop peak elapsed time	LPET	+/–INT, INT
SF program peak elapsed time	PPET	+/–INT, INT
SF subroutine peak elapsed time	SPET	+/–INT, INT

[1] In the case of write accesses with NITP protocol note:
With the "BIT" type of data in the areas "WX", "WY", "V", "K" and "STW" after changing the specified bit the entire word is written back to the PLC. There is no check to determine whether any other bits in the word have changed. As a result, the PLC only has read access to the specified word.

8.2.2 Optimizing the configuration

Acquisition cycle and update time

The acquisition cycles for the "Area pointers" and the acquisition cycles of the tags specified in the configuration software are decisive factors for the actual update times that can be achieved.

The update time is the sum of the acquisition cycle + transmission time + processing time.

To achieve optimum update times, remember the following points during configuration:

- Keep the individual data areas as small as possible and as large as necessary.
- Define data areas that belong together as belonging together. You can improve the update time by setting up one large data area instead of several small areas.
- If the acquisition cycles you select are too short, this is detrimental to the overall performance. Set the acquisition cycle to suit the rate of change of the process values. The rate of temperature changes at a furnace, for example, is significantly slower compared to the speed rate of an electrical drive. As a general guideline, the acquisition cycle should be approx. 1 second.
- Put the tags of an alarm or a screen in one data area without gaps.
- To allow changes in the PLC to be recognized reliably, these must be available at least during the actual acquisition cycle.
- Set the transmission rate to the highest possible value.

Discrete alarms

For discrete alarms, use arrays and assign the individual alarms to one bit of the array tags themselves and not to the individual subelements. For discrete alarms and arrays, only tags of the data types "Int" and "+/- Int" are permitted.

Screens

With screens, the update rate that can actually be achieved depends on the type and amount of data to be displayed.

Configure short acquisition cycles only for objects which actually require shorter refresh cycles.

Trends

When using bit-triggered trends, if the group bit is set in the "Trend transfer area", the HMI device always updates all the trends whose bit is set in this area. It then resets the bits.

The group bit in the PLC program can only be set again after all bits have been reset by the HMI device.

Job mailboxes

If large numbers of job mailboxes are sent in quick succession, this can lead to overload in the communication between the HMI device and PLC.

The HMI device confirms acceptance of the job mailbox by entering the value zero in the first data word of the job mailbox. The HMI device now processes the job for which it requires time. If a new job mailbox is entered again immediately in the job mailbox, it may take some time before the HMI device can process the next job mailbox. The next job mailbox will only be accepted when there is computing capacity available.

8.2.3 Communication driver for the NITP protocol

8.2.3.1 Requirements of communication

Connector

To connect the HMI device to the SIMATIC 500/505, no additional communications module is required. Communication can be handled via one of the standard ports in the system: This is the COM 1 or COM 2 port on the Panel PC and standard PC and the IF1 port on all other HMI devices. At the PLC end, the HMI device must be connected to the programming interface of the CPU (RS-232 or RS-422).

The HMI device port to be used is defined in the corresponding manual.

Cable

The following cables are available to connect the HMI device to the PLC:

Interface HMI devices	SIMATIC 500/505			
	RS-232, 9-pin	RS-232, 25-pin	RS 422, 9-pin [1]	RS 422, 9-pin [2]
RS-232, 9-pin	PP1	SIMATIC 505 standard cable PPX 260 109-0001 and adapter 25-pin.	Commercially available V.24/RS 422 converter	Commercially available V.24/RS 422 converter
RS 232, 15-pin [3]	6XV1440-2K_ _ _	6VX1 440-2L_ _ _	–	–
RS-422, 9-pin	–	–	6XV1440–2M_ _ _	6XV1440–1M_ _ _

'_' Length key

[1] For SIMATIC 505 (PLC 535, PLC 545-1101, PLC 565T)

[2] For SIMATIC 505 (PLC 545-1102, PLC 555)

[3] The 15-pin RS-232 interface is only relevant for MP 370.

8.2.3.2 Installing the communication driver

Driver for the HMI device

The driver for connection to SIMATIC 500/505 controllers is supplied with WinCC flexible and is installed automatically.

No special blocks are required on the PLC for the connection.

8.2.3.3 Configuring the controller type and protocol

Select the PLC

For a connection to a SIMATIC 500/505 PLC over the NITP protocol, double-click on "Communication ▸ Connections" in the project view of the HMI device. Go to the "Communication drivers" column and select the protocol SIMATIC 500/505.

The property view displays the parameters of the selected protocol.

You can edit the parameters at any time by double-clicking "Communication ▸ Connections" in the project view of the HMI device. Select the connection and edit its parameters in the properties dialog box.

Note

The settings on the HMI device and on the PLC must match.

8.2.3.4 Configuring protocol parameters

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC 500/505 serial" is selected in the "Communication drivers" column in the work area. Change the protocol parameters of the connection in the Properties window.

Device-dependent parameters

- Interface

  Under "Interface" you select the interface on the HMI device over which the connection to the SIMATIC 500/505 will be established.

  For further information, refer to the relevant device manuals.

- Type

  The type depends on the selected interface.

  Note

  If you use the IF1B interface, you must also switch over the RS-485 received data and the RTS signal using 4 DIP switches on the back of the Multi Panel.

- Data bits

  Under "Data bit" set "7".

- Parity

  Under "Parity" set "Odd".

- Stop bits

  Under "Stop bits" set "1".

- Baud rate

  Under "Baud rate" define the transmission rate between the HMI device and the SIMATIC 505. Communication is possible with up to 38,400 bauds.

  Note

  Make sure that the transmission parameters on the HMI device and the SIMATIC 500/505 match.

  Note

  The highest station address must be less than or equal to 63 if you set a transmission rate of 1.5 Mbaud at OP 73 or OP 77A.

  If connecting a TP 170A to a SIMATIC S7 station at a transmision rate of 1.5 MBaud on PROFIBUS DP, set a value less than or equal to 63 for the highest station address (HSA).

8.2.4 Communication driver for PROFIBUS DP

8.2.4.1 Requirements of communication

Hardware requirements

To include the HMI devices in an existing PROFIBUS DP network, you require the following hardware components:

- For Panel PC or Standard PC, a communications processor is required (for example CP5511, CP5611).
- On the PLC: CP 5434-DP (annex card)
- For each device (HMI device or PLC): PROFIBUS DP bus connector or other approved component (except for FSK bus terminal, see configurator in the SIMATIC HMI catalog ST80.1).

Software requirements

For the PROFIBUS DP connection, you require the following software components:

- WinCC flexible engineering tool
- Specific configuration software (e.g. COM PROFIBUS) for assigning parameter values complying with the DP standard to the interface module in the PLC

8.2.4.2 Installing the communication driver

Driver for the HMI device

The driver for connection to SIMATIC 500/505 controllers is supplied with WinCC flexible and is installed automatically.

To connect the HMI device and the PLC, a physical connection and a control program are necessary. A sample program is supplied with WinCC flexible.

8.2.4.3 Configuring the controller type and protocol

Select the PLC

For a connection to a SIMATIC 500/505 PLC over PROFIBUS DP, double-click on "Communication ▸ Connections" in the project window of the HMI device. Go to the "Communication drivers" column and select the protocol for the SIMATIC 500/505 DP.

The property view displays the parameters of the selected protocol.

You can edit the parameters at any time by double-clicking "Communication ▸ Connections" in the project view of the HMI device. Select the connection and edit its parameters in the properties dialog box.

Note

The settings on the HMI device and on the PLC must match.

8.2.4.4 Configuring protocol parameters

Parameters to be set

To edit the parameters, double-click "Communication > Connections" in the project window of the HMI device. "SIMATIC 500/505 DP" is selected in the "Communication drivers" column in the work area. Change the protocol parameters of the connection in the Properties window.

Device-dependent parameters

- Interface

  Under "Interface" you select the interface on the HMI device over which the connection to the SIMATIC 500/505 will be established. The type is set automatically depending on the selected interface set under "Interface".

  For further information, refer to the relevant device manuals.

- Baud rate

  Under "Baud rate" you select the transmission rate at which the HMI device communicates with the SIMATIC 500/505 in the network configuration. The same baud rate must be set on all devices in the network.
  System default: 1500 Kbps.

  Note

  The highest station address must be less than or equal to 63 if you set a transmission rate of 1.5 Mbaud at OP 73 or OP 77A.

  If connecting a TP 170A to a SIMATIC S7 station at a transmision rate of 1.5 MBaud on PROFIBUS DP, set a value less than or equal to 63 for the highest station address (HSA).

PLC-dependent parameters

- HMI address

  Under "HMI address" set the PROFIBUS DP address of the HMI device.

  Values from 3 through 125 are permitted.

- Block length

  Under "Block length" you specify the assignment of the I/O area used for communication between the HMI device and PLC. The size of the I/O area influences performance.

  The configuration is implemented according to class B (basic DP slave complying with EN 50170). You can select four different configurations:

  – Class B tiny

  – Class B small

  – Class B middle

  – Class B big

  The assignment of the I/O areas is fixed with the four various settings. The following table shows the assignment of the I/O areas:

Class	Inputs (bytes)	Outputs (bytes)
Class B tiny	32	22
Class B small	42	22
Class B middle	64	32
Class B big	128	64

The settings in WinCC flexible must match the configuration data of the interface module, for example CP 5434 DP.

Note

To transfer large amounts of data, it is advisable to set a large I/O area. This means that the displays on the HMI device are updated more quickly since the data is fetched in one cycle.

8.2.4.5 Assigning parameter values for the PROFIBUS DP network based on the example of COM PROFIBUS

CP 5434 DP interface module

To configure the CP 5434 DP, you require the COM PROFIBUS configuration package. WinCC flexible also comes with GSD files for HMI device slaves.

These GSD files are located in the "WinCC flexible Support\PlcProg\GSD" directory. Different GSD files must be used depending on the particular HMI device:

GSD file	Vendor ID	HMI device
SIEM80B3.GSD	0x80B3	TP 170B, OP 170B, Mobile Panel 170
SIEM8107.GSD	0x8107	OP 77B, TP 177B, OP 177B, Mobile Panel 177
SIEM80E4.GSD	0x80E4	TP 270, OP 270, MP 270B
SIEM80BE.GSD	0x80BE	MP 370
SIEM8076.GSD	0x8076	Panel PC, standard PC

In the following cases, copy the files from ProTool to COM PROFIBUS:

- The GSD files in the COM PROFIBUS directory "WinCC flexible\PLCPROG\GSD" are older than the GSD files supplied in ProTool.
- The COM PROFIBUS does not yet support a new HMI device.

Then restart the COM PROFIBUS and select the "Read GSD files".

If you have already created a COM PROFIBUS configuration with an older file and want to use the newer GSD files, you will have to recreate the configuration.

Parameter

Before the CP 5434 DP and HMI device can communicate with each other, the following parameters must be set in COM PROFIBUS:

- Station type: HMI
- Station number: 3-125

  The value entered here must match the OP address specified when you configured the HMI device.
- Desired configuration:

  The desired configuration is set by selecting the class and the symbolic name of the configuration. The following desired configurations can be set:

  – Class B tiny

  – Class B small

  – Class B middle

  – Class B big
- Address ID:

  The address ID is assigned automatically according to the selected configuration and must not be changed.
- I and Q address:

  The address must match the address stored in the PLC program.

Integrating the COM PROFIBUS configuration into TISOFT

The TISOFT documentation describes in detail how to integrate the COM PROFIBUS configuration into the TISOFT program. The main steps are simply outlined below:

1. Create a binary file in COM PROFIBUS using the "Export" function.
2. Merge the binary file into your TISOFT program with "CONFIO" > "PRO-DP" > "MERGE".
3. Set the CPU to "ONLINE PLC" mode.
4. Specify the I/O addresses in TISOFT with "CONFIO" > "PRO-DP" > "CONFIG".
5. Transfer the program to the CPU with "UPDATE".

8.2.4.6 Sample program for handling the DP protocol on the controller

Program for handling the DP protocol

To connect to PROFIBUS DP, you require a control program that handles the protocol. A sample program (written in LADDER) is supplied with WinCC flexible. You can adapt this program to suit your requirements. The sample program supports linear P addressing. The sample program is available in the "WINCC flexible\PLCPROG\SIMATIC505" folder.

The sample program was written for the CPU 545 and CPU 555 that connect to the PROFIBUS DP network via the CP 5434 DP (annex card). The following settings are stored in the example program. Adopt these settings in the configuration:

Program	Parameter	Value
WinCC flexible	HMI device	PC
	Protocol	SIMATIC 505 DP
	OP address	3
	Interface	DP/MPI
	Baud rate	1.5 Kbps
	Block length	Class B middle
COM PROFIBUS	Master station type	505-CP5434-DP
	Type of addressing	Linear
	Slave address	3
	Station type	Appropriate HMI device
	Desired configuration	Class B middle
	Configured to I address	P000-P048
	Configured to Q address	P000-P016
TISOFT	I/O address	0100 for WX32 and WY16
	Area for data exchange	V900-V1020

Setting the interface

For Panel PCs and standard PCs, the interface is set under Windows as follows: "Settings > Control Panel > Set PG/PC interface"

Parameter	Value
Access point of the application	DPSONLINE
Module configuration used	PROFIBUS DP slave

If you use the Windows CE operating system, you do not need to make any settings.

8.3 User data areas

8.3.1 Trend request and trend transfer

Function

A trend is the graphic visualization of one or more values from the PLC. The value is read either time- or bit-triggered, depending on the configuration.

Time-triggered trends

The HMI device reads in the trend values cyclically at an interval specified in the configuration. Time-triggered trends are suitable for continuous processes, for example, the operating temperature of a motor.

Bit-triggered trends

By setting a trigger bit in the trend request tag, the HMI device either reads in a trend value or an entire trend buffer. This setting is defined in configuration data. Bit-triggered trends are normally used to visualize rapidly changing values. One example might be the injection pressure in the production of plastic parts.

To trigger bit-triggered trends, create suitable external tags in the "Tags" editor of WinCC flexible. The external tags must be linked with the trend areas. The HMI device and PLC then communicate with each other over these trend areas.

The following areas are available for trends:

- Trend request area
- Trend transfer area 1
- Trend transfer area 2 (required only with switch buffers)

Tags of the "V" or "K" types are permitted. They must be of the data type "Int", "+/- Int", or an array tag of the data type "Int", "+/-Int". During configuration you assign a bit to a trend. This sets a unique bit assignment for all areas.

Trend request area

If a screen is opened on the HMI device with one or more trends, the HMI device sets the corresponding bits in the trend request area. After deselecting the screen, the HMI device resets the relevant bits in the trend request area.

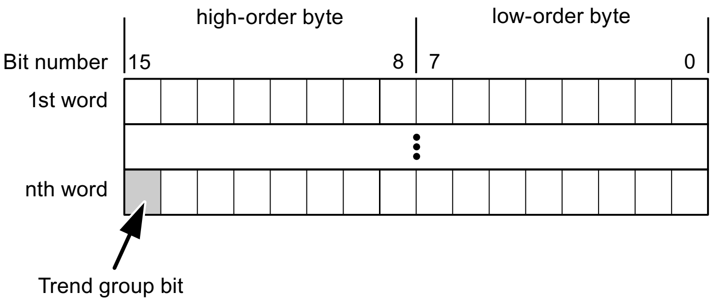
Using the trend request area, the PLC can recognize which trend is currently displayed on the HMI device. Trends can also be triggered without evaluation of the trend request area.

Trend transfer area 1

This area is used to trigger trends. In your PLC program, you set the bit assigned to the trend in the trend transfer area and set the trend group bit. The trend group bit is the last bit in the trend transfer area.

The HMI device detects the trigger. The HMI device reads either a value or the entire buffer from the PLC. It then resets the trend bit and the trend group bit.

The following picture shows the structure of a trend transfer area.



The trend transfer area must not be modified by the PLC program until the trend group bit has been reset.

Trend transfer area 2

Trend transfer area 2 is required for trends configured with a switch buffer. The trend transfer areas 1 and 2 have a similar structure.

Switch buffers

The switch buffer is a second buffer for the same trend that can be set up during configuration.

While the HMI device reads the values from buffer 1, the PLC writes to buffer 2. If the HMI device is reading buffer 2, the PLC writes to buffer 1. This prevents the trend values being overwritten by the PLC while the trend is being read out by the HMI device.

8.3.2 LED mapping

Function

The function keys of the keyboard units of the Operator Panel (OP), Multi Panel (MP) and Panel PC are equipped with LEDs. These LEDs can be controlled by the PLC. This functionality can be used to activate an LED in order to tell the operator which key to press in a specific situation, for example.

Requirements

In order to enable control of an LED, you must set up an LED tag or array tag in the PLC and declare this as the LED tag in the configuration data.

LED assignment

Assign the LEDs to the LED tag bits when you configure the function keys. Define the "LED tag" and the corresponding "bit" for each function key in the "General" group of the properties view.

The bit number "bit" identifies the first of two consecutive bits that control the following LED states:

Bit n+ 1	Bit n	LED function	
		all Mobile Panels, Operator Panels, and Multi Panels	Panel PCs
0	0	Off	Off
0	1	Rapid flashing	Flashing
1	0	Slow flashing	Flashing
1	1	Permanent signal	Permanent signal

8.3.3 Area pointer

8.3.3.1 General information on area pointers (SIMATIC 500/505)

Introduction

Area pointers are parameter fields. WinCC flexible Runtime reads these parameter fields in order to obtain information about the location and size of data areas in the PLC. The PLC and the HMI device interactively communicate read and write data for these data areas. The PLC and the HMI device trigger defined interactions based on the evaluation of stored data.

The area pointers reside in PLC memory. Their addresses are configured in the "Area pointers" dialog of the "Connections" editor.

Area pointers used in WinCC flexible:

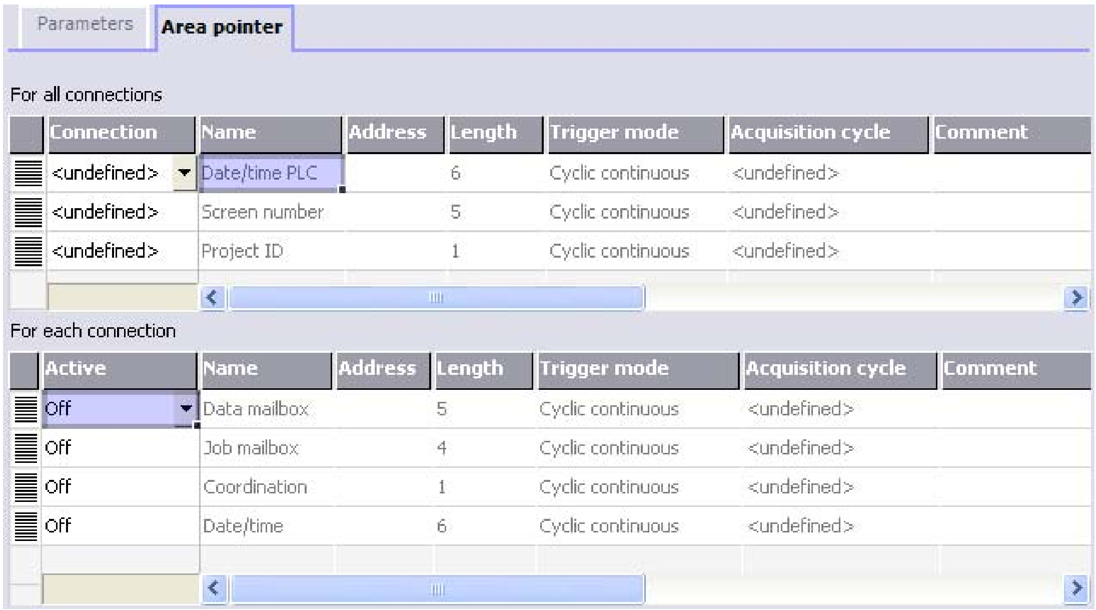
- PLC job
- Project ID
- Screen number
- Data record
- Date/time
- Date/time PLC
- Coordination

Device-dependency

Availability of the area pointer depends on the HMI device used.

Application

Configure and enable the area pointer in "Communication ▸ Connections" before you put it into use.



For all connections

Connection	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
<undefined>	Date/time PLC		6	Cyclic continuous	<undefined>	
<undefined>	Screen number		5	Cyclic continuous	<undefined>	
<undefined>	Project ID		1	Cyclic continuous	<undefined>	

For each connection

Active	Name	Address	Length	Trigger mode	Acquisition cycle	Comment
Off	Data mailbox		5	Cyclic continuous	<undefined>	
Off	Job mailbox		4	Cyclic continuous	<undefined>	
Off	Coordination		1	Cyclic continuous	<undefined>	
Off	Date/time		6	Cyclic continuous	<undefined>	

Enabling an area pointer based on the example of a SIMATIC S7 PLC

- Active

  Enables the area pointer.

- Name

  Name of the area pointer defined by WinCC flexible.

- Address

  Tag address of the area pointer in the PLC.

- Length

  WinCC flexible defines the default length of the area pointer.

- Acquisition cycle

  Define an acquisition cycle in this field to allow cyclic reading of the area pointer in Runtime. An extremely short acquisition time may have a negative impact on HMI device performance.

- Comment

  Save a comment, for example, to describe the purpose of the area pointer.

Accessing data areas

The table shows how the PLC and HMI device handle read (R) and write (W) access to the data areas.

Data area	Required for	HMI device	PLC
Screen number	Evaluation by the PLC in order to determine the active screen.	W	R
Data record	Transfer of data records with synchronization	R/W	R/W
Date/time	Transfer of the date and time from the HMI device to the PLC	W	R
Date/time PLC	Transfer of the date and time from the PLC to the HMI device	R	W
Coordination	Requesting the HMI device status in the control program	W	R
Project ID	Runtime checks consistency between the WinCC flexible project ID and the project in the PLC.	R	W
PLC job	Triggering of HMI device functions by the control program	R/W	R/W

The next sections describe the area pointers and their associated PLC jobs.

8.3.3.2 "Screen number" area pointer

Function

The HMI device saves information about the screen called on the HMI device to the "Screen number" area pointer.

This allows the transfer of the current screen contents from the HMI device to the PLC. The PLC can trigger specific reactions such as the call of a different screen.

Application

Configure and enable the area pointer in "Communication ▸ Connections" before you put it into use. You can create only **one** instance of the "Screen number" area pointer and only on **one** PLC.

The screen number is transferred spontaneously to the PLC. That is, it is always transferred when a new screen is activated on the HMI device. It is therefore unnecessary to configure an acquisition cycle.

Structure

The area pointer is a data area in the memory of the PLC with a fixed length of 5 words.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1st word	Current screen type															
2nd word	Current screen number															
3rd word	Reserved															
4th word	Current field number															
5th word	Reserved															

- Current screen type

  "1" for the root screen or
  "4" for the permanent window
- Current screen number

  1 to 32767
- Current field number

  1 to 32767

8.3.3.3 "Date/time" area pointer

Function

This area pointer is used to transfer the date and time from the HMI device to the PLC.

The PLC writes control job "41" to the job mailbox.

When it evaluating the control job, the HMI device saves its current date and time to the data area configured in the "Date/time" area pointer. All definitions are coded in BCD format.

The "Date/Time" area pointer when used in a project which contains multiple connections must be enabled for each configured connection.

The date/time data area has the following structure:

Data word	Left byte								Right byte								
	15							8	7							0	
n+0	Reserved								Hour (0 to 23)								Time
n+1	Minute (0 to 59)								Second (0 to 59)								
n+2	Reserved								Reserved								
n+3	Reserved								Weekday (1 to 7, 1 = Sunday)								Date
n+4	Day (1 to 31)								Month (1 to 12)								
n+5	Year (80 to 99/0 to 29)								Reserved								

Note

The entry of values from 80 to 99 in the "Year" data area returns the years 1980 through 1999; values from 0 to 29 return the years 2000 through 2029.

8.3.3.4 "Date/time controller" area pointer

Function

This area pointer is used to transfer the date and time from the PLC to the HMI device. Use this area pointer if the PLC is the time master.

The PLC loads the data area of the area pointer. All definitions are coded in BCD format.

The HMI device reads the data cyclically within the configured acquisition cycle and synchronizes itself.

Note

Set an acquisition cycle of sufficient length for the date/time area pointer in order to avoid any negative impact on HMI device performance.
Recommended: Acquisition cycle of 1 minute if your process can handle it.

The date/time data area has the following structure:

DATE_AND_TIME format (in BCD code)

<table>
<tr><th rowspan="2">Data word</th><th colspan="3">Left byte</th><th colspan="3">Right byte</th></tr>
<tr><th>15</th><th>......</th><th>8</th><th>7</th><th>......</th><th>0</th></tr>
<tr><td>n+0</td><td colspan="3">Year (80 to 99/0 to 29)</td><td colspan="3">Month (1 to 12)</td></tr>
<tr><td>n+1</td><td colspan="3">Day (1 to 31)</td><td colspan="3">Hour (0 to 23)</td></tr>
<tr><td>n+2</td><td colspan="3">Minute (0 to 59)</td><td colspan="3">Second (0 to 59)</td></tr>
<tr><td>n+3</td><td colspan="3">Reserved</td><td colspan="2">Reserved</td><td>Weekday
(1 to 7, 1 = Sunday)</td></tr>
<tr><td>n+4 1)</td><td colspan="3">Reserved</td><td colspan="3">Reserved</td></tr>
<tr><td>n+5 1)</td><td colspan="3">Reserved</td><td colspan="3">Reserved</td></tr>
</table>

1) The two data words must be available in the data area in order to ensure compliance of the data format with WinCC flexible and to avoid the reading of incorrect information.

Note

Note that when you enter the year, values 80-99 result in years 1980 through 1999 and the values 0-29 result in the years 2000 through 2029.

8.3.3.5 "Coordination" area pointer

Function

The "Coordination" area pointer is used to implement the following functionality:

- detection in the control program of HMI device startup
- detection in the control program of the current HMI device operating mode
- detection in the control program of the HMI devices ready to communicate state

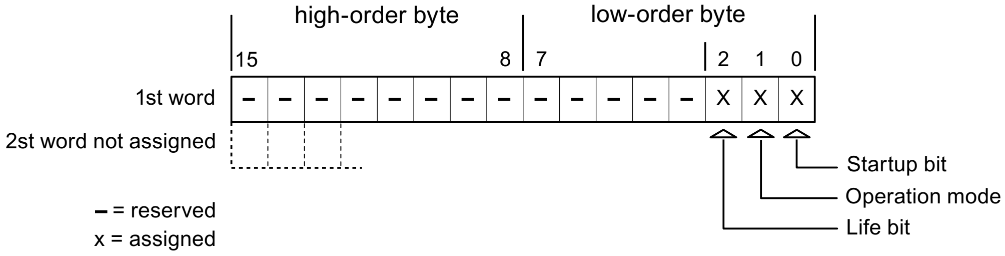
The "Coordination" area pointer has a length of two words.

Application

Note

The HMI device always writes the entire coordination area when updating the area pointer. The control program may not make changes to the coordination area for this reason.

Assignment of bits in the "Coordination" area pointer



Startup bit

The startup bit is set briefly to "0" by the HMI device during startup. It sets the bit permanently to "1" when startup is completed.

Operating mode

The operating mode bit is set to 1 as soon as the user switches the HMI device offline. The state of the operating mode bit is "0" during normal operation of the HMI device. You can determine the current operating mode of the HMI device by reading this bit.

Life bit

The HMI device inverts the life bit at intervals of approximately one second. You can check whether or not the connection to the HMI device is still up by querying this bit in the control program.

8.3.3.6 "Project ID" area pointer

Function

You can check whether the HMI device is connected to the correct PLC at the start of runtime. This check is important when operating with several HMI devices.

The HMI device compares a value stored on the PLC with the value specified in configuration data. This ensures compatibility of configuration data with the control program. If discrepancy is detected, a system alarm is displayed on the HMI device and runtime is stopped.

Application

Settings in configuration data required when using this area pointer:

- Define the version of configuration data. Possible values between 1 and 255.

  Enter the version in the "Device settings ▸ Device settings" editor in "Project ID."
- Data address of the value for the version that is stored in the PLC:

  Enter the data address in the "Communication ▸ Connections" editor in "Address."

Connection failure

A connection failure to a device on which the "project ID" area pointer is configured results in all the other connections in the project being switched to "offline".

This behavior has the following prerequisites:

- You have several configured connections in a project.
- You are using the "project ID" area pointer in at least one connection.

Causes which may set connections "offline":

- The PLC is not available.
- The connection has been switched offline in the engineering system.

8.3.3.7 "Job mailbox" area pointer

Function

The PLC can use the job mailbox to transfer jobs to the HMI device to trigger corresponding actions on the HMI device. These functions include, for example:

- Display screen
- Set date and time

Data structure

The first word of the job mailbox contains the job number. Depending on the job mailbox, up to three parameters can be transferred.

Word	Left byte	Right byte
n+0	0	Job number
n+1	Parameter 1	
n+2	Parameter 2	
n+3	Parameter 3	

The HMI device evaluates the job mailbox if the first word of this job is unequal to zero. This means that the parameters must be entered in the job mailbox first, followed by the job number.

When the HMI device accepts the job mailbox, the first word is set to 0 again. The execution of the job mailbox is generally not completed at this point in time.

Job mailboxes

All job mailboxes and their parameters are listed below. The "No." column contains the job number of the job mailbox. Job mailboxes can only be triggered by the PLC when the HMI device is online.

Note

Please note that not all HMI devices support job mailboxes. TP 170A and Micro Panel do not support PLC jobs, for example.

No.	Function	
14	**Setting the time (BCD coded)**	
	Parameter 1	Left byte: - Right byte: hours (0-23)
	Parameter 2	Left byte: minutes (0-59) Right byte: seconds (0-59)
	Parameter 3	-
15	**Setting the date (BCD coded)**	
	Parameter 1	Left byte: - Right byte: weekday (1-7: Sunday-Saturday)
	Parameter 2	Left byte: day (1-31) Right byte: month (1-12)
	Parameter 3	Left byte: year
23	**User logon**	
	Logs the user on with the name "PLC user" at the HMI device with the group number transferred in Parameter 1. The logon is possible only when the transferred group number exists in the project.	
	Parameter 1	Group number 1 to 255
	Parameter 2, 3	-

No.	Function	
24	User logoff	
	Logs off the current user. The function corresponds to the "logoff" system function)	
	Parameter 1, 2, 3	-
40	Transfer date/time to PLC	
	(in the S7 format DATE_AND_TIME) An interval of at least 5 seconds must be maintained between two successive jobs to prevent overload of the HMI device.	
	Parameter 1, 2, 3	-
41	Transfer date/time to PLC	
	(In OP/MP format) An interval of at least 5 seconds must be maintained between successive jobs in order to prevent overload of the HMI device.	
	Parameter 1, 2, 3	-
46	Update tags	
	Causes the HMI device to read the current value of the PLC tags whose update ID matches the value transferred in Parameter 1. (Function corresponds to the "UpdateTag" system function.)	
	Parameter 1	1 - 100
49	Clear process alarm buffer	
	Parameter 1, 2, 3	-
50	Clear alarm buffer	
	Parameter 1, 2, 3	-
51	Screen selection [1)]	
	Parameter 1	Screen number
	Parameter 2	-
	Parameter 3	Field number
69	Read data record from PLC	
	Parameter 1	Recipe number (1-999)
	Parameter 2	Data record number (1-65535)
	Parameter 3	0: Do not overwrite existing data record 1: Overwrite existing data record
70	Write data record to PLC	
	Parameter 1	Recipe number (1-999)
	Parameter 2	Data record number (1-65535)
	Parameter 3	-

[1)] OP 73, OP 77A and TP 177A HMI devices also execute the "Screen selection" job mailbox if the on-screen keyboard is active.

8.3.3.8 "Data mailbox" area pointer

"Data mailbox" area pointer

Function

When data records are transferred between the HMI device and PLC, both partners access common communications areas on the PLC.

Data transfer types

There are two ways of transferring data records between the HMI device and PLC:

- Transfer without synchronization
- Transfer with synchronization over the data record

Data records are always transferred directly. That is, the tag values are read from an address or written to an address configured for this tag directly, without redirecting the values by means of interim memory.

Initiating the transfer of data records

There are three ways of triggering the transfer:

- Operator input in the recipe view
- PLC jobs

  The transfer of data records can also be triggered by the PLC.
- Triggering by configured functions

If the transfer of data records is triggered by a configured function or by a PLC job, the recipe display on the HMI device remains operable. The data records are transferred in the background.

Simultaneous processing of several transfer requests is, however, not possible. In this case, the HMI device rejects the other transfer requests with a system alarm.

Transfer without synchronization

If you select asynchronous transfer of data records between the HMI device and PLC, there is no coordination over the common data areas. It is therefore unnecessary to set up a data area during configuration.

Asynchronous data record transfer can be a useful alternative, for example, when:

- The system is capable of excluding the risk of uncontrolled overwriting of data by the communication peer.
- The PLC does not require information about the recipe number and data record number.
- The transfer of data records is triggered by the operator of the HMI device.

Reading values

When a read job is triggered, the values are read from the PLC addresses and transferred to the HMI device.

- Triggering by the operator in the recipe view:

  The values are downloaded to the HMI device. You can then process, edit, or save these values, for example.

- Triggering by a function or PLC job:

  The values are saved immediately to the data volume.

Writing values

When a write job is triggered, the values are written to the PLC addresses.

- Triggering by the operator in the recipe view:

  The current values are written to the PLC.

- Triggering by a function or PLC job:

  The current values are written to the PLC from the data medium.

Transfer with synchronization (SIMATIC 500/505)

If you select synchronous transfer, both communication partners set status bits in the common data area. You can use this mechanism to prevent uncontrolled overwriting of data in either direction in your control program.

Application

Synchronous data record transfer can be a useful solution, for example, when:

- The PLC is the "active partner" in the transfer of data records.
- The PLC evaluates the information about the recipe number and data record number.
- The transfer of data records is triggered by means of a Job mailbox.

Requirements

In order to synchronize transfer of data records between the HMI device and the PLC, the following requirements must be met during configuration:

- An area pointer has been set up: "Communication ▸ Connections" editor in "Area pointer"
- The PLC with which the HMI device synchronizes transfer of data records is specified in the recipe: "Recipes" editor, properties view of the recipe, "Properties" group in "Transfer".

Structure of the data area

The data area has a fixed length of 5 words. Structure of the data area:

	15		0
1. Word	Current recipe number (1 - 999)		
2. Word	Current data record number (0 - 65535)		
3. Word	Reserved		
4. Word	Status (0, 2, 4, 12)		
5. Word	Reserved		

- Status

  The status word (word 4) can adopt the following values:

Value		Meaning
Decimal	Binary	
0	0000 0000	Transfer permitted, data record free
2	0000 0010	Transfer is busy
4	0000 0100	Transfer completed without error
12	0000 1100	Transfer completed with error

Sequence of a transfer started by the operator in the recipe display

Reading from the PLC started by the operator in the recipe display

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe number to be read and the status "Transfer active" in the data record and sets the data record number to 0.	Abort with system alarm.
3	The HMI device reads the values from the PLC and displays them in the recipe display. If the recipes have synchronized tags, the values from the PLC are also written to the tags.	
4	The HMI device sets the status "Transfer completed."	
5	The control program must reset the status word to zero in order to enable further transfers.	

Writing to the PLC started by the operator in the recipe display

Step	Action	
	Check: Status word = 0?	
1	Yes	No
	The HMI device enters the recipe and data record number to be written and the status "Transfer active" in the data record.	Abort with system alarm.
2	The HMI device writes the current values to the PLC. If the recipes have synchronized tags, the changed values are synchronized between the recipe display and tags and then written to the PLC.	
3	The HMI device sets the status "Transfer completed."	
4	If required, the control program can now evaluate the transferred data.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Note

The status word may only be set by the HMI device. The PLC may only reset the status word to zero.

Note

The PLC may only evaluate the recipe and data record numbers when data inconsistency is detected if one of the conditions outlined below has been met:

- The data mailbox status is set to "Transfer completed".
- The data mailbox status is set to "Transfer completed with error".

Sequence of the transfer triggered by a job mailbox

The transfer of data records between the HMI device and the PLC can be initiated by either one of these stations.

The two PLC jobs No. 69 and No. 70 are available for this type of transfer.

No. 69: Read data record from PLC ("PLC → DAT")

PLC job no. 69 transfers data records from the PLC to the HMI device. The PLC job is structured as follows:

	Left byte (LB)	Right byte (RB)
Word 1	0	69
Word 2	Recipe number (1-999)	
Word 3	Data record number (1 to 65535)	
Word 4	Do not overwrite existing data record: 0 Overwrite existing data record: 1	

No. 70: Write data record to PLC ("DAT → PLC")

PLC job No. 70 transfers data records from the HMI device to the PLC. The PLC job is structured as follows:

	Left byte (LB)	Right byte (RB)
Word 1	0	70
Word 2	Recipe number (1-999)	
Word 3	Data record number (1 to 65535)	
Word 4	—	

Sequence when reading from the PLC with PLC job "PLC → DAT" (no. 69)

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the job and the status "Transfer active" in the data record.	Abort without return message.
3	The HMI device reads the values from the PLC and saves these to the data record defined in the PLC job.	
4	• If "Overwrite" was selected in the job, an existing data record is overwritten without any prompt for confirmation. The HMI device sets the status "Transfer completed." • If "Do not overwrite" was selected in the job, and the data record already exists, the HMI device aborts the job and enters 0000 1100 in the status word of the data record.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Sequence of writing to the PLC using PLC job "DAT → PLC" (no. 70)

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the job and the status "Transfer active" in the data record.	Abort without return message.
3	The HMI device fetches the values of the data record specified in the function from the data medium and writes the values to the PLC.	
4	The HMI device sets the status "Transfer completed."	
5	The control program can now evaluate the transferred data. The control program must reset the status word to zero in order to enable further transfers.	

Sequence of the transfer when triggered by a configured function

Reading from the PLC using a configured function

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the function and the status "Transfer active" in the data record.	Abort with system alarm.
3	The HMI device reads the values from the PLC and stores them in the data record specified in the function.	
4	• If "Yes" was selected for the "Overwrite" function, an existing data record is overwritten without any prompt for confirmation. The HMI device sets the status "Transfer completed." • If "No" was selected for the "Overwrite" function and the data record already exists, the HMI device aborts the job and enters 0000 1100 in the status word of the data record.	
5	The control program must reset the status word to zero in order to enable further transfers.	

Writing to the PLC by means of configured function

Step	Action	
1	Check: Status word = 0?	
	Yes	No
2	The HMI device enters the recipe and data record number specified in the function and the status "Transfer active" in the data record.	Abort with system alarm.
3	The HMI device fetches the values of the data record specified in the function from the data medium and transfers the values to the PLC.	
4	The HMI device sets the status "Transfer completed."	
5	The control program can now evaluate the transferred data. The control program must reset the status word to zero in order to enable further transfers.	

Possible causes of error when transferring data records

Possible causes of error

The section below shows possible error causes which lead to the cancellation of data record transfer:

- Tag address not set up on the PLC
- Overwriting data records not possible
- Recipe number does not exist
- Data record number does not exist

Note

The status word may only be set by the HMI device. The PLC may only reset the status word to zero.

Note

The PLC may only evaluate the recipe and data record numbers when data inconsistency is detected if one of the conditions outlined below has been met:

- The data mailbox status is set to "Transfer completed".
- The data mailbox status is set to "Transfer completed with error".

Reaction to an aborted transfer due to errors

If the transfer of data records is aborted due to errors, the HMI device reacts as follows:

- Triggering by the operator in the recipe display

  Information in the status bar of the recipe view and output of system alarms
- Triggered by function

  Output of system alarms
- Triggering by PLC job

  No feedback message on the HMI device

You can nonetheless evaluate the status of the transfer by querying the status word in the data record.

8.3.4 Events, alarms, and acknowledgments

8.3.4.1 General information on events, alarms, and acknowledgments

Function

Messages return information about the PLC or HMI device operating states or problems to the user on the HMI device. The message texts consist of configurable texts and/or tags with actual values.

Operational messages and events must be distinguished. The programmer defines what is an operational message and what is an error alarm.

Operational message

An operational message indicates a state. Example:

- Motor on
- PLC in manual mode

Alarm message

An error alarm indicates a malfunction. Example:

- Valve does not open.
- Excess motor temperature

Alarms indicate exceptional operational states, and must therefore be acknowledged.

Acknowledgment

To acknowledge error alarms:

- Operator input on the HMI device
- The PLC sets an acknowledgment bit.

Triggering alarms

Triggering of an alarm in the PLC:

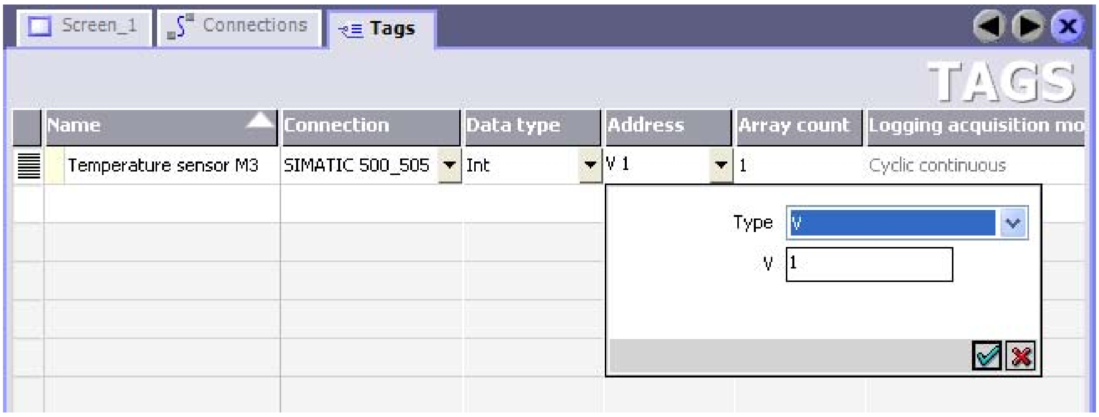
- Setting a tag bit
- Measured value limits exceeded

The location of tags, or of the tag array, is defined in WinCC flexible ES. The tag or array must be set up on the PLC.

8.3.4.2 Step 1: Creating tags or an array

Procedure

You create tags or arrays in the "Tags" editor. The dialog box is shown below.



Name	Connection	Data type	Address	Array count	Logging acquisition mo
Temperature sensor M3	SIMATIC 500_505	Int	V 1	1	Cyclic continuous

Type: V

V: 1

- Specifying the names of the tags or the name of the array
- Select the connection to the PLC

  The connection must already be configured in the "Connections" editor.
- Select the data type

  The available data types depend on the PLC being used. If you select an illegal data type, the tag will not be available in the "Discrete alarms" and "Analog alarms" editors.

  The following data types are supported for SIMATIC 500/505 controllers:

PLC	Permitted data types	
	Discrete alarms	Analog alarms
SIMATIC 500/505	Int, +/-Int	Bit, Int, +/– Int, Double, +/– Double, Real

- Specify the address

  The tag addressed here contains the bit that triggers the alarm.

  As soon as the bit of the tag is set on the PLC and is transferred to the HMI device in the configured acquisition cycle, the HMI device recognizes the alarm as "incoming".

  After the same bit is reset on the PLC, the HMI device recognizes the alarm as "outgoing".
- Specify array elements

  If the number of array elements is increased, you can select more bit numbers in the "Discrete alarms" editor. An array with a length of three words provides 48 alarm bits, for example.

8.3.4.3 Step 2: Configuring an alarm

Procedure

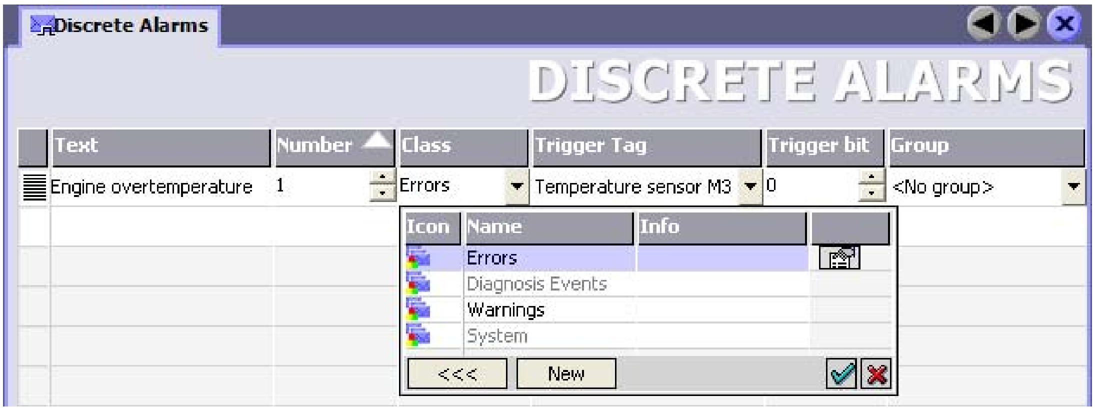
We differentiate between the following alarms:

- Discrete alarms
- Analog alarms

You create alarms in the "Discrete alarms" and "Analog alarms" editors.

Discrete alarms

The editor is shown in the figure below.



Text	Number	Class	Trigger Tag	Trigger bit	Group
Engine overtemperature	1	Errors	Temperature sensor M3	0	<No group>

- Edit text

  Enter the text to display in runtime. You can format the text characters. The text may contain fields for the output of tags.

  The text is output to the alarm view if this view was configured in the "Screens" editor.

- Specify number

  Every alarm has a number that must be unique within the project. It is used to uniquely identify the alarm and is indicated with the alarm in runtime.

  The permitted range of values is 1 to 100,000.

  The WinCC flexible engineering system assigns consecutive numbers. You can change the alarm numbers when assigning these to groups, for example.

- Specify the alarm class

  Available alarm classes:

  – Error alarms

    This class must be acknowledged.

  – Warning alarms

    This class signals events with incoming and outgoing alarms.

- Assign trigger tag

  In the "Trigger tag" column, you link the configured alarm with the tag created in step 1. All tags with permitted data types are shown in the selection list.

- Specify the bit number

  In the "bit number" column, specify the relevant bit position in the created tag.

  Remember that the way the bit positions are counted depends on the particular PLC. With SIMATIC 500/505 controllers, the bit positions are counted as follows:

How the bit positions are counted	Left byte								Right byte							
in SIMATIC 500/505 controllers	1							8	9							16
In the WinCC flexible, you configure the following:	15							8	7							0

Analog alarms

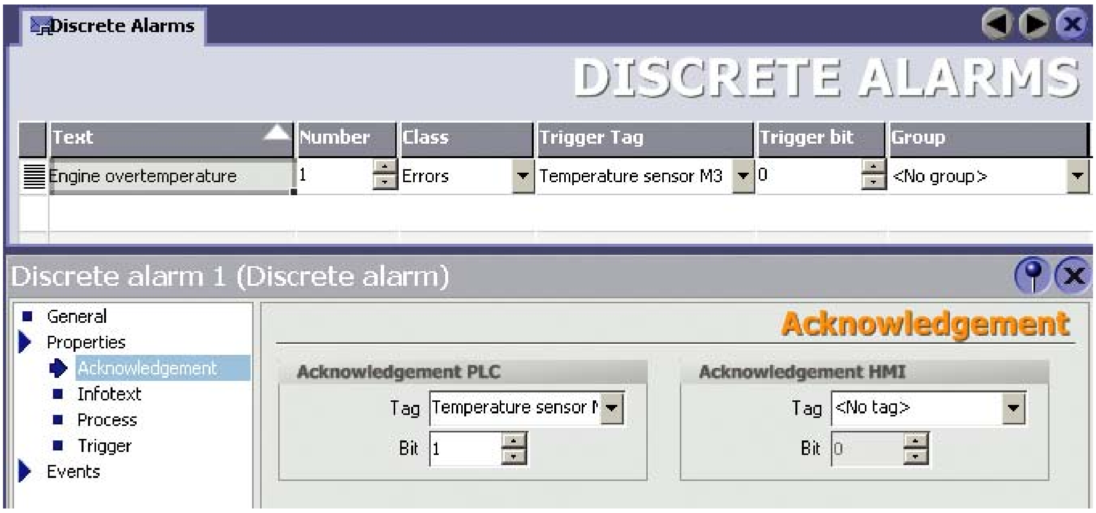
The only difference between discrete alarms and analog alarms is that you configure a limit value, rather than a bit number. The alarm is triggered when this limit is exceeded. The outgoing alarm is triggered when the low limit is violated, making allowances for any configured hysteresis.

8.3.4.4 Step 3: Configure the acknowledgment

Procedure

Create suitable tags on the PLC to acknowledge an error alarm. You assign these tags to an alarm in the "Bit messages" editor. You make the assignment in "Properties ▸ Acknowledgment."

The following figure shows the dialog for configuring an acknowledgment.



Text	Number	Class	Trigger Tag	Trigger bit	Group
Engine overtemperature	1	Errors	Temperature sensor M3	0	<No group>

Acknowledgement PLC
Tag: Temperature sensor M
Bit: 1

Acknowledgement HMI
Tag: <No tag>
Bit: 0

Distinction in terms of acknowledgment:

- Acknowledgment on the HMI device
- Acknowledgment by the PLC

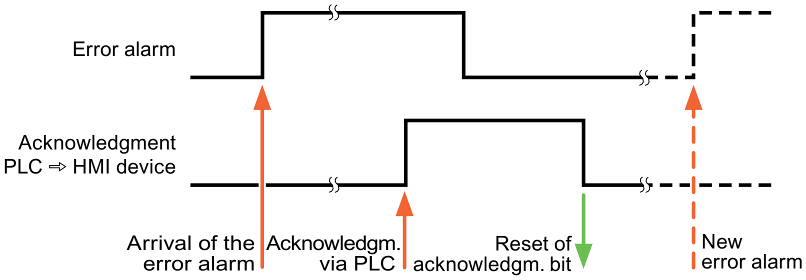
Acknowledgment by the PLC

In "Acknowledgment PLC tag", you configure the tag or the array tag and the bit number based on which the HMI device can recognize an acknowledgment by the PLC.

A bit set in the tag triggers acknowledgment of the assigned error alarm bit at the HMI device. This tag bit returns a function similar to acknowledgment on the HMI device which is triggered by pressing the "ACK" button, for example.

The acknowledgment bit must be located in the same tag as the bit for the error alarm.

Reset the acknowledgment bit before setting the bit in the alarm area again. The figure below shows the pulse diagram.



Acknowledgment on the HMI device

In "Ack read tag", you configure the tag or the array tag and the bit number that is written to the PLC after acknowledgment from the HMI device. Make sure when you use an array tag that it is not longer than 6 words.

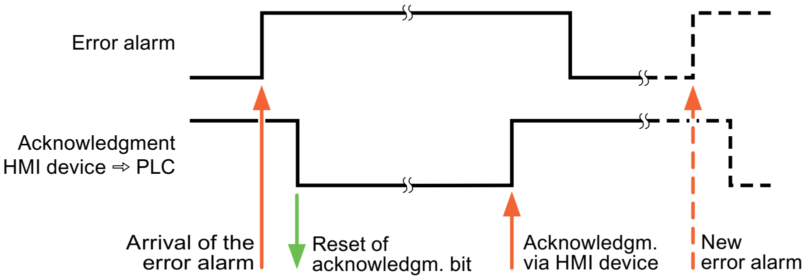
In order to ensure that a signal transition is generated as soon as the acknowledgment bit is set, the HMI device first resets the acknowledgment bit assigned to an error alarm. There is a certain time-based offset between these two operations, due to the processing time of the HMI device.

Note

The reset includes all alarm bits acknowledged since the last restart of Runtime. The PLC may only read this area once.

If the alarm is acknowledged on the HMI device, the bit is then set in the assigned acknowledgment tag on the PLC. This allows the PLC to recognize that the error alarm has been acknowledged.

The figure below shows the pulse diagram.



8.4 Commissioning components

8.4.1 Commissioning components

Transferring the PLC program to the PLC

1. Interconnect the PC with the CPU using the appropriate cable.
2. Download the program files to the CPU.
3. Then set the CPU to RUN.

Transferring project data to the HMI device

1. The HMI device must be in transfer mode in order to accept the project transfer.

   Possible scenarios:

   – Initial startup

     The HMI device does not yet contain any configuration data in the initial startup phase. The project data and runtime software required for operation must be transferred from the configuration computer to the device: The HMI device automatically changes to transfer mode.
     The transfer dialog box opens with a connection message on the HMI device.

   – Recommissioning

     Recommissioning means that you overwrite existing project data on the HMI device.

   For corresponding detailed instructions, refer to the HMI device manual.

2. Check whether the alarm settings meet requirements of your WinCC flexible project.
3. Select "Project > Transfer > Transfer settings" to configure the transfer parameters before you transfer project data to the HMI device:

   – Select the used port.

   – Set the transfer parameters.

   – Select the target storage location.

4. Initiate the transfer of project data by clicking "Transfer".

   – The project is compiled automatically.

   – All compilation and transfer steps are logged to a message window.

   Message output on the configuration computer on successful completion of the transfer: "Transfer completed successfully".

   The start screen appears on the HMI device.

Interconnecting the PLC with the HMI device

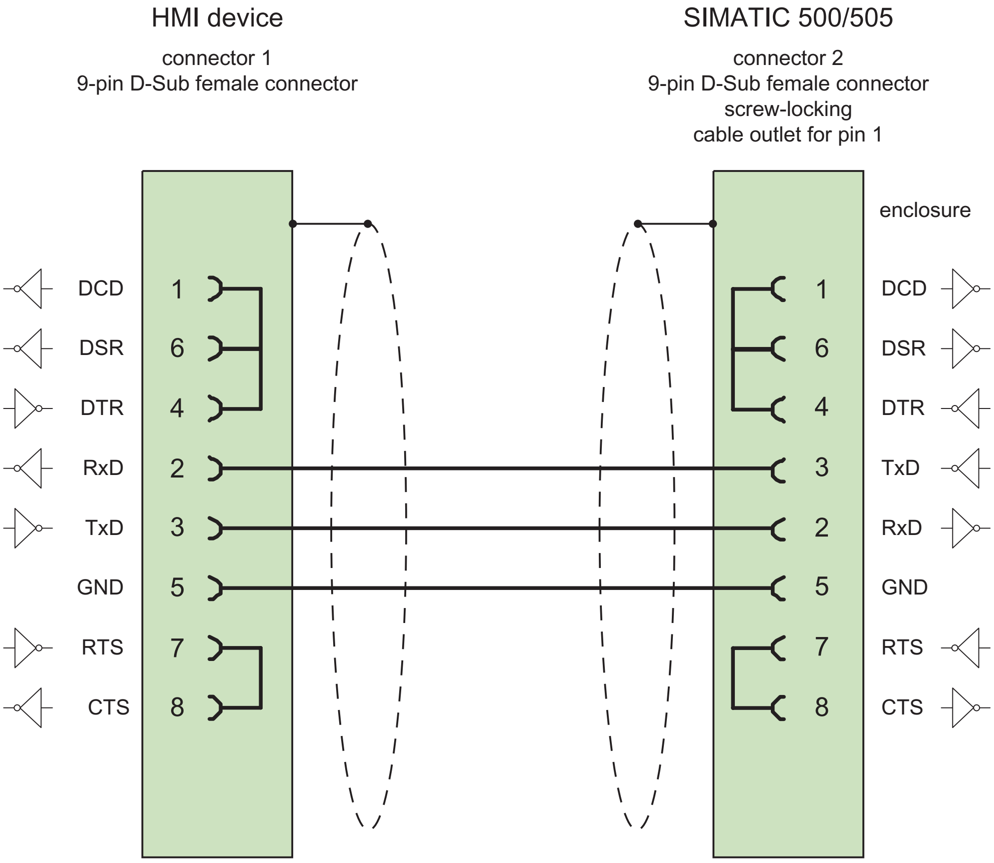
1. Interconnect the PLC with the HMI device using a suitable cable.
2. The message "Connection to PLC .... is established" is output to the HMI device. Note that users can edit the system alarm texts in WinCC flexible.

NOTICE
Always observe the safety-related information in the HMI device Manual when commissioning the device. RF radiation emitted from devices such as mobile phones may cause unwanted operating states.

8.5 Connecting cables for SIMATIC 500/505

8.5.1 Connecting cable PP1, RS-232, for SIMATIC 500/505

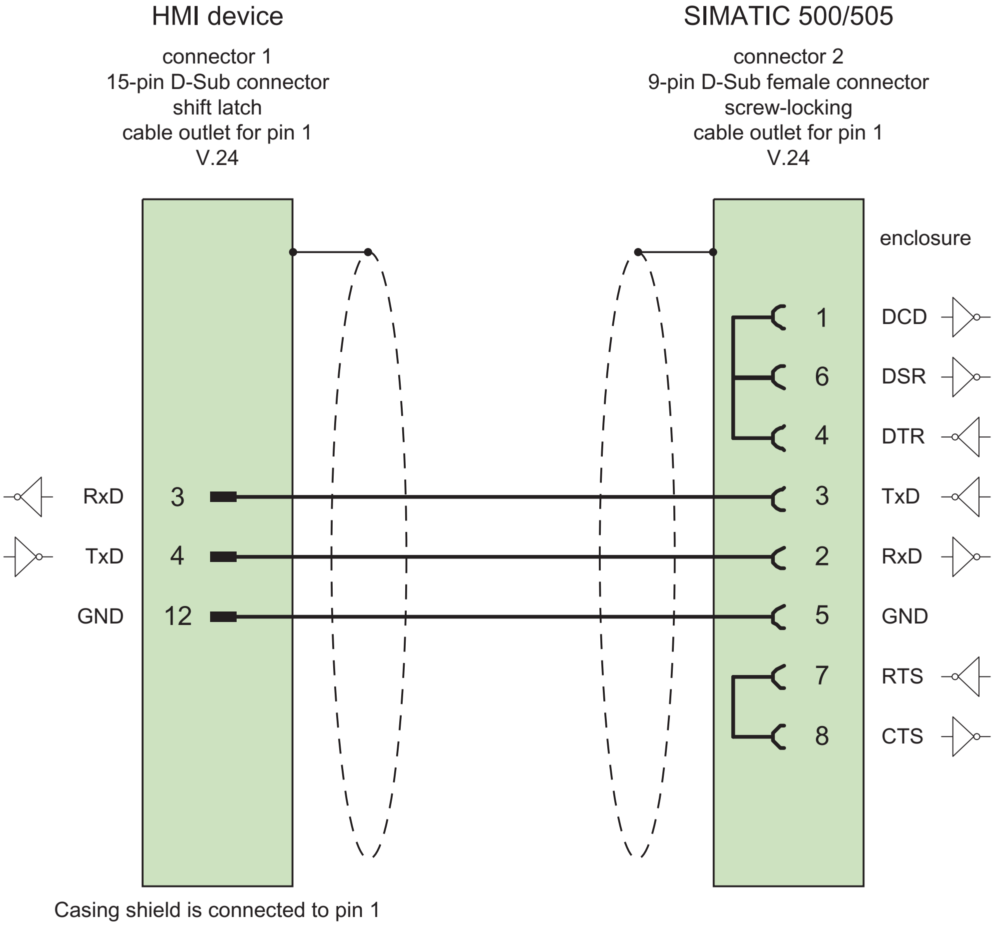
PP1 connecting cable



Shield with large-area contact to casing
Cable: 3 x 0.14 mm², shielded,
max. length 15 m

8.5.2 Connecting cable 6XV1440-2K, RS-232, for SIMATIC 500/505

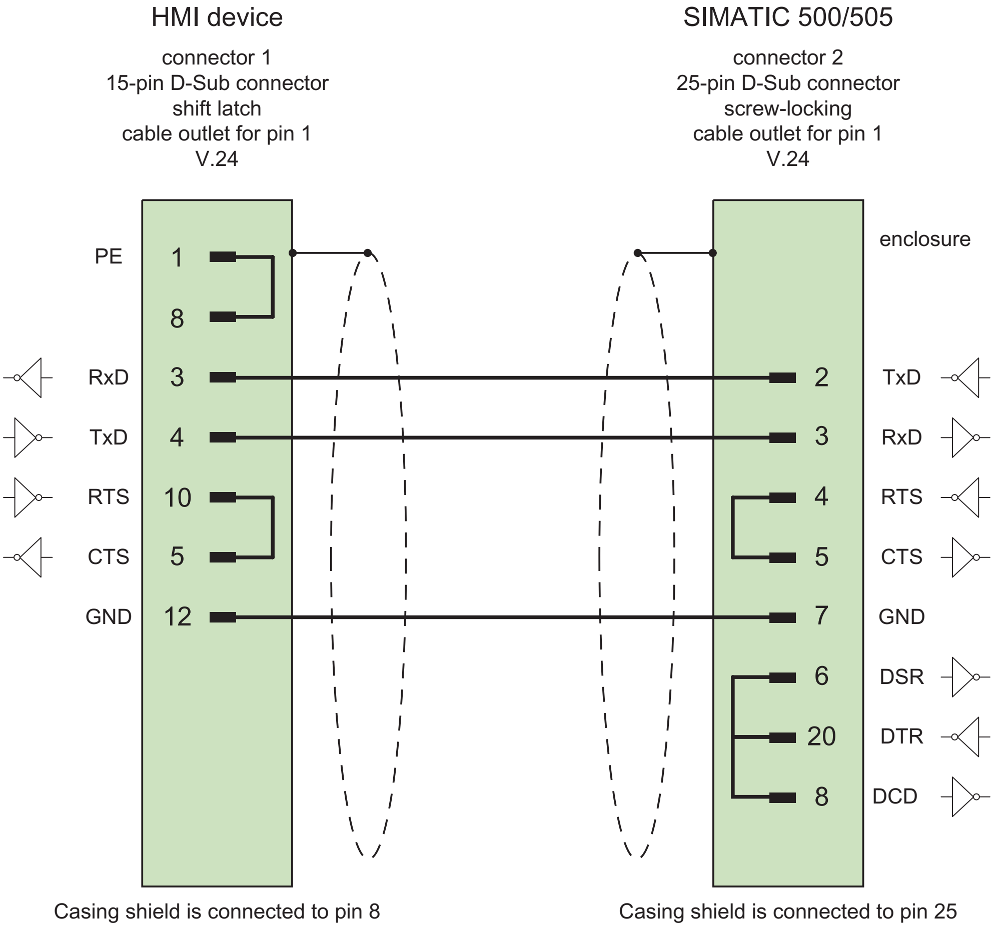
6XV1440-2K_ _ _



Shield with large-area contact to casing
Cable: 5 x 0.14 mm^2, shielded,
max. length 15 m

8.5.3 Connecting cable 6XV1440-2L, RS-232, for SIMATIC 500/505

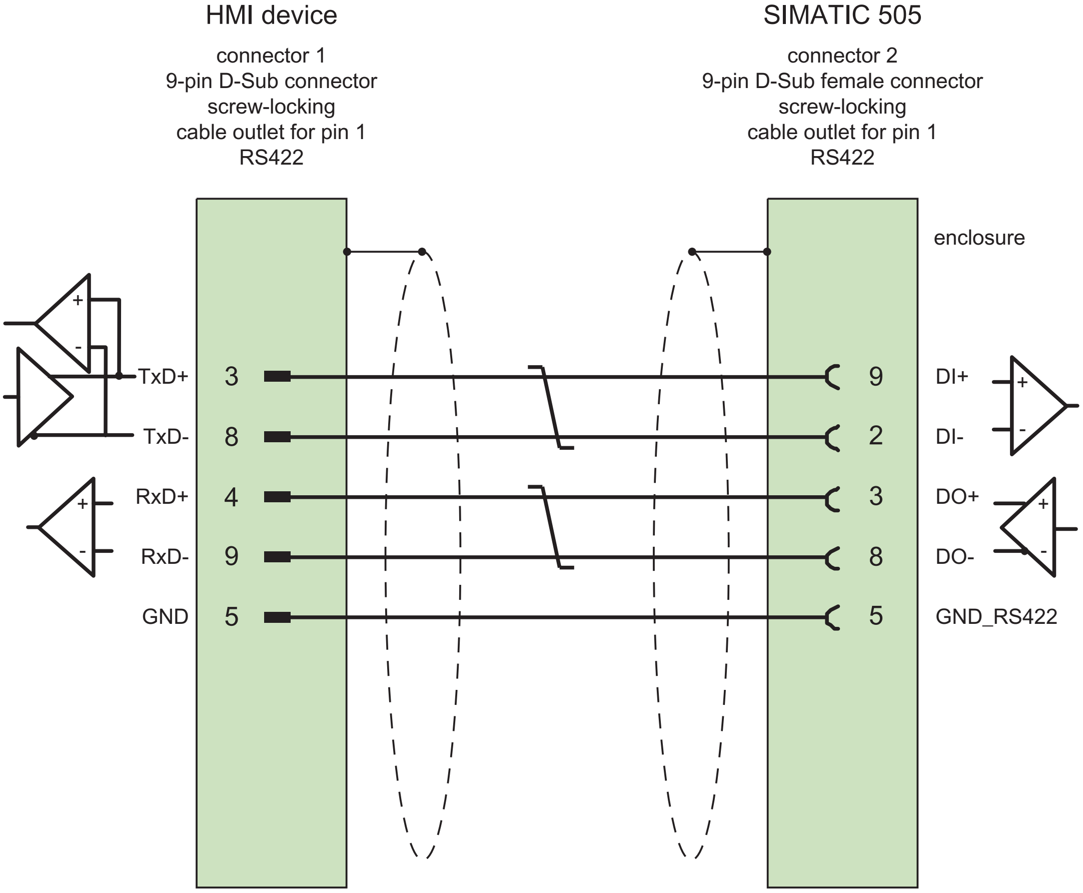
6XV1440-2L _ _ _



Shield with large-area contact to casing
Cable: 5 x 0.14 mm^2, shielded,
max. length 15 m

8.5.4 Connecting cable 6XV1440-1M, RS-422, for SIMATIC 505

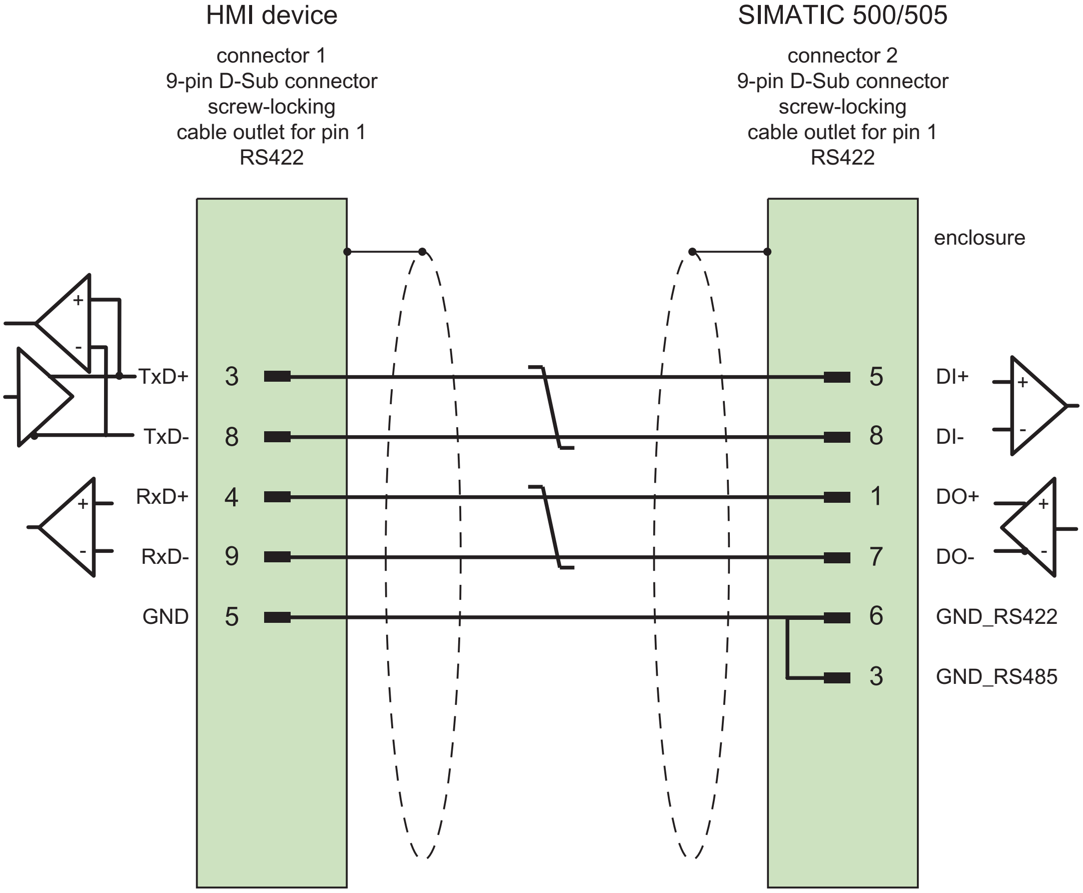
6XV1440-1M _ _ _ (PLC 545 / CPU 1102, PLC 555))



Shield with large-area contact to casing
Cable: 3 x 2 x 0.14 mm^2, shielded,
max. length 300 m

8.5.5 Connecting cable 6XV1440-2M, RS-422, for SIMATIC 500/505

6XV1440-2M _ _ _ (PLC 525, 545 / CPU 1101, PLC 565T)



Shield with large-area contact to casing
Cable: 3 x 2 x 0.14 mm^{2}, shielded,
max. length 300 m

Appendix 9

9.1 System alarms

Introduction

System alarms on the HMI device provide information about internal states of the HMI device and PLC.

The following overview shows the causes of system alarms and how to eliminate the cause of error.

Some of the system alarms described in this section are relevant to individual HMI devices based on their range of features.

Note

System alarms are only indicated if an alarm window was configured. System alarms are output in the language currently set on your HMI device.

System alarm parameters

System alarms may contain encrypted parameters which are relevant to troubleshooting because they provide a reference to the source code of the runtime software. These parameters are output after the text "Error code:"

Meaning of the system alarms

All the system alarms that can be displayed are listed below. The system alarms are divided into different ranges:

10000 - Printer alarms

Number	Effect/cause	Remedy
10000	The print job could not be started or was canceled due to an unknown error. Faulty printer setup. Or: No authorization is available for accessing the network printer. Power supply failure during data transfer.	Check the printer settings, cable connections and the power supply. Set up the printer once again. Obtain a network printer authorization. If the error persists, contact the Hotline!
10001	No printer is installed or a default printer has not been set up.	Install a printer and/or select it as the default printer.
10002	Overflow of the graphics buffer for printing. Up to two images are buffered.	Allow sufficient intervals between successive print jobs.
10003	Images can now be buffered again.	--
10004	Overflow of the buffer for printing lines in text mode (e.g. alarms). Up to 1000 lines are buffered.	Allow sufficient intervals between successive print jobs.
10005	Text lines can now be buffered again.	--
10006	The Windows printing system reports an error. Refer to the output text and the error ID to determine the possible causes. Nothing is printed or the print is faulty.	Repeat the action if necessary.

20000 - Global script alarms

Number	Effect/causes	Remedy
20010	An error has occurred in the specified script line. Execution of the script was therefore aborted. Note the system alarm that may have occurred prior to this.	Select the specified script line in the configuration. Ensure that the tags used are of the allowed types. Check system functions for the correct number and types of parameters.
20011	An error has occurred in a script that was called by the specified script. Execution of the script was therefore aborted in the called script. Note the system alarm that may have occurred prior to this.	In the configuration, select the script that has been called directly or indirectly by the specified script. Ensure that the tags used are of the allowed types. Check system functions for the correct number and types of parameters.
20012	The configuration data is inconsistent. The script could therefore not be generated.	Recompile the configuration.
20013	The scripting component of WinCC flexible Runtime is not correctly installed. Therefore, no scripts can be executed.	Reinstall WinCC flexible Runtime on your PC. Rebuild your project with "Project > Generator > Generate" and transfer the project to the HMI device.
20014	The system function returns a value that is not written in any return tag.	Select the specified script in the configuration. Check whether the script name has been assigned a value.

Number	Effect/causes	Remedy
20015	Too many successive scripts have been triggered in short intervals. When more than 20 scripts are queued for processing, any subsequent scripts are rejected. In this case, the script indicated in the alarm is not executed.	Find what is triggering the scripts. Extend the times, e.g. the polling time of the tags which trigger the scripts.

30000 - Alarms for IFwSetValue: SetValue()

Number	Effect/causes	Remedy
30010	The tag could not accept the function result, e.g. when it has exceeded the value range.	Check the tag type of the system function parameter.
30011	A system function could not be executed because the function was assigned an invalid value or type in the parameter.	Check the parameter value and tag type of the invalid parameter. If a tag is used as a parameter, check its value.
30012	A system function could not be executed because the function was assigned an invalid value or type in the parameter.	Check the parameter value and tag type of the invalid parameter. If a tag is used as a parameter, check its value.

40000 - Linear scaling alarms

Number	Effect/causes	Remedy
40010	The system function could not be executed since the parameters could not be converted to a common tag type.	Check the parameter types in the configuration.
40011	The system function could not be executed since the parameters could not be converted to a common tag type.	Check the parameter types in the configuration.

50000 - Data server alarms

Number	Effect/causes	Remedy
50000	The HMI device is receiving data faster than it is capable of processing. Therefore, no further data is accepted until all current data have been processed. Data exchange then resumes.	--
50001	Data exchange has been resumed.	--

60000 - Win32 function alarms

Number	Effect/causes	Remedy
60000	This alarm is generated by the “DisplaySystemAlarms” function. The text to be displayed is transferred to the function as a parameter.	--

Number	Effect/causes	Remedy
60010	The file could not be copied in the direction defined because one of the two files is currently open or the source/target path is not available. It is possible that the Windows user has no access rights to one of the two files.	Restart the system function or check the paths of the source/target files. Using Windows NT/XP: The user executing WinCC flexible Runtime must be granted access rights for the files.
60011	An attempt was made to copy a file to itself. It is possible that the Windows user has no access rights to one of the two files.	Check the path of the source/target file. Using Windows NT/XP with NTFS: The user executing WinCC flexible Runtime must be granted access rights for the files.

70000 - Win32 function alarms

Number	Effect/causes	Remedy
70010	The application could not be started because it could not be found in the path specified or there is insufficient memory space.	Check whether the application exists in the specified path or close other applications.
70011	The system time could not be modified. The error alarm only appears in connection with area pointer "Date/time PLC". Possible causes: • An invalid time was transferred in the job mailbox. • The Windows user has no right to modify the system time. If the first parameter in the system alarm is displayed with the value 13, the second parameter indicates the byte containing the incorrect value.	Check the time which is to be set. Using Windows NT/XP: The user executing WinCC flexible Runtime must be granted the right to change the system time of the operating system.
70012	An error occurred when executing the function "StopRuntime" with the option "Runtime and operating system". Windows and WinCC flexible Runtime are not closed. One possible cause is that other programs cannot be closed.	Close all programs currently running. Then close Windows.
70013	The system time could not be modified because an invalid value was entered. Incorrect separators may have been used.	Check the time which is to be set.
70014	The system time could not be modified. Possible causes: • An invalid time was transferred. • The Windows user has no right to modify the system time. Windows rejects the setting request.	Check the time which is to be set. Using Windows NT/XP: The user executing WinCC flexible Runtime must be granted the right to change the system time of the operating system.
70015	The system time could not be read because Windows rejects the reading function.	--

Number	Effect/causes	Remedy
70016	An attempt was made to select a screen by means of a system function or job. This is not possible because the screen number specified does not exist. Or: A screen could not be generated due to insufficient system memory. Or: The screen is blocked. Or: Screen call has not been executed correctly.	Check the screen number in the function or job with the screen numbers configured. Assign the number to a screen if necessary. Check the details for the screen call and whether the screen is blocked for specific users.
70017	Date/time is not read from the area pointer because the address set in the PLC is either not available or has not been set up.	Change the address or set up the address in the PLC.
70018	Acknowledgment that the password list has been successfully imported.	--
70019	Acknowledgment that the password list has been successfully exported.	--
70020	Acknowledgment for activation of alarm reporting.	--
70021	Acknowledgment for deactivation of alarm reporting.	--
70022	Acknowledgment to starting the Import Password List action.	--
70023	Acknowledgment to starting the Export Password List action.	--
70024	The value range of the tag has been exceeded in the system function. The calculation of the system function is not performed.	Check the desired calculation and correct it if necessary.
70025	The value range of the tag has been exceeded in the system function. The calculation of the system function is not performed.	Check the desired calculation and correct it if necessary.
70026	No other screens are stored in the internal screen memory. No other screens can be selected.	--
70027	The backup of the RAM file system has been started.	--
70028	The files from the RAM have been copied in the Flash memory. The files from the RAM have been copied in the Flash memory. Following a restart, these saved files are copied back to the RAM file system.	--
70029	Backup of the RAM file system has failed. No backup copy of the RAM file system has been made.	Check the settings in the "Control Panel > OP" dialog and save the RAM file system using the "Save Files" button in the "Persistent Storage" tab.
70030	The parameters configured for the system function are faulty. The connection to the new PLC was not established.	Compare the parameters configured for the system function with the parameters configured for the PLCs and correct them as necessary.
70031	The PLC configured in the system function is not an S7 PLC. The connection to the new PLC was not established.	Compare the S7 PLC name parameter configured for the system function with the parameters configured for the PLC and correct them as necessary.

Number	Effect/causes	Remedy
70032	The object configured with this number in the tab order is not available in the selected screen. The screen changes but the focus is set to the first object.	Check the number of the tab order and correct it if necessary.
70033	An e-mail cannot be sent because a TCP/IP connection to the SMTP server no longer exists. This system alarm is generated only at the first attempt. All subsequent unsuccessful attempts to send an e-mail will no longer generate a system alarm. The event is regenerated when an e-mail has been successfully sent in the meantime. The central e-mail component in WinCC flexible Runtime attempts, in regular intervals (1 minute), to establish the connection to the SMTP server and to send the remaining e-mails.	Check the network connection to the SMTP server and re-establish it if necessary.
70034	Following a disruption, the TCP/IP connection to the SMTP server could be re-established. The queued e-mails are then sent.	--
70036	No SMTP server for sending e-mails is configured. An attempt to connect to an SMTP server has failed and it is not possible to send e-mails. WinCC flexible Runtime generates the system alarm after the first attempt to send an e-mail.	Configure an SMTP server: In WinCC flexible Engineering System using "Device settings > Device settings" In the Windows CE operating system using "Control Panel > Internet Settings > E-mail > SMTP Server"
70037	An e-mail cannot be sent for unknown reasons. The contents of the e-mail are lost.	Check the e-mail parameters (recipient etc.).
70038	The SMTP server has rejected sending or forwarding an e-mail because the domain of the recipient is unknown to the server or because the SMTP server requires authentication. The contents of the e-mail are lost.	Check the domain of the recipient address or disable the authentication on the SMTP server if possible. SMTP authentication is currently not used in WinCC flexible Runtime.
70039	The syntax of the e-mail address is incorrect or contains illegal characters. The contents of the e-mail are discarded.	Check the e-mail address of the recipient.
70040	The syntax of the e-mail address is incorrect or contains illegal characters.	--
70041	The import of the user management was aborted due to an error. Nothing was imported.	Check your user management or transfer it again to the panel.
70042	The value range for the tags has been exceeded while executing the system function. The system function calculation has not been carried out.	Check the desired calculation and correct it if necessary.
70043	The value range for the tags has been exceeded while executing the system function. The system function calculation has not been carried out.	Check the desired calculation and correct it if necessary.

80000 - Archive alarms

Number	Effect/causes	Remedy
80001	The log specified is filled to the size defined (in percent) and must be stored elsewhere.	Store the file or table by executing a ‘move’ or ‘copy’ function.
80002	A line is missing in the specified log.	--
80003	The copying process for logging was not successful. In this case, it is advisable to check any subsequent system alarms, too.	--
80006	Since logging is not possible, this causes a permanent loss of the functionality.	In the case of databases, check whether the corresponding data source exists and start up the system again.
80009	A copying action has been completed successfully.	--
80010	Since the storage location was incorrectly entered in WinCC flexible, this causes a permanent loss of the functionality.	Configure the storage location for the respective log again and restart the system when the full functionality is required.
80012	Log entries are stored in a buffer. If the values are read to the buffer faster than they can be physically written (using a hard disk, for example), overloading may occur and recording is then stopped.	Archive fewer values. Or: Increase the logging cycle.
80013	The overload status no longer applies. Archiving resumes the recording of all values.	--
80014	The same action was triggered twice in quick succession. Since the process is already in operation, the action is only carried out once.	--
80015	This system alarm is used to report DOS or database errors to the user.	--
80016	The logs are separated by the system function "CloseAllLogs" and the incoming entries exceed the defined buffer size. All entries in the buffer are deleted.	Reconnect the logs.
80017	The number of incoming events cause a buffer overflow. This can be caused, for example, by several copying actions being activated at the same time. All copy jobs are deleted.	Stop the copy action.
80019	The connection between WinCC flexible and all logs were closed, for example, after executing the system function "CloseAllLogs". Entries are written to the buffer and are then written to the logs when a connection is re-established. There is no connection to the storage location and the storage medium may be replaced, for example.	--
80020	The maximum number of simultaneously copy operations has been exceeded. Copying is not executed.	Wait until the current copying actions have been completed, then restart the last copy action.
80021	An attempt was made to delete a log which is still busy with a copy action. Deletion has not been executed.	Wait until the current copying actions have been completed, then restart the last action.

Number	Effect/causes	Remedy
80022	An attempt was made to use the system function "StartSequenceLog" to start a sequence log for a log which is not configured as a sequence log. No sequence log file is created.	In the project, check • if the "StartSequenceLog" system function was properly configured. • if the tag parameters are properly provided with data on the HMI device.
80023	An attempt was made to copy a log to itself. The log is not copied.	In the project, check • if the "CopyLog" system function was properly configured. • if the tag parameters are properly provided with data on the HMI device.
80024	The "CopyLog" system function does not allow copying when the target log already contains data ("Mode" parameter). The log is not copied.	Edit the "CopyLog" system function in the project if necessary. Before you initiate the system function, delete the destination log file.
80025	You have canceled the copy operation. Data written up to this point are retained. The destination log file (if configured) is not deleted. The cancellation is reported by an error entry RT_ERR at the end of the destination log.	--
80026	This alarm is output after all logs are initialized. Values are written to the logs from then on. Prior to this, no entries are written to the logs, irrespective whether WinCC flexible Runtime is active or not.	--
80027	The internal Flash memory has been specified as the storage location for a log. This is not permissible. No values are written to this log and the log file is not created.	Configure "Storage Card" or a network path as the storage location.
80028	The alarm returns a status report indicating that the logs are currently being initialized. No values are logged until the alarm 80026 is output.	--
80029	The number of logs specified in the alarm could not be initialized. The logs are initialized. The faulty log files are not available for logging jobs.	Evaluate the additional system alarms related to this alarm. Check the configuration, the ODBC (Open Database Connectivity) and the specified drive.
80030	The structure of the existing log file does not match the expected structure. Logging is stopped for this log.	Delete the existing log data manually, in advance.
80031	The log in CSV format is corrupted. The log cannot be used.	Delete the faulty file.
80032	Logs can be assigned events. These are triggered as soon as the log is full. If WinCC flexible Runtime is started and the log is already full, the event is not triggered. The log specified no longer logs data because it is full.	Close WinCC flexible Runtime, delete the log, then restart WinCC flexible Runtime. Or: Configure a button which contains the same actions as the event and press it.
80033	"System Defined" is set in the data log file as the data source name. This causes an error. No data is written to the database logs, whereas the logging to the CSV logs works.	Reinstall SQL Sever 2005 Express.

Number	Effect/causes	Remedy
80034	An error has occurred in the initialization of the logs. An attempt has been made to create the tables as a backup. This action was successful. A backup has been made of the tables of the corrupted log file and the cleared log was restarted.	No action is necessary. However, it is recommended to save the backup files or delete them in order to make the space available again.
80035	An error has occurred in the initialization of the logs. An attempt has been made to create backups of the tables and this has failed. No logging or backup has been performed.	It is recommended to save the backups or to delete them in order to release memory.
80044	The export of a log was interrupted because Runtime was closed or due to a power failure. It was detected that the export needed to be resume when Runtime restarted.	The export resumes automatically.
80045	The export of a log was interrupted due to an error in the connection to the server or at the server itself.	The export is repeated automatically. Check: • The connection to the server. • If the server is running. • If there is enough free space on the server.
80046	The destination file could not be written while exporting the log.	Check whether there is enough space on the server and it you have permission to create the log file.
80047	The log could not be read while exporting it.	Check whether the storage medium is correctly inserted.
80049	The log could not be renamed while preparing to export it. The job can not be completed."	Check whether the storage medium is correctly inserted and if there is sufficient space on the medium.
80050	The log which shall be exported is not closed. The job can not be completed.	Make sure the "CloseAll Logs" system function is called before using the "ExportLog" system function. Change the configuration as required.

90000 - FDA alarms

Number	Effect/causes	Remedy
90024	No operator actions can be logged due to lack of space on the storage medium for log. The operator action will therefore not be executed.	Make more space available by inserting an empty storage medium or swapping out the log files on the server using "ExportLog".
90025	No user actions can be logged because of error state of the archive. Therefore the user action will not be executed.	Check whether the storage medium is correctly inserted.
90026	No operator actions can be logged because the log is closed. The operator action will therefore not be executed.	Before further operator actions are carried out, the log must be opened again using the system function "OpenAllLogs". Change the configuration as required.
90028	The password you entered is incorrect.	Enter the correct password.
90029	Runtime was closed during ongoing operation (perhaps due to a power failure) or a storage medium in use is incompatible with Audit Trail. An Audit Trail is not suitable if it belongs to another project or has already be archived.	Ensure that you are using the correct storage medium.
90030	Runtime was closed during ongoing operation (perhaps due to a power failure).	--

Number	Effect/causes	Remedy
90031	Runtime was closed during ongoing operation (perhaps due to a power failure).	--
90032	Running out of space on the storage medium for log.	Make more space available by inserting an empty storage medium or swapping out the log files on the server using "ExportLog".
90033	No more space on the storage medium for log. As of now, no more operator actions requiring logging will be executed.	Make more space available by inserting an empty storage medium or swapping out the log files on the server using "ExportLog".
90039	You do not have the necessary authorization to perform this action.	Adapt or upgrade your authorizations.
90040	Audit Trail is switched off because of a forced user action.	Activate the "Audit Trail" again using the system function "StartLog".
90041	A user action which has to be logged has been executed without a logged on user.	A user action requiring logging should only be possible with permission. Change the configuration by setting a required permission for the input object.
90044	A user action which has to be confirmed was blocked, because there is another user action pending.	Repeat the user action if necessary.

110000 - Offline function alarms

Number	Effect/causes	Remedy
110000	The operating mode was changed. "Offline" mode is now set.	--
110001	The operating mode was changed. "Online" mode is now set.	--
110002	The operating mode was not changed.	Check the connection to the PLCs. Check whether the address area for the area pointer 88 “Coordination" in the PLC is available.
110003	The operating mode of the specified PLC was changed by the system function "SetConnectionMode". The operating mode is now "offline".	--
110004	The operating mode of the specified PLC has been changed by the system function "SetConnectionMode". The operating mode is now "online".	--
110005	An attempt was made to use the system function SetConnectionMode to switch the specified PLC to "online" mode, although the entire system is in "offline" mode. This changeover is not allowed. The PLC remains in "offline" mode.	Switch the complete system to "online" mode, then execute the system function again.
110006	The content of the "project version" area pointer does not match the user version configured in WinCC flexible. WinCC flexible Runtime is therefore closed.	Check: • The project ID entered on the PLC. • The project ID entered in WinCC flexible.

120000 - Trend alarms

Number	Effect/causes	Remedy
120000	The trend is not displayed because you configured an incorrect axis to the trend or an incorrect trend.	Change the configuration.
120001	The trend is not displayed because you configured an incorrect axis to the trend or an incorrect trend.	Change the configuration.
120002	The trend is not displayed because the tag assigned attempts to access an invalid PLC address.	Check whether the data area for the tag exists in the PLC, the configured address is correct and the value range for the tag is correct.

130000 - System information alarms

Number	Effect/causes	Remedy
130000	The action was not executed.	Close all other programs. Delete files no longer required from the hard disk.
130001	The action was not executed.	Delete files no longer required from the hard disk.
130002	The action was not executed.	Close all other programs. Delete files no longer required from the hard disk.
130003	No data medium found. The operation is canceled.	Check, for example, if • The correct data medium is being accessed • The data medium is inserted
130004	The data medium is write-protected. The operation is canceled.	Check whether access has been made to the correct data carrier. Remove the write protection.
130005	The file is read only. The operation is canceled.	Check whether access has been made to the correct file. Edit the file attributes if necessary.
130006	Access to file failed. The operation is canceled.	Check, for example, if • The correct file is being accessed • The file exists • Another action is preventing simultaneous access to the file.
130007	The network connection is interrupted. Records cannot be saved or read over the network connection.	Check the network connection and eliminate the cause of error.
130008	The storage card is not available. Records cannot be saved to / read from the storage card.	Insert the storage card.
130009	The specified folder does not exist on the storage card. Any files saved to this directory are not backed up when you switch off the HMI device.	Insert the storage card.
130010	The maximum nesting depth can be exhausted when, for example, a value change in a script results in the call of another script and the second script in turn has a value change that results in the call of yet a further script etc. The configured functionality is not supported.	Check the configuration.

140000 - Connection alarms chns7: Connection + device

Number	Effect/causes	Remedy
140000	An online connection to the PLC is established.	--
140001	The online connection to the PLC was shut down.	--
140003	No tag updating or writing is executed.	Check the connection and if the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PG/PC interface". Restart the system.
140004	No tag update or write operations are executed because the access point or the module configuration is faulty.	Verify the connection and check whether the PLC is switched on. Check the access point or the module configuration (MPI, PPI, PROFIBUS) in the Control Panel with "Set PG/PC interface". Restart the system.
140005	No tag updating or writing is executed because the HMI device address is incorrect (possibly too high).	Use a different HMI device address. Verify the connection and check whether the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PG/PC interface". Restart the system.
140006	No tag updating or writing is executed because the baud rate is incorrect.	Select a different baud rate in WinCC flexible (according to module, profile, communication peer, etc.).
140007	Tags are not updated or written because the bus profile is incorrect (see %1). The following parameters could not be written to the registry: 1: Tslot 2: Tqui 3: Tset 4: MinTsdr 5: MaxTsdr 6: Trdy 7: Tid1 8: Tid2 9: Gap Factor 10: Retry Limit	Check the user-defined bus profile. Check the connection and if the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PG/PC interface". Restart the system.
140008	No tag updating or writing is executed because baud rate is incorrect. The following parameters could not be written to the registry: 0: General error 1: Wrong version 2: Profile cannot be written to the registry. 3: The subnet type cannot be written to the registry. 4: The Target Rotation Time cannot be written to the registry. 5: Faulty Highest Address (HSA).	Check the connection and if the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PG/PC interface". Restart the system.
140009	Tags are not updated or written because the module for S7 communication was not found.	Reinstall the module in the Control Panel using "Set PG/PC interface".

Number	Effect/causes	Remedy
140010	No S7 communication partner found because the PLC is shut down. DP/T: The option “PG/PC is the only master” is not set in the Control Panel under “Set PG/PC interface.”	Switch the PLC on. DP/T: If only one master is connected to the network, disable "PG/PC is the only master" in "Set PG/PC interface". If several masters are connected to the network, enable these. Do not change any settings, for this will cause bus errors.
140011	No tag updating or writing is executed because communication is down.	Check the connection and that the communication partner is switched on.
140012	There is an initialization problem (e.g. when WinCC flexible Runtime was closed in Task Manager). Or: Another application (e.g.STEP7) with different bus parameters is active and the driver cannot be started with the new bus parameters (transmission rate, for example).	Restart the HMI device. Or: Run WinCC flexible Runtime, then start your other applications.
140013	The MPI cable is disconnected and, thus, there is no power supply.	Check the connections.
140014	The configured bus address is in already in use by another application.	Edit the HMI device address in the PLC configuration.
140015	Wrong transmission rate Or: Faulty bus parameters (e.g. HSA) Or: OP address > HSA or: Wrong interrupt vector (interrupt does not arrive at the driver)	Correct the relevant parameters.
140016	The hardware does not support the configured interrupt.	Change the interrupt number.
140017	The set interrupt is in use by another driver.	Change the interrupt number.
140018	The consistency check was disabled by SIMOTION Scout. Only a corresponding note appears.	Enable the consistency check with SIMOTION Scout and once again download the project to the PLC.
140019	SIMOTION Scout is downloading a new project to the PLC. Connection to the PLC is canceled.	Wait until the end of the reconfiguration.
140020	The version in the PLC and that of the project (FWX file) do not match. Connection to the PLC is canceled.	The following remedies are available: Download the current version to the PLC using SIMOTION Scout. Regenerate the project using WinCC flexible ES, close WinCC flexible Runtime and restart with a new configuration.

150000 - Connection alarms chnAS511: Connection

Number	Effect/causes	Remedy
150000	No more data is read or written. Possible causes: • The cable is defective. • The PLC does not respond, is defective, etc. • The wrong port is used for the connection. • System overload	Ensure that the cable is plugged in, the PLC is operational, the correct port is being used. Restart the system if the system alarm persists.
150001	Connection is up because the cause of the interruption has been eliminated.	--

160000 - Connection alarms IVar (WinLC) / OPC: Connection

Number	Effect/causes	Remedy
160000	No more data is read or written. Possible causes: • The cable is defective. • The PLC does not respond, is defective, etc. • The wrong port is used for the connection. • System overload	Ensure that the cable is plugged in, the PLC is operational, the correct port is being used. Restart the system if the system alarm persists.
160001	Connection is up because the cause of the interruption has been eliminated.	--
160010	No connection to the server because the server identification (CLS-ID) cannot be determined. Values cannot be read or written.	Check access rights.
160011	No connection to the server because the server identification (CLS-ID) cannot be determined. Values cannot be read or written.	Check, for example, if • The server name is correct. • The computer name is correct. • The server is registered.
160012	No connection to the server because the server identification (CLS-ID) cannot be determined. Values cannot be read or written.	Check, for example, if • The server name is correct. • The computer name is correct. • The server is registered. Note for advanced users: Interpret the value from HRESULT.
160013	The specified server was started as InProc server. This has not been released and may possibly lead to incorrect behavior because the server is running in the same process area as the WinCC flexible Runtime software.	Configure the server as OutProc Server or Local Server.
160014	Only one OPC server project can be started on a PC/MP. An alarm is output when an attempt is made to start a second project. The second project has no OPC server functionality and cannot be located as an OPC server by external sources.	Do not start a second project with OPC server functionality on the computer.

170000 - S7 dialog alarms

Number	Effect/causes	Remedy
170000	S7 diagnostics events are not indicated because it is not possible to log on to the S7 diagnostics functions at this device. The service is not supported.	--
170001	The S7 diagnostics buffer cannot be viewed because communication with the PLC is shut down.	Set the PLC to online mode.
170002	The S7 diagnostics buffer cannot be viewed because reading of the diagnostics buffer (SSL) was canceled with error.	--
170003	An S7 diagnostics event cannot be visualized. The system returns internal error %2.	--
170004	An S7 diagnostics event cannot be visualized. The system returns an internal error of error class %2, error number %3.	--
170007	It is not possible to read the S7 diagnostics buffer (SSL) because this operation was canceled with an internal error of class %2 and error code %3.	--

180000 - Misc/common alarms

Number	Effect/causes	Remedy
180000	A component/OCX received configuration data with a version ID which is not supported.	Install a newer component.
180001	System overload because too many actions running in parallel. Not all the actions can be executed, some are rejected.	Several remedies are available: • Generate the alarms at a slower rate (polling). • Initiate scripts and functions at greater intervals. If the alarm appears more frequently: Restart the HMI device.
180002	The screen keyboard could not be activated. Possible causes: "TouchInputPC.exe" was not registered due to a faulty Setup.	Reinstall WinCC flexible Runtime.

190000 - Tag alarms

Number	Effect/causes	Remedy
190000	It is possible that the tag is not updated.	--
190001	The tag is updated after the cause of the last error state has been eliminated (return to normal operation).	--
190002	The tag is not updated because communication with the PLC is down.	Select the system function "SetOnline" to go online.
190004	The tag is not updated because the configured tag address does not exist.	Check the configuration.

Number	Effect/causes	Remedy
190005	The tag is not updated because the configured PLC type does not exist for this tag.	Check the configuration.
190006	The tag is not updated because it is not possible to map the PLC type in the data type of the tag.	Check the configuration.
190007	The tag value is not modified because the connection to the PLC is interrupted or the tag is offline.	Set online mode or reconnect to the PLC.
190008	The threshold values configured for the tag have been violated, for example, by • A value entered • A system function • A script	Observe the configured or current threshold values of the tag.
190009	An attempt has been made to assign the tag a value which is outside the permitted range of values for this data type. For example, a value of 260 was entered for a byte tag or a value of -3 for an unsigned word tag.	Observe the range of values for the data type of the tags.
190010	Too many values are written to the tag (for example, in a loop triggered by a script). Values are lost because only up to 100 actions are saved to the buffer.	The following remedies are available: • Increase the time interval between multiple write actions. • Do not use an array tag longer than 6 words when you configure an acknowledgment on the HMI device using "Acknowledgment HMI".
190011	Possible cause 1: The value entered could not be written to the configured PLC tag because the high or low limit was exceeded. The system discards the entry and restores the original value. Possible cause 2: The connection to the PLC was interrupted.	Make sure that the value entered lies within the range of values of the control tags. Check the connection to the PLC.
190012	It is not possible to convert a value from a source format to a target format, for example: An attempt is being made to assign a value to a counter that is outside the valid, PLC-specific value range. A tag of the type Integer should be assigned a value of the type String.	Check the range of values or the data type of the tags.
190013	The user has entered a string that is longer than the tag. The string is automatically shortened to the permitted length.	Only enter strings that do not exceed the permitted tag length.

190100 - Area pointer alarms

Number	Effect/causes	Remedy
190100	The area pointer is not updated because the address configured for this pointer does not exist. Type 1 Warnings 2 Errors 3 PLC acknowledgment 4 HMI device acknowledgment 5 LED mapping 6 Trend request 7 Trend transfer 1 8 Trend transfer 2 No.: Consecutive number displayed in WinCC flexible ES.	Check the configuration.
190101	The area pointer is not updated because it is not possible to map the PLC type to the area pointer type. Parameter type and no.: see alarm 190100	--
190102	The area pointer is updated after the cause of the last error state has been eliminated (return to normal operation). Parameter type and no.: See alarm 190100.	--

200000 - PLC coordination alarms

Number	Effect/causes	Remedy
200000	Coordination is not executed because the address configured in the PLC does not exist/is not set.	Change the address or set up the address in the PLC.
200001	Coordination is canceled because the write access to the address configured in the PLC is not possible.	Change the address or set the address in the PLC at an area which allows write access.
200002	Coordination is not carried out at the moment because the address format of the area pointer does not match the internal storage format.	Internal error
200003	Coordination can be executed again because the last error state is eliminated (return to normal operation).	--
200004	The coordination may not be executed.	--
200005	No more data is read or written. Possible causes: • The cable is defective. • The PLC does not respond, is defective, etc. • System overload	Ensure that the cable is plugged in and the PLC is operational. Restart the system if the system alarm persists.

200100 - PLC user version alarms

Number	Effect/causes	Remedy
200100	Coordination is not executed because the address configured in the PLC does not exist/is not set.	Change the address or set up the address in the PLC.
200101	Coordination is canceled because the write access to the address configured in the PLC is not possible.	Change the address or set the address in the PLC at an area which allows write access.
200102	Coordination is not carried out at the moment because the address format of the area pointer does not match the internal storage format.	Internal error
200103	Coordination can be executed again because the last error state is eliminated (return to normal operation).	--
200104	The coordination may not be executed.	--
200105	No more data is read or written. Possible causes: • The cable is defective. • The PLC does not respond, is defective, etc. • System overload	Ensure that the cable is plugged in and the PLC is operational. Restart the system if the system alarm persists.

210000 - PLC job alarms

Number	Effect/causes	Remedy
210000	Jobs are not processed because the address configured in the PLC does not exist/has not been set up.	Change the address or set up the address in the PLC.
210001	Jobs are not processed because read/write access to the address configured in the PLC is not possible.	Change the address or set up the address in the PLC in an area which allows read/write access.
210002	Jobs are not executed because the address format of the area pointer does not match the internal storage format.	Internal error
210003	The job buffer is processed again because the last error status has been eliminated (return to normal operation).	--
210004	It is possible that the job buffer will not be processed.	--
210005	A control request with an illegal number was initiated.	Check the PLC program.
210006	An error occurred while attempting to execute the control request. As a result, the control request is not executed. Observe the next/previous system alarms.	Check the parameters of the control request. Recompile the configuration.

220000 - WinCC channel adapter alarms

Number	Effect/causes	Remedy
220001	The tag is not downloaded because the associated communication driver / HMI device does not support the download of Boolean/discrete data types.	Change the configuration.
220002	The tag is not downloaded because the associated communication driver / HMI device does not support write access to the data type BYTE.	Change the configuration.

Number	Effect/causes	Remedy
220003	The communication driver cannot be loaded. The driver may not be installed.	Install the driver by reinstalling WinCC flexible Runtime.
220004	Communication is down and no update data is transferred because the cable is not connected or defective etc.	Check the connection.
220005	Communication is up.	--
220006	The connection between the specified PLC and the specified port is active.	--
220007	The connection to the specified PLC is interrupted at the specified port.	Check whether • The cable is plugged in • The PLC is OK • The correct port is used • Your configuration is OK (port parameters, protocol settings, PLC address). Restart the system if the system alarm persists.
220008	The communication driver cannot access or open the specified port. The port may be in use by another application or the port used is not available on the destination device. There is no communication with the PLC.	Close all the applications which access this port and restart the computer. Use another port of the system.

230000 - View alarms

Number	Effect/causes	Remedy
230000	The value entered could not be accepted. The system discards the entry and restores the previous value. Either • The value range has been exceeded • Illegal characters have been entered • The maximum permitted number of users has been exceeded.	Enter a practical value or delete any unneeded users.
230002	The currently logged in user has not the required authorization. The system therefore discards the input and restored the previous value.	Log on as a user with appropriate authorization.
230003	Changeover to the specified screen failed because the screen is not available/configured. The current screen remains selected.	Configure the screen and check the screen selection function.
230005	The value range of the tag has been exceeded in the I/O field. The original value of the tag is retained.	Observe the range of values for the tag when entering a value.
230100	During navigation in the web browser, the system returned a message which may be of interest to the user. The web browser continues to run but may not (fully) show the new page.	Navigate to another page.
230200	The connection to the HTTP channel was interrupted due to an error. This error is explained in detail by another system alarm. Data is no longer exchanged.	Check the network connection. Check the server configuration.

Number	Effect/causes	Remedy
230201	The connection to HTTP channel was established. Data is exchanged.	--
230202	WININET.DLL has detected an error. This error is usually generated if it is not possible to connect to the server or if the server denies access because the client could not authenticate itself. A rejected server certificate could also cause a communication error in secure SSL connections. For details, refer to the error text in the alarm. This text is always output in the language of your Windows installation, as it is returned by the Windows operating system. Process values are not exchanged. The part of the alarm which is returned by the Windows operating system may not be displayed, for example "An error has occurred." WININET.DLL returns the following error: Number: 12055 Text:HTTP: <no error text available>."	Depending on the cause: When an attempt to connect fails or a timeout error occurs: • Check the network connection and the network. • Check the server address. • Check whether the WebServer is actually running on the destination station. Faulty authorization: • The configured user name and/or password do not match those on the server. Establish consistency When the server certificate is rejected: Certificate signed by an unknown CA ( ): • Either ignore this item in your project, or • Install a certificate that has been signed with a root certificate known to the client computer. The date of the certificate is invalid: • Either ignore this item in your project, or • Install a certificate with a valid date on the server. Invalid CN (Common Name or Computer Name): • Either ignore this item in your project, or • Install a certificate with a name that corresponds to that of the server address.
230203	Although a connection can be made to the server, the HTTP server refuses to connect because • WinCC flexible Runtime is not running on the server, or • The HTTP channel is not supported (503 Service unavailable). Other errors can only occur if the Webserver does not support the HTTP channel. The language of the alarm text depends on the Webserver. Data is not exchanged.	Error 503 Service unavailable: Check that WinCC flexible Runtime is running on the server and the HTTP channel is supported.
230301	An internal error has occurred. An English text explains the error in more detail. This may be caused by insufficient memory. OCX does not work.	--
230302	The name of the remote server cannot be resolved. The attempt to connect failed.	Check the configured server address. Check whether the DNS service is available on the network.
230303	The remote server is not running on the addressed computer. Wrong server address. The attempt to connect failed.	Check the configured server address. Check whether the remote server is running on the target computer.
230304	The remote server on the addressed computer is incompatible with VNCOCX. The attempt to connect failed.	Use a compatible remote server.

Number	Effect/causes	Remedy
230305	The authentication has failed because the password is incorrect. The attempt to connect failed.	Configure the correct password.
230306	Error in the connection to the remote server. This may occur as a result of network problems. The attempt to connect failed.	Check whether • The bus cable is plugged in • There are network problems.
230307	The connection to the remote server was shut down because • The remote server was shut down, or • The user instructed the server to close all connections. The connection is closed.	--
230308	This alarm provides information on the connection status. An attempt is made to connect.	--

240000 - Authorization alarms

Number	Effect/causes	Remedy
240000	WinCC flexible Runtime is operating in demo mode. You have no authorization or your authorization is corrupted.	Install the authorization.
240001	WinCC flexible Runtime is operating in demo mode. Too many tags are configured for the installed version.	Load an adequate authorization / powerpack.
240002	WinCC flexible Runtime is operating with a time-limited emergency authorization.	Restore the full authorization.
240004	Error while reading the emergency authorization. WinCC flexible Runtime is operating in demo mode.	Restart WinCC flexible Runtime, install the authorization or repair the authorization (see Commissioning Instructions Software Protection).
240005	The Automation License Manager has detected an internal system fault. Possible causes: • A corrupt file • A defective installation • No free space for the Automation License Manager etc.	Reboot the HMI device or PC. If this does not solve the problem, remove the Automation License Manager and install it again.

250000 - S7 Force alarms

Number	Effect/causes	Remedy
250000	The tag in the specified line in "Status Force" is not updated because the address configured for this tag is not available.	Check the set address and then verify that the address is set up in the PLC.
250001	The tag in the specified line in "Status Force" is not updated because the PLC type configured for this tag does not exist.	Check the set address.

Number	Effect/causes	Remedy
250002	The tag in the specified line in "Status Force" is not updated because it is not possible to map the PLC type in the tag type.	Check the set address.
250003	An attempt to connect to the PLC failed. The tags are not updated.	Check the connection to the PLC. Check that the PLC is switched on and is online.

260000 - Password system alarms

Number	Effect/causes	Remedy
260000	An unknown user or an unknown password has been entered in the system. The current user is logged off from the system.	Log on to the system as a user with a valid password.
260001	The logged in user does not have sufficient authorization to execute the protected functions on the system.	Log on to the system as a user with sufficient authorization.
260002	This alarm is triggered by the system function "TrackUserChange".	--
260003	The user has logged off from the system.	--
260004	The user name entered into the user view already exists in the user management.	Select another user name because user names have to be unique in the user management.
260005	The entry is discarded.	Enter a shorter user name.
260006	The entry is discarded.	Use a shorter or longer password.
260007	The logon timeout value entered is outside the valid range of 0 to 60 minutes. The new value is discarded and the original value is retained.	Enter a logon timeout value between 0 and 60 minutes.
260008	An attempt was made to read a PTProRun.pwl file created with ProTool V 6.0 in WinCC flexible. Reading the file was canceled due to incompatibility of the format.	--
260009	You have attempted to delete the user "Admin" or "PLC User". These users are fixed components of the user management and cannot be deleted.	If you need to delete a user, because perhaps you have exceeded the maximum number permitted, delete another user.
260012	The passwords entered in the "Change Password" dialog and the confirmation field are not identical. The password has not been changed. User will be logged off.	You have to log on to the system again. Then enter the identical password twice to be able to change the password.
260013	The password entered in the "Change Password" dialog is invalid because it is already in use. The password has not been changed. User will be logged off.	You have to log on to the system again. Then enter a new password that has not been used before.
260014	You have tried unsuccessfully to log on three times in succession. You will be locked out and assigned to group no. 0.	You can log on to the system with your correct password. Only an administrator can change the assignment to a group.
260023	The password you entered does not meet the necessary security guidelines.	Enter a password that contains at least one number.
260024	The password you entered does not meet the necessary security guidelines.	Enter a password that contains at least one character.

Number	Effect/causes	Remedy
260025	The password you entered does not meet the necessary security guidelines.	Enter a password that contains at least one special character.
260028	Upon system start-up, an attempt to log on, or when trying to change the password of a SIMATIC log-on user, the system attempts to access the SIMATIC Logon Server. If attempting to log on, the new user is not logged in. If a different user was logged on before, then this user is logged off.	Check the connection to the SIMATIC Logon Server and its configuration; for example: 1. Port number 2. IP address 3. Server name 4. Functional transfer cable Or use a local user.
260029	The SIMATIC Logon user is not associated to any or several groups. The new user is not logged in. If a different user was logged on before, then this user is logged off.	Check the user data on the SIMATIC Logon Server and the configuration in your WinCC flexible project. A user may only be assigned to one group.
260030	The SIMATIC Logon user could not change his password on the SIMATIC Logon Server. The new password may not comply with the password regulations on the server or the user does not have the right to change his password. The old password remains and the user is logged off.	Log in again and choose a different password. Check the password rules on the SIMATIC Logon Server.
260031	It was not possible to log the user on to the SIMATIC Logon Server. The user name or the password could be incorrect or the user does not have sufficient rights to log on. The new user is not logged in. If a different user was logged on before, then this user is logged off.	Try again. If necessary, check the password data on the SIMATIC Logon Server.
260032	It was not possible to log the user on to the SIMATIC Logon Server as his account is blocked. The new user is not logged in. If a different user was logged on before, then this user is logged off.	Check the user data on the SIMATIC Logon Server.
260033	The action change password or log on user could not be carried out.	Check the connection to the SIMATIC Logon Server and its configuration; for example: 1. Port number 2. IP address 3. Server name 4. Functional transfer cable Or use a local user.
260034	The last logon operation has not yet ended. A user action or a logon dialog can therefore not be called. The logon dialog is not opened. The user action is not executed.	Wait until the logon operation is complete.
260035	The last attempt to change the password was not completed. A user action or a logon dialog can therefore not be called. The logon dialog is not opened. The user action is not executed.	Wait until the procedure is complete.
260036	There are insufficient licenses on the SIMATIC Logon Sever. The logon is not authorized.	Check the licensing on the SIMATIC Logon Server.

Number	Effect/causes	Remedy
260037	There is no license on the SIMATIC Logon Sever. A logon is not possible. It is not possible to log on via the SIMATIC Logon Server, only via a local user.	Check the licensing on the SIMATIC Logon Server.
260040	The system attempts to access the SIMATIC Logon Server upon system start-up or when trying to change the password. If attempting to log on, the new user is not logged in. If a different user was logged on before, then this user is logged off.	Check connection to the domain and its configuration in the Runtime security settings editor. Or use a local user.

270000 - System alarms

Number	Effect/causes	Remedy
270000	A tag is not indicated in the alarm because it attempts to access an invalid address in the PLC.	Check whether the data area for the tag exists in the PLC, the configured address is correct and the value range for the tag is correct.
270001	There is a device-specific limit as to how many alarms may be queued for output (see the operating instructions). This limit has been exceeded. The view no longer contains all the alarms. However, all alarms are written to the alarm buffer.	--
270002	The view shows alarms of a log for which there is no data in the current project. Wildcards are output for the alarms.	Delete older log data if necessary.
270003	The service cannot be set up because too many devices want to use this service. A maximum of four devices may execute this action.	Reduce the number of HMI devices which want to use the service.
270004	Access to persistent buffer is not possible. Alarms cannot be restored or saved.	If the problems persist at the next startup, contact Customer Support (delete Flash).
270005	Persistent buffer damaged: Alarms cannot be restored.	If the problems persist at the next startup, contact Customer Support (delete Flash).
270006	Project modified: Alarms cannot be restored from the persistent buffer.	The project was generated and transferred new to the HMI device; The error should no longer occur when the device starts again.
270007	A configuration problem is preventing the restore (a DLL is missing, a directory is unknown, etc.).	Update the operating system and then transfer your project again to the HMI device.

280000 - DPHMI alarms Connection

Number	Effect/causes	Remedy
280000	Connection is up because the cause of the interruption has been eliminated.	--

Number	Effect/causes	Remedy
280001	No more data is read or written. Possible causes: • The cable is defective • The PLC does not respond, is defective, etc. • The wrong port is used for the connection • System overload	Check whether • The cable is plugged in • The PLC is OK • The correct port is used. Restart the system if the system alarm persists.
280002	The connection used requires a function block in the PLC. The function block has responded. Communication is now enabled.	--
280003	The connection used requires a function block in the PLC. The function block has not responded.	Check whether • The cable is plugged in • The PLC is OK • The correct port is used. Restart the system if the system alarm persists. Remedy depends on the error code: 1: The function block must set the COM bit in the response container. 2: The function block must not set the ERROR bit in the response container. 3: The function block must respond within the specified time (timeout). 4: Go online to the PLC.
280004	The connection to the PLC is interrupted. There is no data exchange at present.	Check the connection parameters in WinCC flexible. Ensure that the cable is plugged in, the PLC is operational, the correct port is being used. Restart the system if the system alarm persists.

290000 - Recipe system alarms

Number	Effect/causes	Remedy
290000	The recipe tag could not be read or written. It is assigned the start value. The alarm can be entered in the alarm buffer for up to four more failed tags if necessary. After that, alarm 290003 is output.	Check in the configuration that the address has been set up in the PLC.
290001	An attempt has been made to assign a value to a recipe tag which is outside the value range permitted for this type. The alarm can be entered in the alarm buffer for up to four more failed tags if necessary. After that, alarm 290004 is output.	Observe the value range for the tag type.
290002	It is not possible to convert a value from a source format to a target format. The alarm can be entered in the alarm buffer for up to four more failed recipe tags if necessary. After that, alarm 290005 is output.	Check the value range or type of the tag.
290003	This alarm is output when alarm number 290000 is triggered more than five times. In this case, no further separate alarms are generated.	Check in the configuration that the tag addresses have been set up in the PLC.

Number	Effect/causes	Remedy
290004	This alarm is output when alarm number 290001 is triggered more than five times. In this case, no further separate alarms are generated.	Observe the value range for the tag type.
290005	This alarm is output when alarm number 290002 is triggered more than five times. In this case, no further separate alarms are generated.	Check the value range or type of the tag.
290006	The threshold values configured for the tag have been violated by values entered.	Observe the configured or current threshold values of the tag.
290007	There is a difference between the source and target structure of the recipe currently being processed. The target structure contains an additional data recipe tag which is not available in the source structure. The data recipe tag specified is assigned its start value.	Insert the specified data recipe tag in the source structure.
290008	There is a difference between the source and target structure of the recipe currently being processed. The source structure contains an additional data recipe tag which is not available in the target structure and therefore cannot be assigned. The value is rejected.	Remove the specified data recipe tag in the specified recipe from the project.
290010	The storage location configured for the recipe is not permitted. Possible causes: Illegal characters, write protection, data carrier out of space or does not exist.	Check the configured storage location.
290011	The record with the specified number does not exist.	Check the source for the number (constant or tag value).
290012	The recipe with the specified number does not exist.	Check the source for the number (constant or tag value).
290013	An attempt was made to save a record under a record number which already exists. The action is not executed.	The following remedies are available: • Check the source for the number (constant or tag value). • First, delete the record. • Change the "Overwrite" function parameter.
290014	The file specified to be imported could not be found.	Check: • The file name • Ensure that the file is in the specified directory.
290020	Alarm reporting that the download of records from the HMI device to the PLC has started.	--
290021	Alarm reporting that the download of records from the HMI device to the PLC was completed.	--
290022	Alarm reporting that the download of records from the HMI device to the PLC was canceled due to an error.	Check in the configuration whether: • The tag addresses are configured in the PLC • The recipe number exists • The record number exist • The "Overwrite" function parameter is set
290023	Alarm reporting that the download of records from the PLC to the HMI device has started.	--

Number	Effect/causes	Remedy
290024	Alarm reporting that the download of records from the PLC to the HMI device was completed.	---
290025	Alarm reporting that the download of records from the PLC to the HMI device was canceled due to an error.	Check in the configuration whether: • The tag addresses are configured in the PLC • The recipe number exists • The record number exist • The "Overwrite" function parameter is set
290026	An attempt has been made to read/write a record although the record is not free at present. This error may occur in the case of recipes for which downloading with synchronization has been configured.	Set the record status to zero.
290027	Unable to connect to the PLC at present. As a result, the record can neither be read nor written. Possible causes: No physical connection to the PLC (no cable plugged in, cable is defect) or the PLC is switched off.	Check the connection to the PLC.
290030	This alarm is output after you selected screen which contains a recipe view in which a record is already selected.	Reload the record from the storage location or retain the current values.
290031	While saving, it was detected that a record with the specified number already exists.	Overwrite the record or cancel the action.
290032	While exporting records it was detected that a file with the specified name already exists.	Overwrite the file or cancel the process.
290033	Confirmation request before deleting records.	--
290040	A record error with error code %1 that cannot be described in more detail occurred. The action is canceled. It is possible that the record was not installed correctly on the PLC.	Check the storage location, the record, the "Data record" area pointer and if necessary, the connection to the PLC. Restart the action after a short time. If the error persists, contact Customer Support. Forward the relevant error code to Customer Support.
290041	A record or file cannot be saved because the storage location is full.	Delete files no longer required.
290042	An attempt was made to execute several recipe actions simultaneously. The last action was not executed.	Trigger the action again after waiting a short period.
290043	Confirmation request before storing records.	--
290044	The data store for the recipe has been destroyed and is deleted.	--
290050	Alarm reporting that the export of records has started.	--
290051	Alarm reporting that the export of records was completed.	--
290052	Alarm reporting that the export of records was canceled due to an error.	Ensure that the structure of the records at the storage location and the current recipe structure on the HMI device are identical.
290053	Alarm reporting that the import of records has started.	--
290054	Alarm reporting that the import of records was completed.	--

Number	Effect/causes	Remedy
290055	Alarm reporting that the import of records was canceled due to an error.	Ensure that the structure of the records at the storage location and the current recipe structure on the HMI device are identical.
290056	Error when reading/writing the value in the specified line/column. The action was canceled.	Check the specified line/column.
290057	The tags of the recipe specified were toggled from "offline" to "online" mode. Each change of a tag in this recipe is now immediately downloaded to the PLC.	--
290058	The tags of the specified recipe were toggled from "offline" to "online" mode. Modifications to tags in this recipe are no longer immediately transferred to the PLC but must be transferred there explicitly by downloading a record.	--
290059	Alarm reporting that the specified record was saved.	--
290060	Alarm reporting that the specified record memory was cleared.	--
290061	Alarm reporting that clearing of record memory was canceled due to an error.	--
290062	The record number is above the maximum of 65536. This record cannot be created.	Select another number.
290063	This occurs with the system function "ExportDataRecords" when the parameter "Overwrite" is set to No. An attempt has been made to save a recipe under a file name which already exists. The export is canceled.	Check the "ExportDataRecords" system function.
290064	Alarm reporting that the deletion of records has started.	--
290065	Alarm reporting that the deletion of records has successfully completed.	--
290066	Confirmation request before deleting records.	--
290068	Security request to confirm if all records in the recipe should be deleted.	--
290069	Security request to confirm if all records in the recipe should be deleted.	--
290070	The record specified is not in the import file.	Check the source of the record number or record name (constant or tag value).
290071	During the editing of record values, a value was entered which exceeded the low limit of the recipe tag. The entry is discarded.	Enter a value within the limits of the recipe tag.
290072	When editing record values, a value was entered which exceeds the high limit of the recipe tag. The entry is discarded.	Enter a value within the limits of the recipe tag.
290073	An action (e.g. saving a record) failed due to an unknown error. The error corresponds to the status alarm IDS_OUT_CMD_EXE_ERR in the large recipe view.	--

Number	Effect/causes	Remedy
290074	While saving, it was detected that a record with the specified number already exists but under another name.	Overwrite the record, change the record number or cancel the action.
290075	A record with this name already exists. The record is not saved.	Please select a different record name.
290110	The default values could not be set due to an error.	--
290111	The Recipes subsystem cannot be used. Recipe views have no content and recipe-specific functions will not be performed. Possible causes: • An error occurred while transferring the recipes. • The recipe structure was changed in ES. When the project was downloaded again, the recipes were not transferred with it. This means that the new configuration data is not being transferred to the old recipes on the device.	Transfer the project to the device again, together with the recipes (the corresponding check box in the Transfer dialog must be checked).

300000 - Alarm_S alarms

Number	Effect/causes	Remedy
300000	Faulty configuration of process monitoring (e.g. using PDiag or S7-Graph): More alarms are queued than specified in the specifications of the CPU. No further ALARM_S alarms can be managed by the PLC and reported to the HMI devices.	Change the PLC configuration.
300001	ALARM_S is not registered on this PLC.	Select a controller that supports the ALARM_S service.

310000 - Report system alarms

Number	Effect/causes	Remedy
310000	An attempt is being made to print too many reports in parallel. Only one log file can be output to the printer at a given time; the print job is therefore rejected.	Wait until the previous active log was printed. Repeat the print job if necessary.
310001	An error occurred on triggering the printer. The report is either not printed or printed with errors.	Evaluate the additional system alarms related to this alarm. Repeat the print job if necessary.

320000 - Alarms

Number	Effect/causes	Remedy
320000	The movements have already been indicated by another device. The movements can no longer be controlled.	Deselect the movements on the other display units and select the motion control screen on the required display unit.

Number	Effect/causes	Remedy
320001	The network is too complex. The faulty addresses cannot be indicated.	View the network in STL.
320002	No diagnosable alarm message (error) selected. The unit associated with the alarm message could not be selected.	Select a diagnostics alarm from the ZP_ALARM alarm screen.
320003	No alarm message (error) exists for the selected unit. The detail view cannot visualize any networks.	Select the defective unit from the overview screen.
320004	The required signal states could not be read by the PLC. The faulty addresses cannot be found.	Check the consistency between the configuration on the display unit and the PLC program.
320005	The project contains ProAgent elements which are not installed. ProAgent diagnostic functions cannot be performed	In order to run the project, install the optional ProAgent package.
320006	You have attempted to execute a function which is not supported in the current constellation.	Check the type of the selected unit.
320007	No error-triggering addresses were found on the networks. ProAgent cannot indicate any faulty addresses.	Switch the detail screen to STL layout mode and check the status of the addresses and exclusion addresses.
320008	The diagnostic data stored in the configuration are not synchronized with those in the PLC. ProAgent can only indicate the diagnostic units.	Transfer the project to the HMI device again.
320009	The diagnostic data stored in the configuration are not synchronized with those in the PLC. The diagnostic screens can be operated as usual. ProAgent may be unable to show all diagnostic texts.	Transfer the project to the HMI device again.
320010	The diagnostic data stored in the configuration are not synchronized with those in STEP7. The ProAgent diagnostics data is not up-to-date.	Transfer the project to the HMI device again.
320011	A unit with the corresponding DB number and FB number does not exist. The function cannot be executed.	Check the parameters of the "SelectUnit" function and the units selected in the project.
320012	The "Step sequence mode" dialog is no longer supported.	Use the ZP_STEP step sequence screen from the corresponding standard project for your project. Instead of calling the Overview_Step_Sequence_Mode function, call the "FixedScreenSelection" function using ZP_STEP as the screen name.
320014	The selected PLC cannot be evaluated for ProAgent. The Alarm view assigned to the "EvaluateAlarmDisplayFault" system function could not be found.	Check the parameters of the "EvaluateAlarmDisplayFault" system function.

330000 - GUI alarms

Number	Effect/causes	Remedy
330022	Too many dialogs are open on the HMI device.	Close all dialogs you do not require on the HMI device.
330026	The password will expire after the number of days shown.	Enter a new password.

350000 - GUI alarms

Number	Effect/causes	Remedy
350000	PROFIsafe packages have not arrived within the necessary period. There is a communication problem with the F-CPU. RT is terminated.	Check the WLAN connection.
350001	PROFIsafe packages have not arrived within the necessary period. There is a communication problem with the F-CPU. The PROFIsafe connection is re-established.	Check the WLAN connection.
350002	An internal error has occurred. Runtime is terminated.	Internal error
350003	Feedback concerning the connection established with the F-CPU. The Emergency-Off buttons are active immediately.	--
350004	PROFIsafe communication was set and the connection was cleared. The Runtime can be terminated. The Emergency-Off buttons are deactivated immediately.	--
350005	Incorrect address configured for the F-slave. No PROFIsafe connection.	Check and modify the address of the F slave in WinCC flexible ES.
350006	The project has started. At the start of the project, the enabling buttons must be checked for functionality.	Press the two enabling buttons one after another in the "Enable" and "Panic" positions.
350008	The wrong number of fail-safe buttons was configured. No PROFIsafe connection.	Change the number of fail-safe buttons in the project.
350009	The device is in Override mode. It may no longer be possible to detect the location because transponder detection fails.	Exit Override mode.
350010	Internal error: The device has no fail-safe buttons.	Send the device back. Worldwide contact person

9.2 Abbreviations

Abbreviations

The abbreviations and acronyms used in the manual have the following meaning:

PLC	Programmable Logic Controller
ANSI	American National Standards Institute
AS 511	Protocol of the PG interface to SIMATIC S5
ASCII	American Standard Code for Information Interchange
SM	Events
CCFL	Cold Cathode Fluorescence Lamp
CF	Compact Flash
CPU	Central Processing Unit
CS	Configuration System
CSA	Customer Specified Articles
CSV	Comma Separated Values
CTS	Clear To Send
DC	Direct Current
DCD	Data Carrier Detect
DI	Digital Input
DIP	Dual In–Line Package
DP	Distributed (Peripheral) I/O
DRAM	Dynamic Random Access Memory
DSN	Data Source Name
DSR	Data Set Ready
DTR	Data Terminal Ready
ESD	Electrostatic Discharge (and components/modules that can be damaged by it)
EMC	Electromagnetic Compatibility
EN	European standard
ESD	Electrostatic Discharge
HF	High Frequency
HMI	Human Machine Interface
GND	Ground
IEC	International Electrotechnical Commission
IF	Interface
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MOS	Metal Oxide Semiconductor
MP	Multi Panel
MPI	Multipoint Interface (SIMATIC S7)
MTBF	Mean Time Between Failures
OP	Operator Panel
PC	Personal Computer

PCL	Printer Control Language
PG	Programming device
PPI	Point to Point Interface (SIMATIC S7)
RAM	Random Access Memory
RTS	Request To Send
RxD	Receive Data
SELV	Safety Extra Low Voltage
AL	Alarm
SP	Service Pack
PLC	Programmable Logic Controller
SRAM	Static Random Access Memory
STN	Super Twisted Nematic
D-sub	Subminiature D (plug)
TCP/IP	Transmission Control Protocol/Internet Protocol
TFT	Thin Film Transistor
TP	Touch Panel
TTL	Transistor–Transistor Logic
TxD	Transmit Data
UL	Underwriter’s Laboratory
UPS	Uninterruptible Power Supply
UPS	Uninterruptible Power Supply
VGA	Video Graphic Array
AT	Accept button

9.3 Glossary

Alarm

Indicates particularly serious operating states that must be acknowledged.

Alarm cleared (also known as outgoing)

Time at which an alarm is cleared by the controller.

Alarm generated (also known as incoming)

Time at which an alarm is triggered by the controller or the HMI device.

Alarm level

Operational level of the HMI device in which the alarms are displayed.

Alarm reporting

Printout of alarms and system messages at the same time as the screen display.

Alarm time

Time between generation and clearance of an alarm.

Area pointer

Required for data exchange between HMI device and controller. It contains information on the location of data areas on the controller.

Combo box

Box for setting a parameter (one value can be selected from those displayed).

Configuration

Specifying basic settings, alarms, and screens for a specific plant using the ProTool configuration software.

Configuration computer

Generic term for programming devices and PCs on which configurations are created.

Display duration

Time between an alarm being generated and being cleared.

Display function

Function that causes a change in the displayed information, for example alarm level display, alarm buffer display, screen display

Events

Indicates certain statuses of the machine or plant connected to the controller.

Field

Reserved area in configured or fixed texts for output and/or input of values.

Flash memory

Programmable memory that can be erased quickly and then written to again.

Forced printout

Automatic printout of the alarms and system messages deleted when there is a buffer overflow.

Hard copy

Printout of the content of the display on a printer.

Job mailbox

Triggering of a function by the controller.

Loop through mode

Mode on the HMI device Includes normal operation and also allows communication between the configuration computer and controller over the second interface of the HMI device. This mode is possible only when the connection to the controller uses the AS511 protocol.

Normal mode

Mode on the HMI device in which alarms are displayed and input can made in screens.

Operator note

Configurable additional information on alarms, screens, screen entries and boxes.

Output box

Box for displaying a process value.

Screen

Display of logically related process data that can be displayed together on the HMI device and that can be individually changed.

Screen entry

Element of a screen - consists of the entry number, texts, and tags.

Screen level

Processing level on the HMI device at which pictures can be viewed and manipulated.

Self test

Test of the status of the CPU and the memory each time the power is turned on.

Softkey

Key with a variable assignment (dependent on the displayed screen entry)

System event

Indicates an internal state on the HMI device and on the controller.

System to be monitored

Related to operator control and monitoring using an HMI device, this includes machines, processing centers, systems, plants, and processes.

Transfer mode

Mode on the HMI device in which data is transferred from the configuration computer to the HMI device.

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