

SIMATIC HMI

ProTool How to configure text- based units

User Manual

Order number
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Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are marked as follows according to the level of danger:



Danger

indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



Warning

indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Caution

used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Attention

indicates that unwanted events or status can occur if the relevant information is not observed.

Note

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Qualified Personnel

Only qualified personnel should be allowed to install and work with this software. Qualified personnel within the meaning of the safety notices of this documentation are persons capable of giving due consideration to safety engineering standards when using this software on systems.

Correct Usage

Note the following:



Warning

The equipment may be used only for the applications stipulated in the catalog and in the technical description and only in conjunction with other equipment and components recommended or approved by Siemens.

Startup must not take place until it is established that the machine, which is to accommodate this component, is in conformity with the guideline 98/37 ECC.

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Order number: 6AV6594-1AA06-0AB0

Preface

Purpose

This document forms part of the documentation package for the ProTool CS configuration software. It provides all information required for the creation and configuration of projects.

Documentation

- *ProTool User Manual (this document)*
The User Manual is supplied in a printed version and addresses development engineers. It contains configuration basics, details on configurable objects as well as samples.
- *Installation guide*
The Installation Guide is supplied in a printed version. It addresses system administrators who want to install the ProTool CS configuration software on a PC.
- *ProAgent/PC and ProAgent/MP User Manual*
The printed version of this User Manual is supplied with *ProAgent/PC* and *ProAgent/MP*. It addresses systems engineers who want to configure system-specific process diagnostics for error detection and troubleshooting routines.

Notation

Different font formats simplify orientation within the text:

- | | |
|-----------------------|--|
| "Messages" dialog box | Names of dialog boxes, fields and buttons are shown in quotation marks. |
| "System" > "ProTool" | Menu items are shown in quotation marks. Successive submenus/options are separated by arrows. The complete route to the menu option in question is always shown. |

History of the documentation

This documentation describes the configuration of text displays with ProTool.

The various issues of the documentation correspond to the following product versions:

Issue 07/98	Configuring Windows-based systems. Valid for ProTool/Pro CS 5.0 or higher.
Issue 01/99	Inclusion of MP 270 and editorial reworking of manual. Software runs under Windows 95, Windows 98, Windows NT 4.0 and higher. Valid for ProTool/Pro CS 5.1 or higher.
Issue 12/99	Extensions and inclusions of new operating units. Software runs under Windows 95/98, Windows 2000 and Windows NT 4.0 and higher. Valid for ProTool/Pro CS 5.2 or higher.
Issue 07/00	Extensions, new operating units and new PLC drivers. Applies to ProTool/Pro CS version 5.2 or higher plus Service Pack 2
Issue 03/01	Incorporation of MP 370 and SIMOTION PLC drivers. Applies to ProTool/Pro CS version 5.2 or higher plus Service Pack 3
Issue 12/01	Valid for ProTool CS 6.0 or higher.

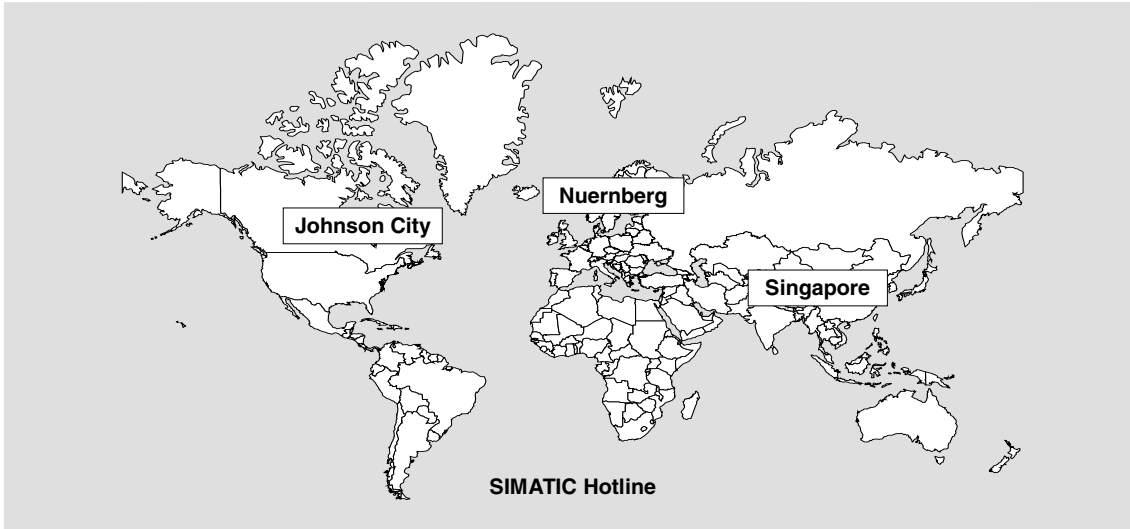
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 - 8,N,1,ANSI.
 - You can also dial in per ISDN (x.75, 64 kbps).
- You can find your local partner for Automation & Drives in our Partner Database on the Internet under
 - <http://www3.ad.siemens.de/partner/search.asp>

Up-to-date information on ProTool

- You can obtain general information on ProTool on the Internet URL
 - http://www1.ad.siemens.de/hmi/html_00/products/software/pro_tool/index.htm or
 - http://www1.ad.siemens.de/hmi/html_76/products/software/pro_tool/index.htm (English).
- The ProTool Online Support with information on FAQs (Frequently Asked Questions), spare parts as well as Tips & Tricks is also found on the [Internet](#). Available downloads are, for example, Firmware Updates, Service Packs or helpful applications.

SIMATIC HMI-documentation

This manual is part of the SIMATIC HMI documentation. The table below shows where to find what information.

Documentation	Target Group	Content
Getting Started Brief instructions	New users	This documentation guides you step by step through configuring a screen with different objects, a change of screens, a message. This documentation is available for text-based displays graphics displays Windows-based systems
ProTool Configuring Windows -based systems User's Guide	Programmers	Provides information about working with the configuration software. It contains information about installation, background to configuration, detailed description of configurable objects and functions. This document applies to Windows-based systems.
ProTool Configuring Graphics Displays User's Guide	Programmers	Provides information about working with the configuration software. It contains information about installation, background to configuration, detailed description of configurable objects and functions. This document applies to graphics-based display units.
ProTool Configuring Text Displays User's Guide	Programmers	Provides information about working with the configuration software. It contains information about installation, background to configuration, detailed description of configurable objects and functions. This document applies to text-based display units.
ProTool Online Help	Programmers	Provides information on the configuration computer during a ProTool session. Online Help contains direct Help extensive instructions and examples detailed information all information from the User's Guide
ProTool/Pro Runtime User's Guide	Commissioning technicians, users	Describes how to install the ProTool/Pro RT visualization software and commissioning and operation of the software on Windows-based systems.

Documentation	Target Group	Content
Software Security Commissioning instructions	Commissioning technicians, users	The ProTool/Pro Runtime visualization software is protected against unauthorized use. These instructions contain information about installing, repairing and uninstalling user authorization.
Example application Commissioning instructions	New users	ProTool is supplied with a number of specimen configurations together with the corresponding PLC programs. This documentation describes how you load the examples onto the operating unit and the PLC, run the example and how you can extend the connection to the PLC for your application.
SIMATIC Panel PC 670 Equipment Manual SIMATIC Panel PC 870 Equipment Manual SIMATIC Panel PC IL Equipment Manual	Commissioning technicians, users	Describes the computing unit and the control unit of the SIMATIC Panel PC 670.
Equipment Manuals: MP 270 MP 270B/OP 270/TP 270 MP 370 TP 170B/OP 170B TP 170A TP 070	Commissioning technicians, users	Describes the hardware and operation of Windows-based devices in general: installation and commissioning, device description, operation, connection of PLC, printer and configuration computer, maintenance and servicing.
OP 37/Pro Equipment Manual	Commissioning technicians, users	Describes the hardware, installation and incorporation of extensions and options for the OP 37/Pro.
TP 27, TP 37 Equipment Manual OP 27, OP 37 Equipment Manual OP 25, OP 35, OP 45 Equipment Manual OP 7, OP 17 Equipment Manual OP 5, OP 15 Equipment Manual TD17 Equipment Manual	Commissioning technicians, users	Describes the hardware and operation of the devices in general: installation and commissioning, device description, connection of PLC, printer and configuration computer, operating modes, operation, description of supplied standard screens and their usage, installation of options, maintenance and replacement of spare parts.

Documentation	Target Group	Content
OP 3 Equipment Manual	Commissioning technicians, users, programmers	Describes the hardware of the OP 3, its general operation and how to connect it to the SIMATIC S7.
PP7, PP17 Equipment manual	Commissioning technicians, users	Describes the hardware, installation and commissioning of Push-Button Panels PP7 and PP17.
Communication User's Guide	Programmers	Provides information about connecting text- and graphics-oriented operating units to the following PLCs: SIMATIC S5, SIMATIC S7, SIMATIC 500/505, drivers for other PLCs. This documentation describes: the configuration and parameters required to connect the devices to the PLC and the network, as well as the user data areas used for exchanging data between the operating unit and the PLC.
Communication for Windows-based Systems User's Guide	Programmers	Provides information about connecting Windows-based systems to the following PLCs: SIMATIC S5, SIMATIC S7, SIMATIC 500/505, SIMATIC WinAC, SIMOTION, drivers for other PLCs. This documentation describes: the configuration and parameters required to connect the devices to the PLC and the network, the user data areas used for exchanging data between the operating unit and the PLC.
Other PLCs Online Help	Programmers	Supplies information about connecting the operating units to PLCs such as Allen-Bradley, GE Fanuc, LG (Lucky Goldstar) GLOFA GM, Mitsubishi, Modicon Modbus, OMRON, OPC, Telemecanique. The relevant online Help is installed at the same time as the drivers are installed.

Documentation	Target Group	Content
ProAgent for OP User's Guide ProAgent/MP and ProAgent/PC User's Guide	Programmers	Supplies the following information about the ProAgent software package (process diagnostics): configuring system-specific process diagnostics, determining process errors, finding the cause of an error and troubleshooting, customizing the supplied diagnostic screens to satisfy your own requirements.

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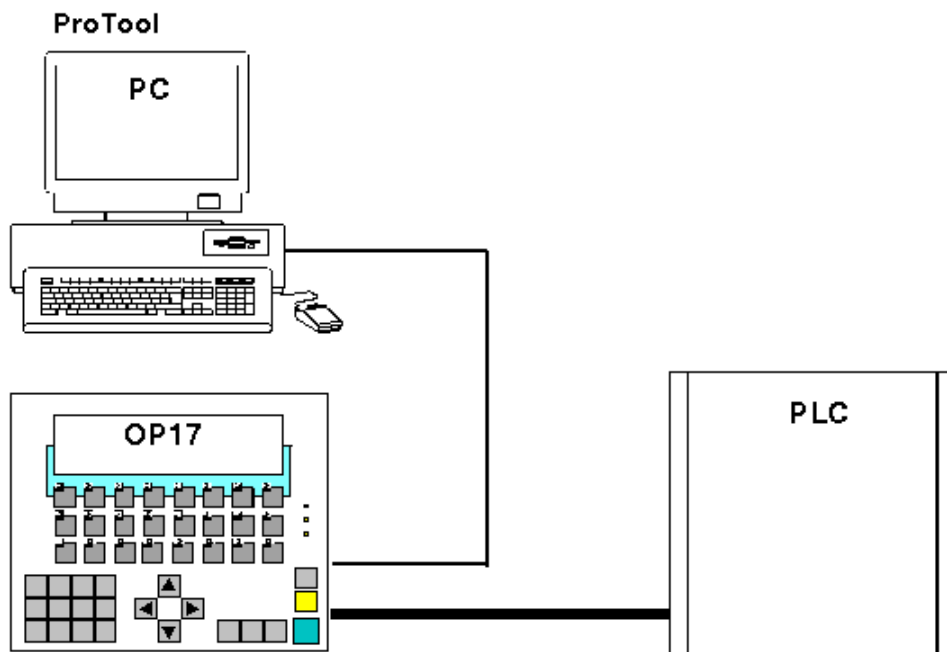
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1 Introduction to ProTool

Configuring text-based displays

ProTool/Lite is an innovative configuration software package for the text-based displays of the SIMATIC HMI device family. You use the same configuration software to configure all the devices in the family. Regardless of the device for which you are creating your project, ProTool always presents you with the same, familiar user interface.

Example of the structure



Example of PC as configuration computer and OP 17 as operating unit

ProTool is easy to use

ProTool is a Windows application for Windows 95, Windows 98, Windows 2000 and Windows NT. The fully graphical user interface allows you to create object-oriented projects easily by mouse click. No special programming knowledge is required.

ProTool is versatile

The editors provided in ProTool can be called simultaneously. You can also open different projects, even those of different devices, simultaneously and transfer data via the clipboard from one project to another.

ProTool can also be integrated in the SIMATIC STEP 7 configuration software, thus allowing you to select SIMATIC STEP 7 symbols and data blocks as tags in ProTool. This not only saves you time and money but also eliminates the possibility of errors made when entering the same data several times.

You will find more information about the configuration of ProTool with SIMATIC STEP 7 at "Configuring with ProTool integrated in SIMATIC STEP 7".

Offline configuration

With ProTool you create and edit your projects offline. The device need not yet be available at this time. The configuration computer displays the configured project data as displayed later on the device.

On completion of configuration you can download the executable project file from the configuration computer to the device.

1.1 Overview of the documentation

The SIMATIC HMI documentation is made up of a combination of manuals, instructions and online Help in keeping with the range of target groups. This chapter provides a broad outline.

1.1.1 ProTool for the whole SIMATIC HMI device family

The SIMATIC HMI device family

The SIMATIC HMI device family is a complete family of text displays, operator panels, touch panels and Windows-based systems for efficient machine operation and monitoring. The performance and convenience of the devices are finely tuned to suit the individual demands made of them.



SIMATIC HMI operating units

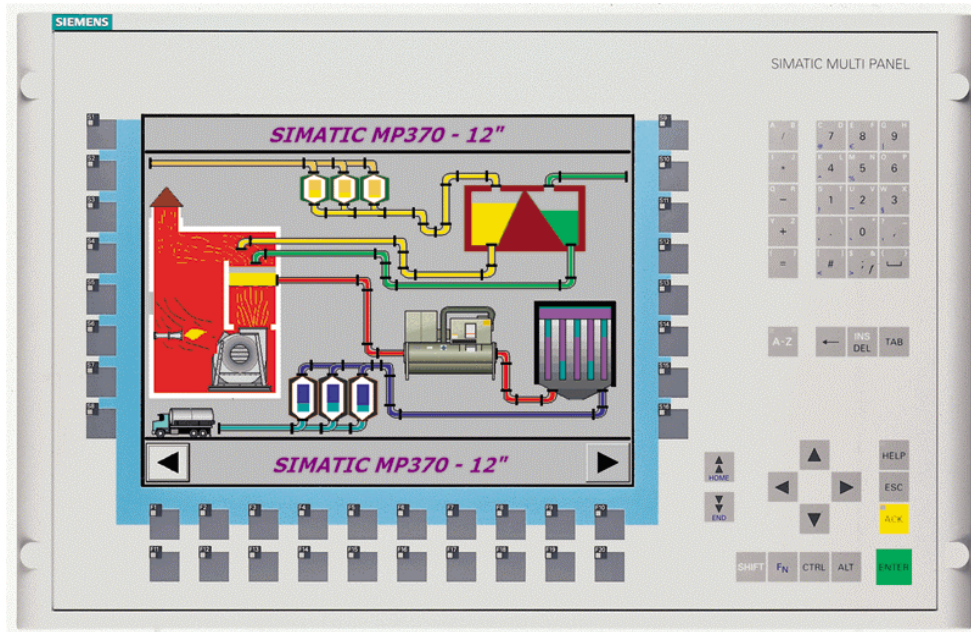
The great advantage is that you configure all the devices with the same configuration software.

1.1.2 ProTool for Windows-based systems

Devices

The "ProTool - Configuring Windows-Based Systems" documentation tells you how to configure the following devices:

- Panels
 - TP 170A
 - TP 170B
 - TP 170B Color
 - TP 270 (6" and 10")
 - OP 170B
 - OP 270 (6" and 10")
- Multi Panels
 - MP 270B
 - MP 270
 - MP 370
 - MP 370 TOUCH
- Panel PCs
 - FI 25
 - FI 45
 - PC 670 10"
 - PC 670 12"
 - PC 670 15"
 - PC 670 12" TOUCH
 - PC 670 15" TOUCH
 - PC 870 12"
 - PC 870 15"
 - PC 870 15" TOUCH
 - PC IL70 12" TOUCH
 - PC IL70 15" TOUCH
- SINUMERIK Panels
 - OP 010
 - OP 012
 - OP 015
- SIMOTION Panels
- PC



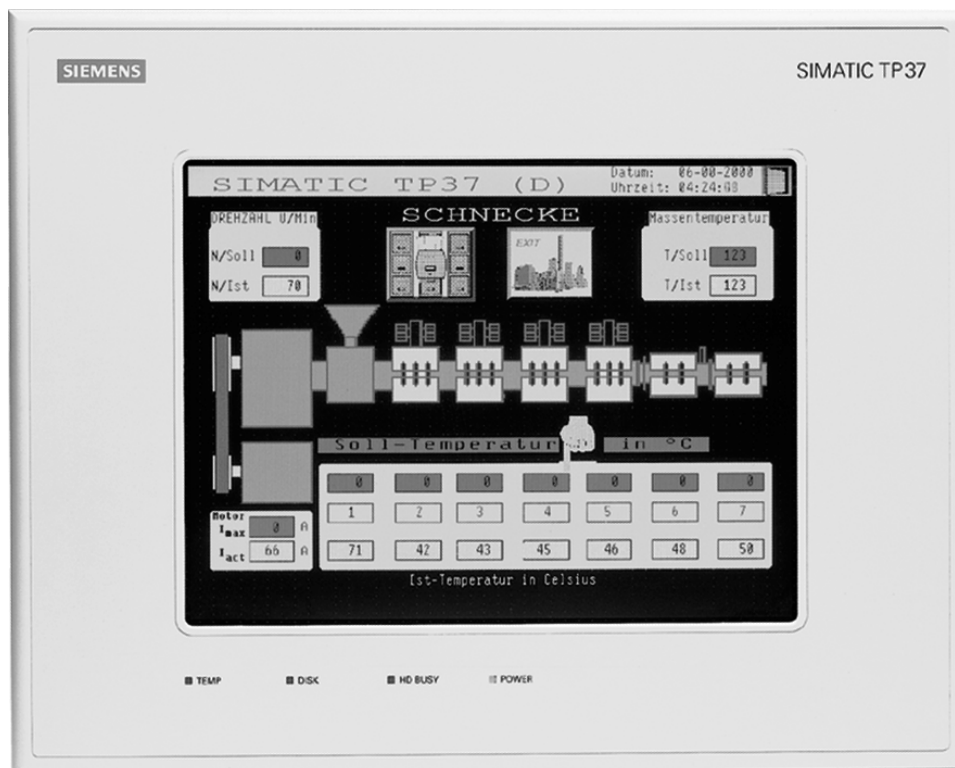
Example: MP 370

1.1.3 ProTool for graphical displays

Devices

The "ProTool - Configuring Graphics Displays" documentation tells you how to configure the following operating units:

- Graphics-oriented operator panels
 - OP 27
 - OP 37
- Touch panels
 - TP 27-6
 - TP 27-10
 - TP 37
- C7 devices
 - C7-626 (OP 25 with integrated S7-CPU)



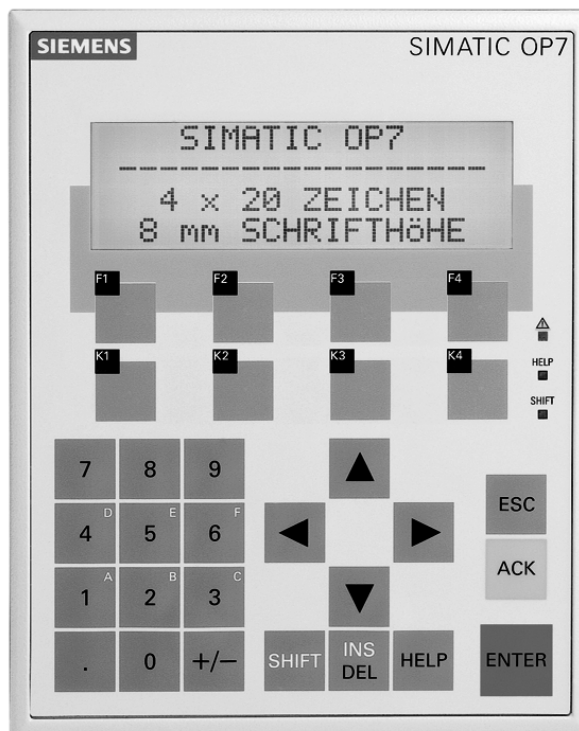
Example: TP 37

1.1.4 ProTool for text-based displays

Devices

The "ProTool - Configuring Text-Based Displays" documentation tells you how to configure the following operating units:

- Text-oriented operator panels
 - OP 3
 - OP 7
 - OP 17
- Text displays
 - TD 17
- C7 devices
 - C7-621 (OP 3 with integrated S7-CPU)
 - C7-623 (OP 5 with integrated S7-CPU)
 - C7-624 (OP 15 with integrated S7-CPU)
 - C7-633 (OP 7 with integrated S7-CPU)
 - C7-634 (OP 17 with integrated S7-CPU)



Example: OP 7

2 Getting started in ProTool

Here you learn how to start ProTool, configure text-based systems, and what you should look out for while you are configuring.

2.1 Starting ProTool

Starting ProTool

After ProTool has been installed, you will find a folder on the Start menu called Simatic, containing the following icons:

ProTool Pro CS v. 6.0



Calls online Help.



Starts the configuration software.



Shows late-breaking information on the configuration software.



Starts Setup in order, say, to change the ProTool language or to add a component.

ProTool Pro RT v. 6.0



Copies the compiled project file in compressed form.



Starts the runtime software.



Shows late-breaking information on the runtime software.



Starts the simulation software.



Starts the Loader.

2.2 Configuring text-based displays

Getting Started

If you are not all that familiar with the ProTool visualization software, we would recommend you read the short guide and get started with ProTool with the help of the example. The printed version is enclosed with the manual.

Requirements for working with the brief introduction

To do the exercises for ProTool in this brief introduction, you require

- a PC as a configuration computer
- the SIMATIC ProTool software package, version 5.2 or higher
- an operating unit - for example, an OP 17

Other documents on ProTool

You will find the electronic manuals on the installation CD at:
Docs\..\UsersManual_Text.pdf

You can find all the information contained in this manual in ProTool's online Help.

2.3 Notes on the configuration computer

Notes on the configuration computer

So that you can work as efficiently as possible when you are configuring, give due consideration to the following notes for your configuration computer:

- **Close applications**
Close all other programs. In this way more main memory will be available for ProTool.
- **Configurations on a local drive**
Do not start projects from networks, but from your local drive. Network access times are frequently too long.
- **Available disk storage**
Your drive should have free disk storage space. Take note of Microsoft's recommendations for the Windows system in this respect.
- **More working memory**
Memory requirements rise in proportion to the number and size of the screen objects you are using. An increase in available main memory reduces processing times considerably.
- **System resources**
Make sure when you are working with ProTool that you have 20 to 40 MB of main memory available and at least 65% free system resources. You will find information on this topic in Explorer by choosing "Help" > "About". Increase the size of your main memory with additional RAM or virtual memory, as necessary. Additional system resources are released by closing other applications.
- **Environment tag TEMP**
In Windows, a temporary file is created for files when they are opened and processed. You decide where this temporary file is stored by means of the TEMP environment tag.
- **The path of the TEMP environment tag is normally set in the `autoexec.bat`® file.** If the TEMP environment tag is not placed in the `autoexec.bat` system file, the temporary file is stored in the local Windows directory. If an error message is issued by ProTool that indicates an error upon write access, the storage space on the drive might be too small for the temporary file.
In Windows 2000, the environment variable "TEMP" is set at "Start" > "Settings" > "Control Panel" > "System" > "Advanced" tab > "Environment variables" button.
In Win NT 4.0, you set it at "Start" > "Settings" > "Control Panel" > "System", "Environment" tab.

3 ProTool integrated in SIMATIC STEP 7

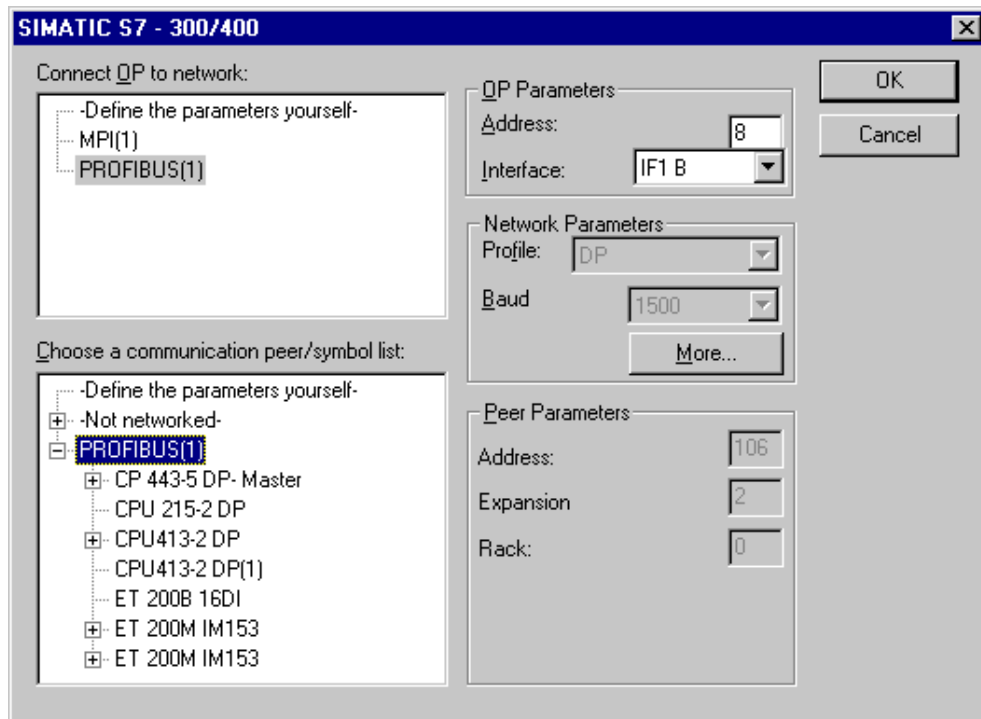
Requirements

If the PLC you are using is a SIMATIC PLC and you have installed STEP 7 configuration software on your system, you can integrate ProTool in SIMATIC STEP 7.

Advantages of STEP 7 integration

With integrated configuration, you access the database that you created when you configured the PLC in SIMATIC STEP 7. You then have the following advantages:

- You can use SIMATIC Manager as a central point for creating, editing and managing ProTool projects.
- The communication parameters of the PLC are created as default values when you create your ProTool project and reset when SIMATIC STEP 7 is changed.



Example of the "Driver Parameters" dialog box with STEP 7 integration: network parameters and parameters of the peer are set as default values.

- When configuring tags and area pointers, you can directly access the STEP 7 data in ProTool. Simply select the STEP 7 icon in the ProTool tag dialog box to which you wish to connect a tag. Changes to the symbol table in SIMATIC STEP 7 are updated in ProTool.
- You assign symbolic names once only and use them in SIMATIC STEP 7 and ProTool.
For this purpose, you must assign a name to a DB (data block) in the SIMATIC STEP 7 symbol table. If this is not the case, this DB is not offered for selection in the ProTool "Tags" dialog box.
- ALARM_S messages configured in SIMATIC STEP 7 are supported by ProTool and can be output to the operating unit.

Switching STEP 7 integration from ProTool

A ProTool installation with integration in SIMATIC STEP 7 provides you the menu item "ProTool Integration in STEP 7" under the "File" menu in ProTool. This allows you to integrate ProTool in SIMATIC STEP 7 or to operate it in stand-alone mode. After changing to integration mode, ProTool is automatically restarted.

Integration of ProTool in SIMATIC STEP 7 is still possible in "ProTool Setup", irrespective of this.

In integrated mode it is also possible to copy single configurations from STEP 7. You can then edit them in ProTool stand-alone mode (e.g. on another configuration computer).

Integrating specific ProTool configurations and copying them from STEP 7

Configurations generated in ProTool stand-alone mode cannot be called directly in SIMATIC Manager. To be able to implement such configurations in a STEP 7 project, you need to integrate them.

Execute by selecting the menu item "File" > "Integrate in STEP 7 project" in ProTool.

Vice versa, if you want to use ProTool in stand-alone mode to edit projects created in SIMATIC STEP 7 in integrated mode and without having SIMATIC STEP 7 available, you must first generate a copy of these configuration files offline of STEP 7.

To do this, select the menu item "File" > "Copy from STEP 7 project" in your ProTool application.

Note

When you open a stand-alone project, there can no longer be automatic synchronization of the database between SIMATIC STEP 7 and ProTool. You therefore have to ensure that the shared database is resynchronized (for example, by re-integrating) if changes are made to the STEP 7 program.

3.1 How to start ProTool in SIMATIC STEP 7

General

There are two ways in which you can start ProTool in SIMATIC STEP 7:

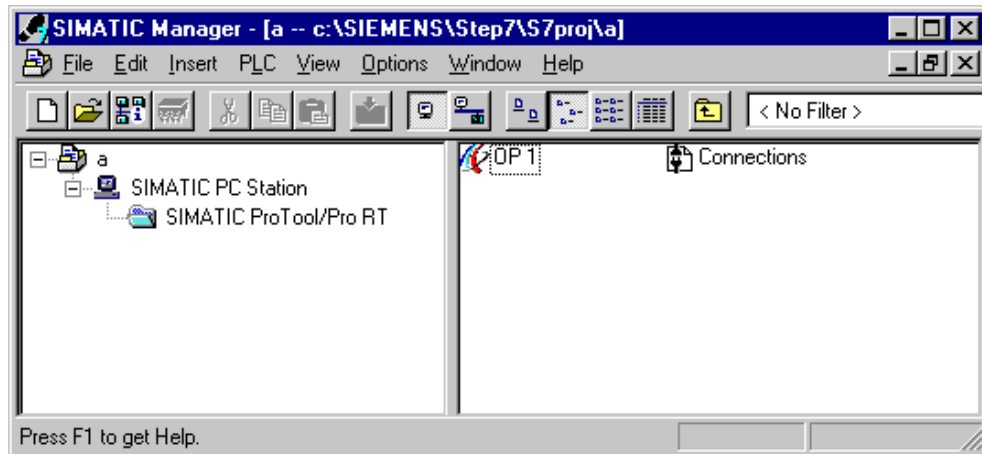
- By means of SIMATIC Manager
- Directly in Windows

Starting ProTool with SIMATIC Manager

Procedure:	
1	Start SIMATIC Manager.
2	Select a STEP 7 project, or create a new STEP 7 project.
3	Choose the "Paste" > "Station" > "SIMATIC OP" option from the menu, and enter a name for the ProTool project.
4	Start ProTool by double-clicking the ProTool project. Then select the operating unit for the project.

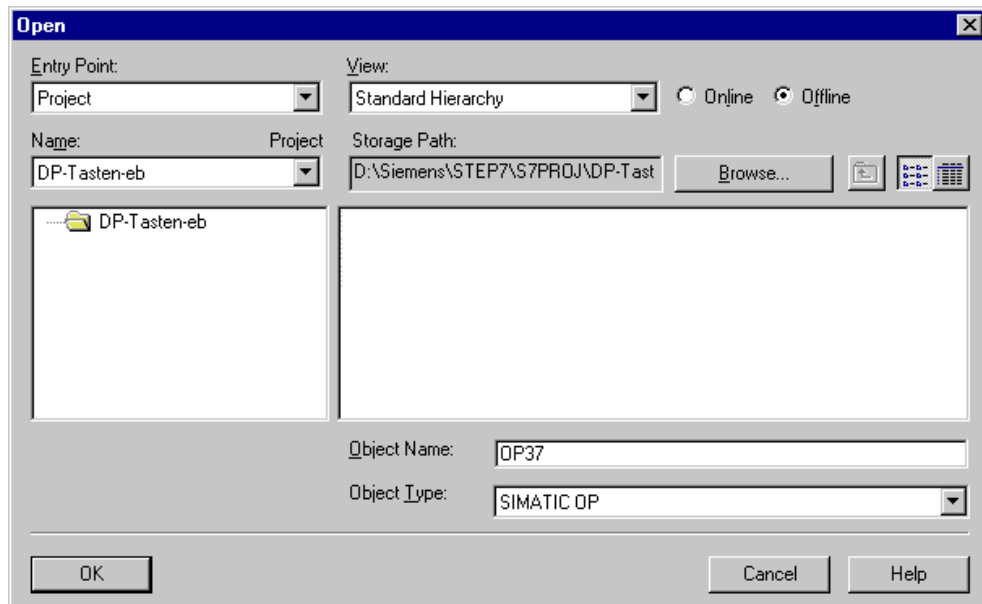
Starting ProTool on a SIMATIC PC station

Procedure:	
1	Start SIMATIC Manager.
2	Select a STEP 7 project, or create a new STEP 7 project.
3	Choose the "Paste" > "Station" > "SIMATIC PC Station" option from the menu, and enter a name for the SIMATIC PC station.
4	Select the "Open Object" from the shortcut menu of the SIMATIC PC station (right click). The "HW Config" and "PC" dialog boxes appear.
5	Select the "Paste" > "Hardware Components" option from the menu. The "Hardware Catalog" dialog box appears.
6	Select "SIMATIC PC Station" > "HMI" and drag the entry "SIMATIC ProTool/Pro RT" to a spare slot in the "PC" dialog box.
7	Close the "HW Config" dialog box.
8	Start ProTool by double-clicking the ProTool project. Then select the operating unit for the project.



Starting ProTool in Windows

Start ProTool directly under Windows. Choose "File" > "New" from the menu to open a dialog box in which you can select a STEP 7 project and create a ProTool project in it. You then select the operating unit.



Example of the "New" dialog box for integrating STEP 7

4 Creating and editing projects

Here you obtain an overview over:

- the ProTool project structure
- the procedure for creating a project
- copying objects
- displaying project information

4.1 Fundamental considerations when creating a project

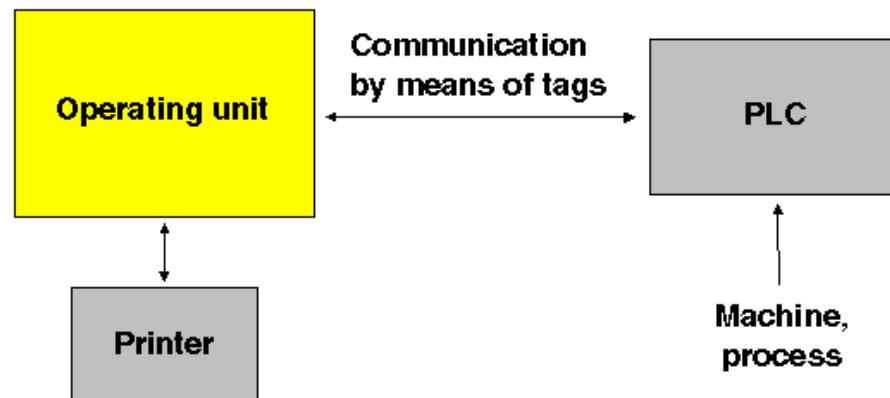
Objective

You want to operate and monitor a machine or process. To do this, you map the machine or process on the operating unit as accurately as is necessary.

System configuration

Communication takes place between the operating unit and the machine or process by means of "tags" via the PLC. The value of a tag is written to a memory area (address) on the PLC, from where it is read by the operating unit.

The following diagram provides an overview of the fundamental structure:



A typical structure

Before you begin

If you are creating a project for the first time, note the following recommendations:

- Use the standard screens from the standard projects.
- When creating a new project, you can select a "standard project" for your system (operating unit and PLC) in the "project assistant".
- At . . . \ProTool\Samples you will also find the example project "Quickmix", which is implemented for various operating units and PLCs.
- Consider also whether you can use parts of existing projects. Message text and graphics are suitable for this, for example.
- In the case of operating units from a single device family, it is also possible to copy entire project sections via the Clipboard.
- The fixed window in the source and destination projects should be the same size.

Note

The prerequisite for successful copying between projects is that the system limits of the operating unit for which you want to use the copied sections must not be exceeded.

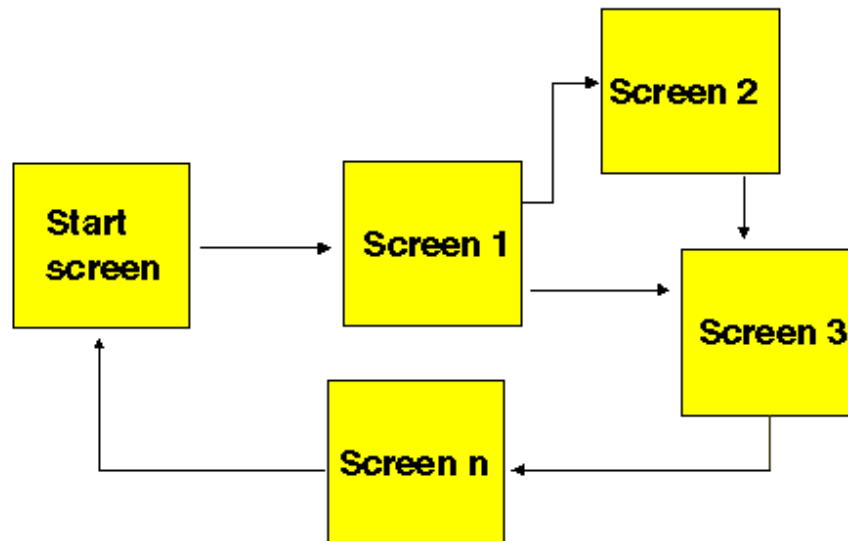
4.2 Defining an operating philosophy

Basic procedure

Consider which process values or states of the machine you want to display on the operating unit or work with and which object types you will have to configure for the purpose.

1. Create a user interface

Screens are the central components of the project, with which you visualize the states of the machine or process and create the prerequisites for operating the machine or process.



Example of screen creation

You can create a number of screens with display elements and controls - for switching between screen, for example - for the user interface with which the operator is subsequently faced on the operating unit.

2. Process data entry and transfer

In order to enter process data or set new values, you configure input/output fields, for example. This is also possible as a symbolic display.

3. Report process states

To acquire and log process and operating states on the operating unit or to archive them, configure messages.

4. Defining communication areas

A defined address area on the PLC for data interchange with the operating unit is addressed by means of an area pointer.

The number of area pointers available varies depending on the selected operating unit

4.3 Components of a ProTool project

What objects are there in ProTool?

When you open a new or an existing project, the project window opens.

The project window displays the object types you can configure on the left and the different objects on the right. The objects that you can configure depend on the type of the operating unit.

The various objects are linked directly in ProTool with the tool required to edit them.

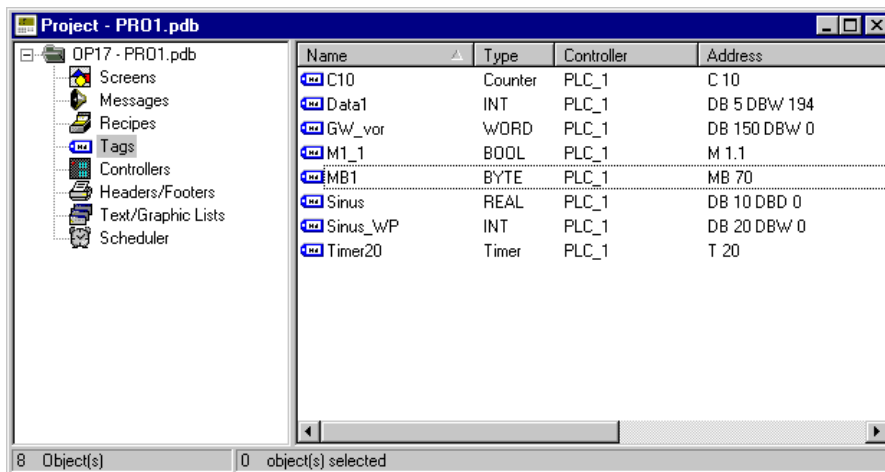
What is displayed in the project window?

The project data of a ProTool project is stored in the form of objects. The objects in a project are arranged in a tree structure.

The "Project" window displays object types that belong to the project and you can configure for the selected operating unit. The project window is comparable with Windows Explorer. The object types contain objects with properties that can be set.

The project window is structured as follows:

- The title bar contains the project name.
- Depending on the operating unit, the configurable object types are displayed in the left half of the window and the objects you create in the right half.












Example of a project window with tags

Note

If you maximize the project window, tabs are displayed for the open windows along the bottom border to enable you to change easily from one window to another.

4.4 Objects in the project window

Overview

Object symbol	Object type	Object name (default)
	ProTool project	PRO1
	Screens	PIC_1
	Messages	"---"
	Recipes: not OP 3, C7-621	REC_1
	Tags	VAR_1
	PLCs	PLC_1
	Headers/footers: not OP 3, C7-621	---
	Text or graphic lists	LIST_1
	Scheduler: OP 15, OP 17, C7-624, C7-634 only	ALARM_1

4.5 Steps to be taken when creating a project

Basic procedure

1. Create a new project ("File" > "New" or "File" > "Open").
Choose "File" > "New" to create a new project. The project assistant guides you through a number of selection dialogs.
2. Select your PLC.
Select a driver for your PLC. Only those drivers with which the operating unit can be run are displayed.
3. Use a standard project.
Select a "standard project" in order to use it as a basis. The project assistant asks you whether you want to enter any more information about the project in the "summary". Click the "Create" button to open the project window.
4. Define communication areas (project window: "Area Pointers").
Define share communication areas (area pointers) so that specific functions such as the "bit message procedure" or "synchronous data record transfer" can be used.
5. Create your project
This involves the most work. You can approach it in one of two ways: Either you create all the individual parts first and then link them to form a meaningful structure (the bottom > up approach), or you begin by designing a structure and then fill it with the individual elements (the top > down approach). As a general rule, perform the following steps for this: Create a user interface with display elements and controls. Configure tags to allow data exchange with the PLC. Configure messages to receive information about the machine status or the process.
6. In addition, you can configure additional objects, such as recipes, depending on the operating unit.

4.6 PLC drivers

Available PLC drivers

Select the PLC driver with the project assistant in the "Select PLC" dialog box.

You can also define or later edit the parameters there if you select PLC "Properties" in the project window.

Note

You will find information about the various PLC drivers at "Start" > "SIMATIC" > "ProTool 6.0" > "ProTool Information System" in the topic "Process communication".

You can select the following drivers for devices with a text-based display:

SIMATIC S5 - AS511

SIMATIC S5 - FAP

SIMATIC S5 - L2-DP

SIMATIC S7-300/400

SIMATIC S7-200

SIMATIC S7-NC

SIMATIC 500/505

Allen-Bradley DF1

Allen-Bradley DH485

GE Fanuc SNP/SNPX

FREE SERIAL

MITSUBISHI FX

Modicon Modbus

OMRON Hostlink / Multilink

Telemecanique Uni-Telway

Repercussions for tags

The address depends on the PLC you are using. The way in which the address of a tag with a PLC connection is displayed depends on the PLC you selected.

You select the available data types and data formats in the "Tags" dialog box at "Type" or "Format".

You will find an overview of the available data types and data formats that you can select for the PLC driver concerned in the "Communication" user's manual.

4.7 Area pointers

What are area pointers for?

A defined address area on the PLC for data interchange with the operating unit is addressed by means of an area pointer.

You create area pointers in the project window at "Area pointers". You can edit area pointers with all the commands available in the shortcut menu – for example, copy and then paste in another project.

What area pointers are available?

The number of area pointers available varies depending on the selected operating unit.

For information on how large the area pointers should be when you create them, and the structure they have to have, refer to the "Communication" user's manual.

The overview below lists the various area pointers and what they are used for. The order in which they are listed corresponds to that in ProTool.

Area pointers	Explanation
User version	The user version identifies the version of the project. A version check is performed on the PLC by means of this area pointer.
Event messages	You can configure an event message for each bit in this data area. The bits are assigned to the message numbers in ascending order. As soon as the PLC sets a bit in this data area, the operating unit recognizes that the assigned event message has "arrived". Conversely, the operating unit interprets the message as "departed" after the bit is reset on the PLC.
Screen number	In this data area the operating unit stores information on the current screen. You can evaluate this information in the PLC program to call another screen, for example.
Data mailbox	The data mailbox is a data area on the PLC. It is used as intermediate storage to download data records from the operating unit to the PLC. The data mailbox contains only the values of the tag. The addresses are not transferred.
Function keyboard	The operating unit transfers keystrokes of the function keys via this data area. You can evaluate this information in the PLC program in order to indicate incorrect operation by means of a message, for example.
LED assignment	The PLC can use this area pointer to drive the light-emitting diodes on the function keys of the operating unit.
OP Acknowledgement	The operating unit uses this area pointer to indicate to the PLC which alarm messages have been acknowledged on the operating unit.

Area pointers	Explanation
PLC Acknowledgement	Messages can be acknowledged from the PLC using this area.
Recipe mailbox	The recipe mailbox is a data area on the SIMATIC S5. It is used as intermediate storage to download data records from the operating unit to the PLC. Not only the values of tags but also their addresses are transferred to the recipe mailbox.
Successive recipe mailbox	The successive recipe mailbox is a data area on the SIMATIC S5 for transferring data records. You have to create it only when the recipe mailbox cannot accommodate the largest data record to occur.
Recipe number	<p>The recipe number mailbox is a data area on the SIMATIC S5. It is required for transferring data records between the operating unit and the PLC.</p> <p>The recipe number mailbox contains the recipe number and the number of the data record to be transferred.</p>
Interface area	The interface area is the interface between PLC program and operating unit. It contains data and pointers to areas required for exchanging data between the PLC and the operating unit.
Alarm messages	<p>You can configure an alarm message for each bit in this data area. The bits are assigned to the message numbers in ascending order.</p> <p>As soon as the PLC sets a bit in this data area, the operating unit recognizes that the assigned alarm message has "arrived". Conversely, the operating unit interprets the message as "departed" after the bit is reset on the PLC.</p>
System keyboard	The operating unit transfers keystrokes of the system keys via this data area. You can evaluate this information in the PLC program in order to indicate incorrect operation by means of a message, for example.

Note

There are no area pointers for the SIMATIC S7-NC.

4.8 Editing projects

Here you will learn:

- How to convert existing projects. For example, you can convert a project for a specific device to a project for another device to use it as a basis for a new project.
- How to copy objects within a project and from one project to another.
- How to undo and redo actions.

4.8.1 Convertible projects

Conversion options in ProTool

You can convert a ProTool project that you created for an OP x5 operator panel into a project for an OP x7. This also applies to projects for the corresponding "C7 devices".

You can convert the following projects:

Source		Objective
OP 5	>	OP 7
OP 15C	>	OP 17
OP 25	>	OP 27
OP 35	>	OP 37

4.8.2 Copying objects: Between projects and within a project

Principle

You can cut or copy selected parts of your project and paste them from one project to another via the Clipboard. For example you can copy text and fields from the alarm message editor to the event message editor, or graphic elements from one screen to another.

A requirement for successfully copying from one project to another is that the system limits of the destination project are exceeded.

You can also copy objects between projects with different resolution. If the destination system uses a lower resolution than the source system, then the icons of soft keys, for example, are cleanly adjusted to the new resolution by an anti-aliasing mechanism.

Preparations for new projects

Before starting to copy objects from an existing project, you should without fail carry out the following global settings in the new project. This will ensure that no loss of data occurs due to different settings during copying.

- At "System" > "Screen/Keys", adjust the partition of the screen display to that in the source project.
- Make the option for Full Screen mode the same as in the source project by choosing "System" > "Settings" from the "View" menu.
- Make the name and driver of the "PLC" the same as in the source project.
- Make the language settings the same as in the source project by choosing "System" > "Language Assignment".

Pasting objects in the destination project

To paste objects from the Clipboard to the destination project, choose "Edit" > "Paste" from the menu.

The object is pasted from the Clipboard to the destination project. If there is already an object of the same name in the destination project, the object is pasted under a new name.

Note

With "Paste", ProTool always checks the lower-level objects (such as the limit value tags of a tag which has been copied) to ensure that existing objects are reusable.

If there is already an object of the same name in the destination project, the object to be pasted will be renamed if necessary. It is given the next available name in the destination project.

Example:

Tag VAR_4 will be renamed VAR_11 if tags VAR_1 through VAR_10 already exist in the destination project.

What is copied?

You can copy the following via the Clipboard:

- All objects listed in the project window, such as screens, text or graphic lists, tags etc.
- Objects from screens (trends, fields, graphics etc.) in the screen editor.
- Messages and objects from messages (message text, fields, Help text etc.) in the message editor.
- Area pointers
- Global and local function key assignments

An object is copied complete with its attributes and all cross-referenced objects. Special situations encountered during copying are reported in the "system message window" at "Clipboard". This gives you information about any objects that have not been copied or renamed, for example.

Special situation with screens

If the object to be copied refers to a screen that does not exist in the destination project, the underlying screen is not copied; instead a blank screen is created as a dummy if the destination project does not contain a screen that can be reused.

This ensures that you will not copy the complete source project by mistake along with the start screen.

Afterward, when you paste the screen via the Clipboard, the dummy screen in the destination project will be automatically replaced by the proper screen.

Special feature with tags

Perform the steps listed below so that tags with a PLC connection can be inserted completely in the destination project when copying from one project to another:

- Assign a self-explanatory symbolic name for the PLC in the source project and do not use the system default setting (for example, PLC_1).
- Copy the PLC object to the destination project first so that it is present in both projects with identical parameters. Then copy the tags belonging to this PLC.

Special feature of recipes

With Windows-based systems, you can also copy recipes via the Clipboard. You will find more information about this at "Compatibility of recipes".

What is not copied?

These objects are not copied:

- Objects that are unknown in the destination project (such as functions or command buttons when copying from TP 170 to OP 170)
- Character sets
- In the case of multilingual projects, only the languages available in the destination project are copied. No new languages will be created. If necessary, create them before copying.
- Settings at "System" - for example, Language Assignment or Full Screen mode.

4.8.3 Replacing a project and project parts

Purpose

If you would like to introduce new or updated standard components (say, from ProAgent) of one project in your project, you can do so with the ProTool's Replace function.

Substituting a complete project

By choosing "File" > "Insert/Replace" > "Settings" from the menu, you can set the object types which should be taken into account when replacing whole projects. For this, select the "Replace whole projects" option and then select the object types.

The settings will be saved in the project concerned; if this project is used as a source project for the substitution, the settings are taken input.

If you choose "File" > "Insert/Replace" > "Start" from the menu, you can select a project to replace your currently open project.

The source project must be of the same type as the destination project.

Using the object name, a check is made for all the objects present in the source project as to whether an object having the same name is already present in the destination project.

If there is no such object present, a new object is created with the name used in the source file. If the object is already present in the destination project, it will be replaced by the object in the source project.

Object linking is not changed by the substitution; merely the contents of the object are inserted and additional linking added.

Should errors occur in the project during the substitution operation, they are reported in the same way as other errors when the project is compiled.

Replacement of a complete project cannot be undone.

Note

PLCs are not replaced as a general rule.

Replacing objects

You can also copy individual project objects from a source project and paste them in another project with the Replace function:

- Choose "Edit" > "Insert/Replace" from the menu to replace the objects in an object group from the project window (such as screens)
- By choosing "Replace" from the shortcut menu of an object, only the selected object is replaced

To do this, choose "File" > "Insert/Replace" > "Settings" from the menu and select the "Replace individual objects" option. Then select the object types which you want to be taken into account in the substitution. The settings for replacing individual objects are common to all projects.

Example

An archive is configured for the tag which you copied to the Clipboard in the source project. If you have selected "archive" as the object type in the "Setting Replace" dialog box, the archive is replaced in the destination project.

Object linking is not changed by the substitution; merely the contents of the object are inserted and additional linking added. All the objects referenced by the inserted objects are also pasted in the destination project.

Should errors occur in the project during the substitution operation, they are reported in the same way as other errors when the project is compiled.

The replacement of individual objects can be undone. Further, Replace is supported differently by various objects, including between projects of different types; thus, for example, you can paste objects from a graphics project in a Windows-based project.

What you must bear in mind

You cannot insert more objects with Replace than the number allowed by the quantity structure of the destination project.

If the destination project has a smaller range of functions than the source project, it is possible that not all objects will be applied.

Object attributes that have not been defined in the source project will be assigned default values in the destination project.

4.8.4 Undoing and redoing actions

Purpose

During configuration, it may become necessary to cancel actions which have been performed, or to reconstruct actions which have been discarded. The two commands "Undo" and "Redo" on the "Edit" menu are used for this purpose.

- Undo The "Undo" command (key combination Ctrl + Z) cancels the last action performed. If you keep selecting the command, you can cancel up to 30 successive modifications.
- Redo The "Redo" command (key combination CTRL+ Y)revokes the last action canceled, thus restoring the status before the last "Undo" command was executed.

Principle

Each active editor (project window, screen editor, drivers) has its own undo history. Thus, for example, if three screens are opened at the same time, three separate Undo Histories will be created. When a screen is closed, the actions listed in the accompanying History are deleted. When the project is saved, all the Undo Histories for the current project are deleted.

The last recorded action is displayed in abbreviated form in the menu. The tooltips contain detailed texts for the "Undo" and "Redo" buttons and for the status bar.

Example of menu

Undo: VAR_5 edited Ctrl + Z
Redo: PIC_2 edited CTRL+ Y

Example of tooltip/status bar

Undo: property edited of tag VAR_5
Redo: contents edited of screen PIC_2

Until the corresponding undo history is deleted, deleted objects in the cross-reference continue to be listed as used objects. The status of these objects is shown in brackets after each object - for example, PIC_5 (deleted).

General Information

The commands "Undo" and "Redo" only work with actions taken since the last time the project was saved. If, for example, you move a screen object and then save your project, you cannot later cancel this action.


These are some of the rules that apply to "Undo/Redo":

- Settings in dialog boxes (properties of a field) can only be canceled in their entirety. It is not possible to open the dialog box and discard individual entries.
- With multilevel dialog boxes, only changes to the primary object are recorded. Modifications to underlying objects, or creations or deletions cannot be reversed. Example (project window):
"Edit Tag" > "Edit Limit Value Tag"
You can only undo changes to the tag here.
- "Undo/Redo" is special to ProTool. With a project integrated in SIMATIC STEP 7, the Undo buffer cannot be accessed by a higher-level SIMATIC Step 7 Undo Manager.

4.8.5 Undoing the last action

Possible procedures

To cancel your last action in ProTool, choose one of the three following options:


- Choose "Edit" > "Undo" from the menu.
The last action that can be undone (canceled) is shown in abbreviated form after the menu command. A longer description is given in the status bar.
-  Click the "Undo" button on the toolbar.
This opens a tooltip which shows you the last action that can be undone (canceled). You are given the same information in the status bar.
- Press CTRL and Z simultaneously.
In contrast to the first two options, you are not given any feedback about which action has been canceled.

If you keep executing the "Undo" command, you can successively cancel all the recorded modifications.

4.8.6 Redoing the last action

Possible procedures

To restore your last canceled action in ProTool, choose one of the three following options:

- Choose the "Edit" > "Redo" command from the menu
The last undone action is shown in abbreviated form after the menu option. A longer description is given in the status bar.
-  Click the "Redo" button on the toolbar.
This opens a tooltip which shows you the last canceled action. You are given the same information in the status bar.
- Press CTRL and Y simultaneously.
In contrast to the first two options, you are not given any feedback about which action has been restored.

If you keep executing the "Redo" command, you can successively restore all the recorded cancellations.

4.9 Retrieving project information

Tools

The following tools are available to you for displaying or storing information on a project.

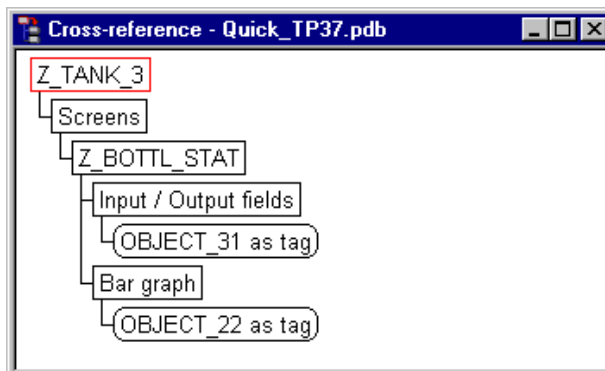
- Cross references
- Project information

4.9.1 Display in "Cross-Reference" window

Usage

When you have to add to or modify a project and need to check where and how a particular object is being used in your project, you open the "Cross-Reference" window.

You select an object in this window, and all the references to this object in the project are then displayed to you.



Example from a project

You open the "Cross-Reference" window by choosing the "View" > "Cross-Reference" option from the menu. The active object is displayed with a red border around it.

The selected object is at the uppermost level, and all the objects in which the selected object is used appear under it.

The cross-reference list also contains objects in the current Undo history (undo and restore actions). The status of these objects is shown in brackets after each object - for example, PIC_5 (deleted).

Note

You can use the "Cross-Reference" window efficiently for troubleshooting.

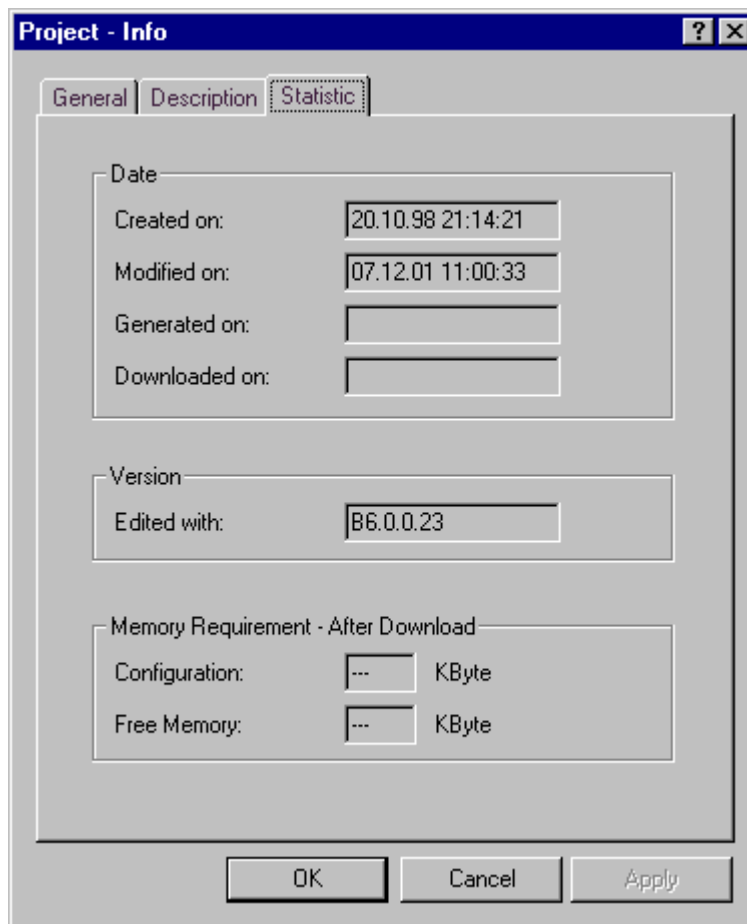
4.9.2 What can you view under "Project Information"?

"Project Information" dialog box

To obtain information about a project when projects change or are adapted, open the "Project Information" dialog box. To do so, choose "File" > "Project Information" from the menu.

The "Project Information" dialog box displays general "project data" and the "memory requirements" for the project. Project information is spread according to subjects over three tab controls:

- General
- Description
- Statistics



Example relating to the "Statistics" tab

General

The "General" tab shows information on the device type, project name, path name of the stored project file and person who created the project. You fill in the "Created by" field and all the other fields are updated automatically by ProTool when the project is saved.

Description

The "Description" tab contains an input field for the project description. Here you can enter any information you like that are important for your project.

Statistics

The "Statistics" tab shows when the project was created, modified, generated and downloaded, the ProTool version last used to edit the project and the memory required by the project after it has been downloaded to the flash memory on the operating unit. The memory requirement is determined and displayed "following the first download operation".

Exception:

With text-based displays OP 3, OP 5 and OP 15A/C, the memory requirement is determined and displayed following initial compilation.

4.10 Example of creating projects


These examples show you how to create a project for an OP 5.

4.10.1 How to create an OP 5 project

Objective

You want to create a project for an OP 5 and the SIMATIC S7-300 or SIMATIC S7-400 PLC.

Procedure

Procedure:	
1	 Click this symbol or choose "File" > "New".
2	In the "Select Device" dialog box at "Text-based operator panels", select an "OP 5". Click the "Next" button.
3	In the "Select PLC" dialog box, enter the name of the PLC. From the list below this, select the driver you want to use for communication between the operating unit and the PLC.
4	Click the "Parameters" button to set the driver parameters Click the "Next" button. You can also set the driver parameters later on.
5	In the "Standard projects" dialog box, select "Use standard project". This puts you on the standard project.
6	Double-click in the left of the project window on "Area Pointers" to configure the communication area for "event messages". Select this at "Type" and then click OK.
7	Enter the following values in the "Event Message" dialog box: DB: 70 Length: 4 Confirm with OK. You can then configure 64 event messages. This data block must also be available in your PLC program.
8	Proceed to configure the event messages. If you enter more than 64 messages, more than messages 0000 to 0063 cannot be issued to the operating unit, since only 4 words of area pointer have been created.
9	Save your project with "File" > "Save".

5 Configuration techniques

In this chapter you will learn how to:

- Create screens
- Configure controls and display elements
- Use tags
- Configure messages

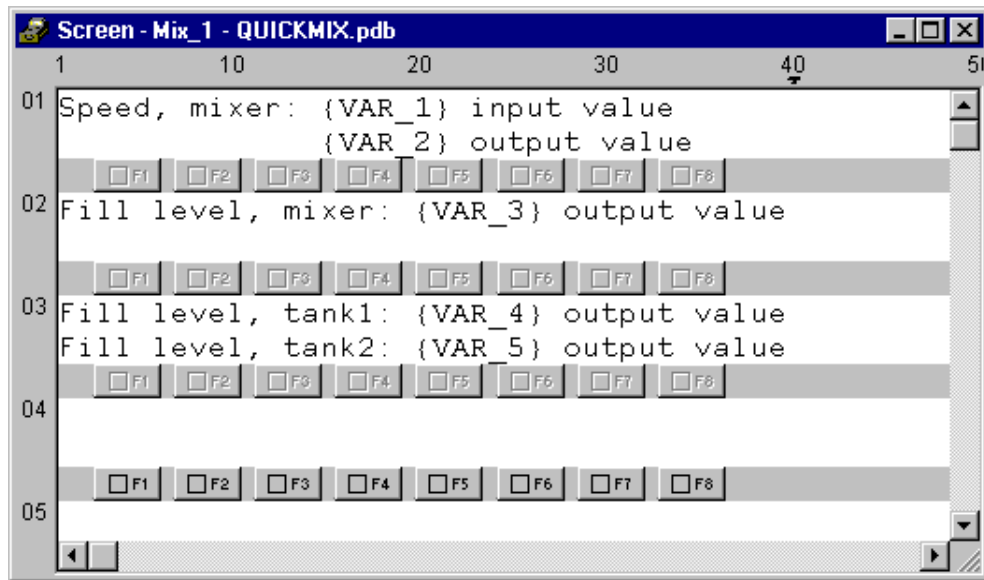
After that we will show you, for example, how to:

- Use functions
- Create recipes
- Assigning operator authorization
- Create multi-lingual projects

5.1 What are screens?

Example

Screens are an image of the process. You can display processes on screens and specify process values. The figure below shows an illustrated example of a mixing unit for producing different juices. Ingredients are filled into a mixer from different tanks and then mixed. The liquid levels in the tanks and in the mixer and also the actual speed of the mixer are displayed. You can specify the required speed of the mixer in an input field.



Configured screen for a mixing unit

Components of a screen

You can configure several "screen entries" for a screen. A screen entry has display size. You can see the entry numbers on the left border of the screen editor. The maximum number of screen entries for a screen depends on which device you are using.

A screen can consist of static and dynamic components. Static components are text, whereas dynamic components are "fields" which are linked to the PLC and display values from the PLC memory. Dynamic components are also inputs made by the operator on the operating unit and written to the PLC memory. The connection to the PLC is established by means of tags (refer to "Using tags").

Depending on the operating unit you are using, fields can be used for input, output and combined input/output.

Screen editor

Screens are created with a separate editor in ProTool. The operating unit is displayed when you call the screen editor. Open the screen editor by:

- double-clicking on "Screens" in the left half of the project window to create a new screen
- double-clicking in the right half of the project window on an existing configured screen to open the screen for editing.

Screens are stored under a symbolic name. You enter a name by choosing "Edit" > "Properties" from the menu. This name has to be specified when you edit, reference or delete the screen. In addition, screens are numbered automatically.

Start screen

Declare one screen in every project as the "start screen". The start screen is the screen that is displayed after the operating unit has started up.

To identify a screen as the start screen, select the screen and assign it as the start screen by choosing "Edit" > "Properties" from the menu. On the "General" tab, select the "Start screen" check box.

Soft keys

Soft keys are function keys with screen-dependent assignment. When you configure a soft key, you assign functions to it. You can point out the task of a soft key with a piece of explanatory text.

You can use soft keys to open another screen, turn a motor on and off or display the message buffer, for example.

Select screen

Every configured screen has to be integrated into the control process so that it can be opened at run time on the operating unit. You can select a screen in either one of two ways:

- "Select Screen" function
You assign this function to an input field or a function key, for example. You specify the name of the screen as the parameter. This means that a screen can be displayed by means of an input field or a function key.
With input fields and soft keys, the function can be used only locally on that screen. Should you wish the function to be available on every screen, you have to configure the function on a global function key on the operating unit.
- Screen directory
Include the screen in the screen directory. To do so, choose "Edit" > "Properties" and click the "Screen to Directory" check box on the "General" tab. Enter text specifically for that screen on the "Title" tab for display in the directory. This means that you can select the screen on the operating unit by means of the "Screens" > "Edit" standard screen.

5.2 Configuring display elements

Purpose

You use display elements to monitor the machine or the system on the operating unit. You can display current information, such as actual values from the PLC, process and operating modes and malfunctions, on the operating unit as a numerical value or in plain language.

Overview

There are essentially two types of display element available for the different tasks:

- **Static display elements**
A static display element is text not having a connection to the PLC. Static display elements do not react to user inputs and cannot be modified in Runtime on the operating unit. Use static display elements, for example, for explanations of controls and dynamic display elements.
- **Dynamic display elements**
Dynamic display elements are output fields that are connected to the PLC by means of tags. They visualize current values from the PLC in alphanumeric form. Output fields can change their display spontaneously in Runtime on the operating unit without the operator intervening.

Use output fields for all tasks associated with monitoring the process, a machine or the system.

5.2.1 What is static text?

Principle

Static text is text that is not linked to the PLC. It cannot be modified at run time on the operating unit. Use static text, for example, to label controls and output fields. The relative importance of different text strings on a screen can be illustrated by means of different character formats - for example, by means of flashing or uppercase text.

You can configure static text separately for any language available on the operating unit. You enter text strings directly into the screen editor.

5.2.2 What are output fields?

Purpose

Output fields display current values from the PLC on the operating unit. The values may be output optionally in numerical, alphanumeric or symbolic form.



Configure output fields by selecting the symbol illustrated or by choosing "Insert" > "Input/Output Field" from the menu.

Numerical and alphanumeric output

Output fields for numerical or alphanumeric values show the value as a number or as text. A numerical value, for example, is the number 80 as the actual value of a temperature. An example of an alphanumeric value is the text string Valve_12.

Symbolic output

Output fields for symbolic values do not display the true value but a text string from a text list. For example, you can store the two states of a valve in a text list. When the valve is open, the output field then points, for example, to the text string OPEN.

By using output fields for symbolic values, you eliminate misinterpretations on the part of the operator to a large extent, since a symbolic value often presents a state more lucidly than an abstract numerical value, for instance.

5.3 Configuring controls

Purpose

You use controls on the operating unit to intervene directly in the process. They are used, for example, to specify setpoints, trigger functions, open screens and acknowledge messages. You can assign a password level to controls in order to prevent operation by unauthorized persons.

Overview

The following controls are available in ProTool for the different tasks:

- Input fields
- Input/output fields
- Function keys

5.3.1 What are input fields?

Purpose

In input fields you enter values on the operating unit that are transferred to the PLC. The values may be input optionally in numerical, alphanumeric or symbolic form. If you define limit values for the input field tag, you can reject inputs on the operating unit that are outside the specified range of values.

You can prevent access by unauthorized persons by assigning a password level.



Create input/output fields by selecting the symbol illustrated or by choosing "Insert" > " Input/Output Field" from the menu.

Numerical and alphanumeric input

In input fields for numerical and alphanumeric values you enter the value one character at a time on the operating unit. A numerical value, for example, is the number 80 as the setpoint for a temperature. An example of an alphanumeric value is the text string Valve_12.

Symbolic input

In input fields for symbolic values you do not enter the value one character at a time but select this value on the operating unit from a text list. During configuration you assign symbolic text on the text list to every value of a tag. In this way, for example, you can turn a motor on and off by means of the two entries ON and OFF.

By using input fields for symbolic values, you prevent misinterpretations to a large extent, since the operating unit accepts only the configured values on the text list.

5.3.2 What are combined input/output fields?

Purpose

Combined input/output fields display current values from the PLC on the operating unit. You can also enter values that are transferred to the PLC at the same time. The values may be input and output optionally in numerical, alphanumeric or symbolic form. During input, the value you want to be output is not updated on the operating unit.

You can prevent access by unauthorized persons by assigning a password level. If you define limit values for the input/output field tag, you can reject inputs on the operating unit that are outside the specified range of values.



Combined input fields are created on the open screen on the "Screen Objects" toolbar by choosing the illustrated button or at "Insert" > "Input/Output Field".

5.3.3 What are function keys?

Purpose

A function key is a key on the operating unit for configuring a function assignment. You can assign one or more functions to any function key in ProTool. The functions are triggered as soon as the key is pressed. The function key assignment may be locally or globally significant. You can assign a password level to function keys in order to prevent operation by unauthorized persons.

Global assignment

Globally assigned function keys always trigger the same function, irrespective of the current control situation. You can use them, for example, to open a screen, display the current alarm message or print the contents of a screen.

By using globally assigned function keys, you cut your configuration effort considerably since you do not have to assign individual functions to global keys on every screen.



Assign function keys globally by choosing "System" > "Screen/Keys" from the menu. To do this, click in the Screen/Keys dialog box on one of the keys "K1" through "Kx" or "F1" through "Fx". You can specify the functions you have assigned to specific keys on the operating unit by means of labeling strips (not OP 3).

Local assignment

Locally assigned function keys trigger different actions on the operating unit depending on the situation. A function key whose assignment may vary from screen to screen is referred to as a "soft key".



Assign soft keys locally in the screen editor. To do so, click in the screen on one of the keys "F1" through "Fx", which are arranged directly around the operating unit screen.

You can also assign soft keys globally. A global assignment is active on all screens to which you do not assign a screen-specific function. Use globally assigned soft keys, for example, to change from any screen to the same system screen.

Note

Do not assign functions that have to be permanently available on the operating unit to soft keys.

5.4 Using tags

Purpose

Since tags are the most important means of communication between the operating unit and the PLC and for exchanging data, a detailed explanation is presented here of what tags are and what types of tag are used in ProTool.

Definition

A tag has a symbolic name and a defined data type. The value of the tag changes while the PLC program is being executed.

Tags with a PLC link are referred to as global tags. Tags without a PLC link are known as local tags.

- **Global tags**
A tag with a PLC link occupies a defined memory address on the PLC, to which read and write access is possible from both the operating unit and the PLC.
- **Local tags**
Local tags are not connected to the PLC. They are available only on the operating unit. You create local tags, for example, so that the operator can enter limit values on the operating unit.

Tag types

ProTool recognizes the following tag types (but these are not available on every PLC):

data type	Bit System	Range of Values
BYTE (OP 7/17 only)	8 bit	0 through 255
INT	16 bit	- 32768 through 32767
UINT	16 bit	0 through 65535
LONG	32 bit	- 2147483648 through 2147483647
ULONG	32 bit	0 through 4294967295
FLOAT	32 bit	Upper limit: $\pm 3.402823 \text{ e}+38$ Lower limit: $\pm 1.175495 \text{ e}-38$
DOUBLE (OP 7/17 only)	64 bit	Approx. 12 valid digits
BOOL		true (1), false (0)
STRING		1 to 128 bytes

data type	Bit System	Range of Values
ARRAY tags	This tag type combines a random number of tags of the same type to form a total, which can be handled as a whole.	

Online tags for S5

Data type	Bit system
KF	16 bit, fixed-point
KH	16 bit, hexadecimal
KM	16 bit, binary
KY	8 bit, 8 bit (2 x 8 bit, comma separated)
KC	(ASCII character)
KT	(S5 timer)
KZ	(S5 counter)
BCD4:	16 bit, BCD
DF	64 bit, fixed-point
DH	64 bit, hexadecimal
KG	Floating point

Online tags for S7

data type	Bit System
CHAR	8 bit
BYTE	8 bit
INT	16 bit, fixed-point
WORD	16 bit
DINT	32 bit, fixed-point
DWORD	16 bit
REAL	32 bits floating point
BOOL	1 bit
STRING	ASCII character
TIMER	Timer (S5#Time)
COUNTER	Counter

Note

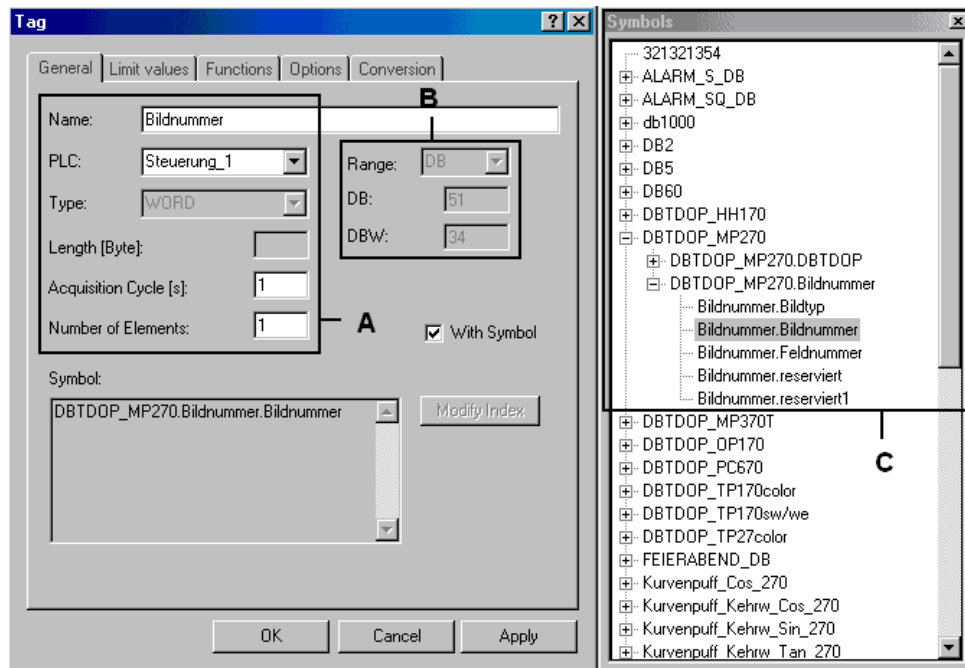
The details "fixed-point", "hexadecimal", etc., refer to the representation of the CPU. They have no bearing on the display options on the OP.

5.4.1 Properties of tags

Tag definition (Section A)

To define a tag, open the "Tag" dialog box.

The figure shows an example of the "Tag" dialog box for SIMATIC S7 integrated in SIMATIC STEP 7.



"Tag" dialog box for the SIMATIC S7

The available data types and data formats depend on the PLC you selected. You choose at "Type" in the "Tag" dialog box between "Format" and "Decimal places".

Updating tags

The acquisition cycle determines the time interval in which the value of a tag is updated on the operating unit.

System default setting: 1 sec

The acquisition cycle is a multiple of the "standard clock pulse", which you configure for every PLC in the "PLC" dialog box. You globally modify the acquisition cycles for all the tags of a project by setting the standard clock pulse.

Array tags

An array tag represents a number of tags of the same type with consecutive memory addresses. If you wish to define an array tag, enter the number of elements in the array in the "Tag" dialog box at "Number of elements".

The system default setting is 1, in other words, the tag is not defined as an array.

The maximum number of elements in an array is 255.

All elements are automatically read in when an array tag is accessed. To avoid as many delays as possible at run time, you should use arrays only when values are not frequently changed.

If the array is connected to a PLC, the whole array is transferred to the PLC every time an array element is modified. An array must therefore not be written from the PLC and from the HMI device for this reason.

Address (Section B)

The address determines the memory location of a global tag on the PLC. The address therefore depends on the PLC you are using.

The display of the address depends on the PLC you selected. This section of the "Tag" dialog box adjusts dynamically to the programmable address areas.

ProTool integrated in SIMATIC STEP 7 (Section C)

If you have installed ProTool integrated in SIMATIC STEP 7, you can access the "STEP 7" symbol table directly in the "Tag" dialog box. The symbol table is displayed in the "Symbols" floater when you select the "With symbol" check box.

For performance reasons, ProTool does not automatically update the STEP 7 symbol table after every change. In order to make the latest changes to the STEP 7 symbol table available in ProTool, update the display of the symbol table in the "Tag" dialog box by clicking the "Update" button.

Setting a start value

You can set a "start value" for the tag at "Options". When the project is downloaded, the tag is assigned the start value. The start value is displayed only on the operating unit and is not stored on the PLC.

Example:

If tags are used for scaling bar graphs, the initial value may be the start value of the scaling.

Setting limit values

An upper and a lower limit value can be configured at Limit values for tags.

If the tag value is outside the defined range, in other words, it is higher or lower than the limit value concerned - this has the following effect on the input fields, for example. If the operator enters a value outside the configured limit values, the input is rejected.

Configuring tags with functions

You can assign functions to tags in input/output fields - for example, the "Select Screen" function. The screen is selected as soon as the value of the tag changes.

Note

A function which you have configured for an internal tag (without PLC connection) whose value is modified by another function is not executed.

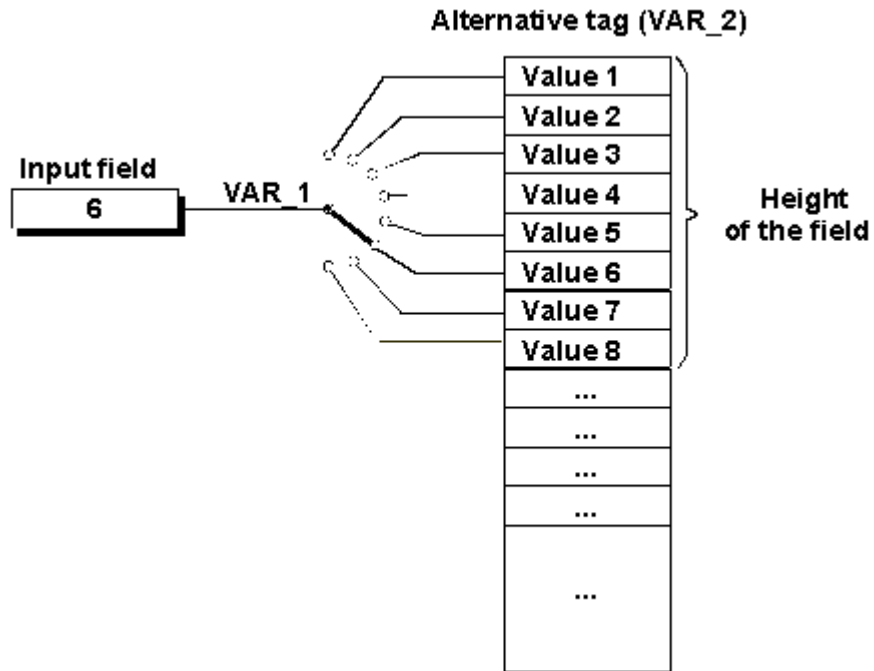
5.4.2 Tag lists

Purpose

With each input field, you generally set in advance which array element is assigned to the input field. With a tag list, this assignment is not static for the OP 7 and OP 17 devices, but it can be influenced by the operator. Thus you directly access an element in the array that supplies the input field with data in Runtime.

Principle

The figure shows the principle of a tag list. When configuring the input field, define a "selection tag" VAR_2 as well for tag VAR_1 of the input field . The selection tag is an array. Use the configured value for the "height" of the input field to set how many elements of the array you want to appear on the display. If the number of array elements is higher than the "height", you can scroll in the displayed "list" of tags. At run time, the value (6), entered in the input field, will determine the index in the selection tag and supply the input field with the value saved at the associated address in the PLC.



Tag list (principle)

5.4.3 Address multiplexing

Requirements

- Address multiplexing of tags is possible only with operating units OP 7, OP 17 and TD 17.
- Use a SIMATIC S7-300 or SIMATIC S7-400 or SIMATIC S7-NC PLC.

Definition

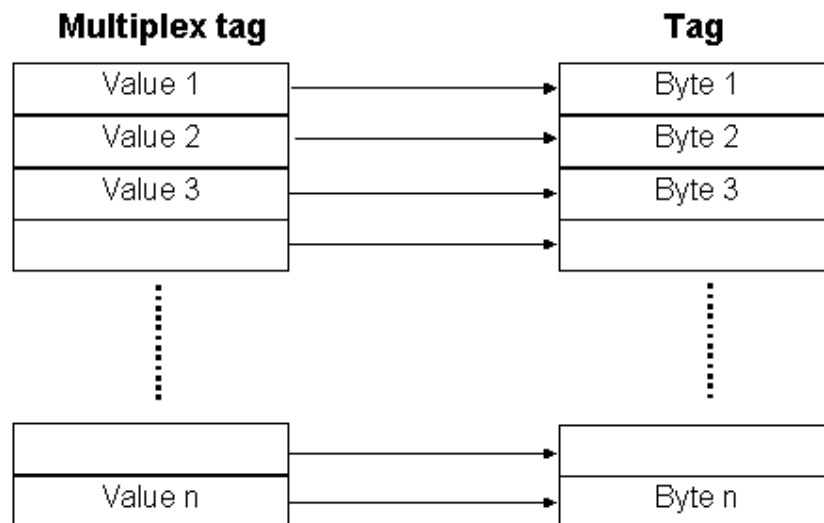
With address multiplexing, the address parameters of a tag are modified as a function of the value of the multiplex tag.

Purpose of address multiplexing

With address multiplexing, you can reference a number of memory addresses in the address area of the PLC (S7-CPU) with a single tag. You can read or write to the addresses without having to define a tag for every single address, that is, it is a very efficient method of processing data.


Principle of address multiplexing

The following figure illustrates the principle of address multiplexing with tags:



Address multiplexing with tags

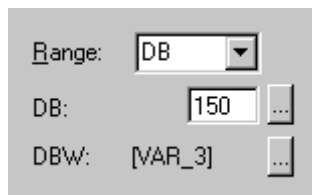
Configuring a multiplex tag

 You define the multiplex tag by pressing this button shown in the "Tag" dialog box next to the address.

Pay attention to the following when configuring multiplex tags:

- The multiplex tag must not be multiplexed.
- The "type" of multiplex tag must match the type of address parameter which the multiplex tag is defining.

The following figure shows the result of the address multiplexing for tags:



Address multiplexing with tags

Note

If one of the multiplex tags is modified during operation, the multiplexed tag is not modified until the next recording cycle. If you want immediate updating, configure the "Update Screen" function for every multiplex tag.

5.4.4 Examples of configuring tags

Using examples, we will show you here how to configure a multiplex tag, set the acquisition cycle and the standard clock pulse of a tag, and scale tags.

5.4.4.1 How to set the acquisition cycle and the standard clock pulse

Settings

System default setting: standard clock pulse 200 ms, acquisition cycle 1 s.

Set the standard clock pulse in the "PLC" dialog box. If you increase the standard clock pulse to 600 ms, the acquisition cycle for all tags is increased to 3 s.

Note

In order not to overtax communication between the PLC and the operating unit, the times you set for the standard clock pulse should not be too short. This would mean that other processes, such as the updating of trends or the execution of PLC jobs, would take considerably longer.

5.4.4.2 Tag scaling

Configuring functions

The scaling of tags is configured as a function for a tag. The following functions are available for this:

- Scaling Linear 1 and Scaling Linear 2

If you configure no scaling, the tag value on the PLC corresponds to the tag value on the operating unit.

Linear scaling

Scaling can be configured for any tag in the form

$$y = a * x + b.$$

- X = displayed value/input value
The Y value read from the PLC undergoes linear scaling before being displayed on the operating unit as the X value. Inputs X on the operating unit undergo scaling before being written to the PLC as the Y value.
- Y = displayed value/input value
The X value read from the PLC undergoes linear scaling before being displayed on the operating unit as the Y value. Inputs Y on the operating unit undergo scaling before being written to the PLC as the X value.



Example

You have configured 3 as the value of a 6 as the value of b. The value 21 is transferred from the PLC. It is included in the scaling function: $21 = 3 * X + 6$. This results in 5 being the value for X. This is the value displayed on the operating unit.

5.4.4.3 How to configure a multiplex tag

Procedure

To multiplex an address, create the following tag, for example:

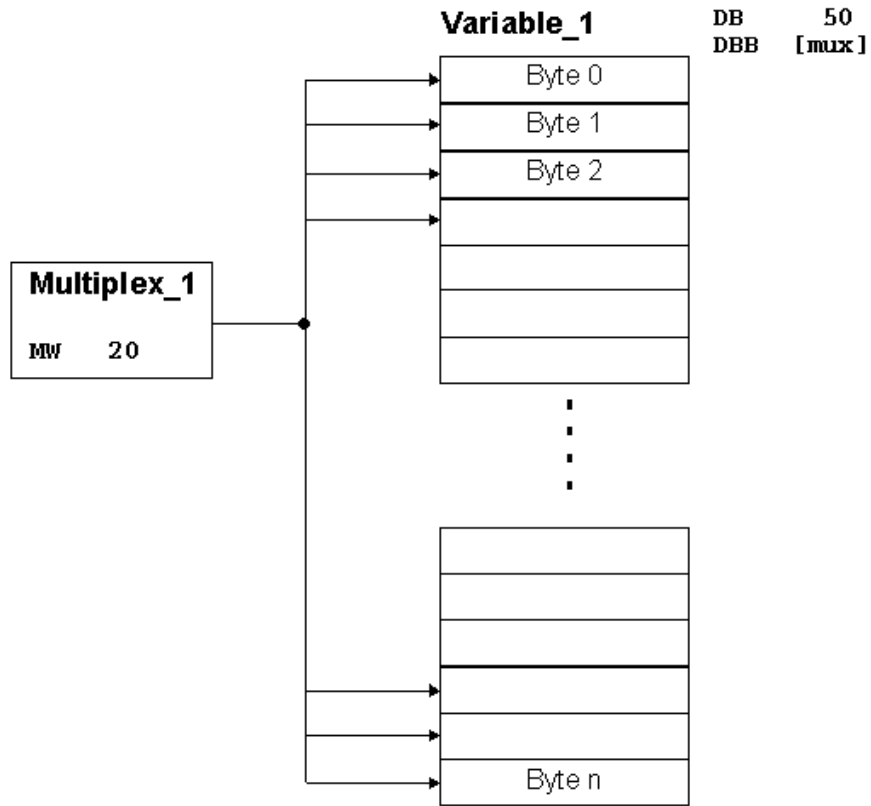
Procedure:	
1	Select "Insert" > "Object" to configure a new tag for any object.
2	In the "Tag" dialog box, enter <code>Variable_1</code> as the name of the new tag.
3	On the "Address tab", select <code>INT</code> at Type and enter the address as: <code>DB 50</code> <code>DBB 0</code>
4	 Click this button to open the "Address Multiplexing" dialog box.
5	Activate address multiplexing.
6	Enter <code>Multiplex_1</code> as the name of the new multiplex tag.
7	 Click this button to define the multiplex tag.
8	On the address tab, select <code>BYTE</code> at Type and enter the address: <code>F W 20</code>
9	The multiplex tag can assume values between 0 and 255, in other words you can reference 256 different addresses with the tag <code>Variable_1</code> . Apply the settings by clicking OK.

Note

If you want to make use of the maximum range of values of the multiplex tag, `DB 50` in the STEP 7 program has to be created with at least 128 data words.

Result

The name of the multiplex tag is displayed as the address of the tag Variable_1:
 DB 50
 DBB [MULTIPLY_1]



Example: configuring a multiplex tag

5.4.5 Details on configuring tags

At "Details" you will find more information on the subject of tags.

5.4.5.1 Decimal places with tags

Overview

The following list shows the possible number of decimal places of the different types as a function of the PLC selected:

PLC	Type	Decimal places
SIMATIC S5	KF	0 through 4
	KG	0 through 6
	DF	0 through 8
	DH, KH, KM, KC, KY, KT, KZ, BCD4	---
SIMATIC S7	INT	0 through 4
	REAL	0 through 6
	DINT	0 through 8
	BOOL, STRING, Timer, Counter, CHAR, BYTE, WORD, DWORD	---
SIMATIC S7-NC	INT_16, UINT_16	0 through 4
	FLOAT	0 through 6
	INTEGER, LONG, UINT32, DOUBLE	0 through 8
	BOOL, CHAR, STRING	---
SIMATIC 500/505	+/- INT, INT	0 through 4
	REAL	0 through 6
	+/- DOUBLE, DOUBLE	0 through 8
	BIT, ASCII	---
No PLC	INT, UINT	0 through 4
	FLOAT	0 through 6
	LONG, ULONG	0 through 8
	BOOL, STRING	---

5.4.5.2 Address and type of a tag

Dependence of tags on the PLC

The address and the data type (the data format) of a tag depends on the PLC.

Note

You will find information about the various PLCs at "Start" > "SIMATIC" > "ProTool 6.0" > "ProTool Information System" in the topic "Process communication".

Available PLCs

- SIMATIC S5 - AS511
- SIMATIC S5 - DP
- SIMATIC S7-300/400
- SIMATIC WinAC
- SIMATIC S7-200
- SIMATIC 500/505
- SIMATIC 500/505-DP
- SIMOTION
- OPC (Client/Server)
- Allen-Bradley DF1
- Allen-Bradley DH485
- LG GLOFA-GM
- MITSUBISHI FX
- MITSUBISHI Protocol 4
- Modicon Modbus
- Telemecanique Uni-Telway
- GE Fanuc SNP/SNPX
- Omron Host-Link

5.5 Headers and footers

Constraints

Note

Headers and footers can only be configured for the OP 5, OP 7, OP 15 and OP 17 and the corresponding C7 devices.

What objects can you use in headers and footers?

You can configure "static text" and "output fields" in headers and footers. Two lines of 80 characters are available in all instances.

At "Usage", you can choose between "date", "time" and "page number". This also sets "display" and "field length".

For what uses can you configure headers and footers?

You can set headers and footers for the following printouts from the operating unit.

Printout	Content
Message Report	Messages for which you have configured "Print" are output to the printer.
EM Chronological	The contents of the event buffer are printed in chronological order of the messages.
EM Together	The contents of the event buffer are printed in message number order.
AM Chronological	The contents of the alarm buffer are printed in chronological order of the messages.
AM Together	The contents of the alarm buffer are printed in message number order.
Overflow	When the buffer overflows, the messages are output to the printer.
Print Screen	A screen that you have selected is printed.
Print Recipe	The recipe specified in the function parameter of the function "Print All Data Records" is printed out complete with all its data records.

5.6 What are text or graphic lists?

Purpose

Text is often more meaningful than an abstract value. For example, the pieces of text `full` and `empty` present the state of a tank more lucidly than the corresponding numerical values. Which is why ProTool gives you the opportunity to configure text or graphic lists. These "text lists" are lists in which you assign a text element from the list to each tag value.

Usage

With text or graphic lists, you can display texts in output fields and select texts for input in input fields. To a large extent, this eliminates misinterpretations in the display and operator errors during input.

A text or graphic list assigns a text to every value of a tag. At run time, the tag value determines which text is selected from the list and displayed, for example, in an input/output field on the operating unit.



To create a new text or graphic list, double-click "Text or graphic lists" in the project window.

5.7 Configuring schedulers

Constraint

Note

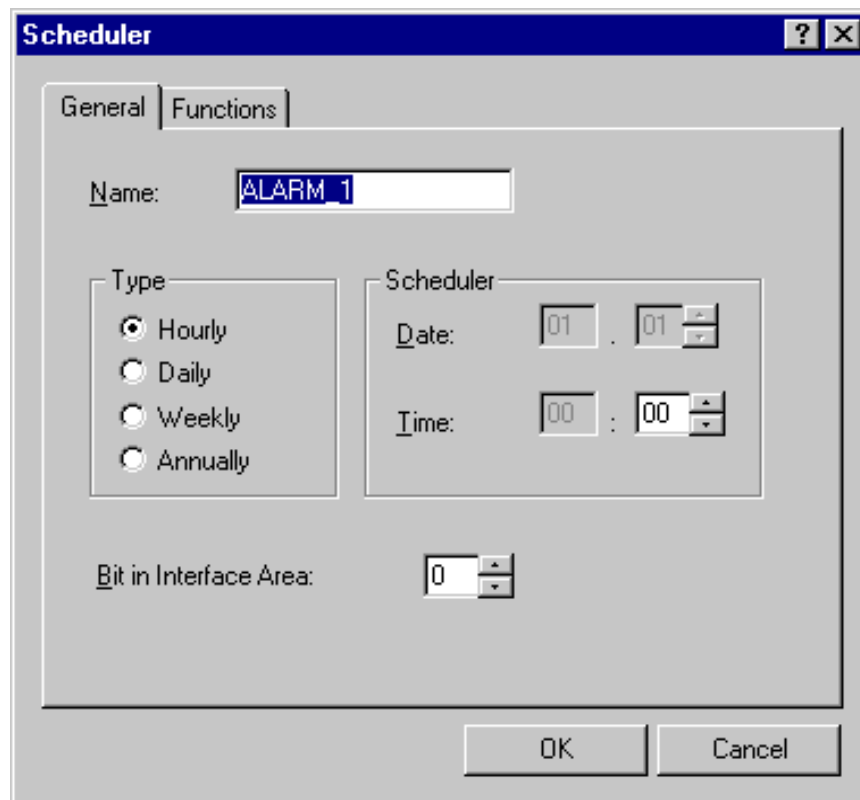
Schedulers are available only for the OP 15 and OP 17 operating units.

Tasks of a scheduler

A scheduler defines a regularly recurring time at which a particular function is to be executed.

The following types of scheduled times are available:

- hourly
- daily
- weekly
- annually



Scheduler dialog box

The following table shows which time entries you can specify for which scheduler types:

Scheduler type	Required time entries
hourly	Minute
daily	Hour, minute
weekly	Day of the week, hour, minute
annually	Month, day, hour, minute

Functions linked to a scheduler

If you subsequently want to change or deactivate the scheduled time on the operating unit, you can insert it in a screen entry. At a scheduled time, the associated scheduler bit is set on the PLC (in the interface area) and the configured function executed.

For example, you can configure print functions for a scheduler:

- Events - Print Buffer
- Alarms - Print Buffer
- Print Screen
- Print Data Record

Scheduler without functions

It is not essential to configure a function. If no function is configured, the scheduler bit is set when the scheduler is executed, but of course no function is executed.

5.8 Configure messages

To display process and operating states or to acquire and log process data on the operating unit that you obtain on the process from the PLC, configure "messages".

Messages are initiated by the PLC and can be displayed on the operating unit.

5.8.1 Displaying operating and process states

What do you use to display operating and process states?

To display process and operating states or to acquire and log process data on the operating unit that you obtain on the process from the PLC, configure "messages".

Messages are initiated by the PLC and can be displayed on the operating unit.

There are the following message types in ProTool:

- Event messages: Display routine operating and process states and processes.
- Alarm messages: Display critical or hazardous operating and process states and require operating personnel to react by issuing an "acknowledgement".
- System messages: Display states and errors of the operating unit, the PLC or the communications between them. They are issued by the operating unit or by the PLC.
- System messages on the S7-NC and S7-FM (OP 7 and OP 17 only): Display states and errors of the PLC or during communication.

For what purpose do you use messages?

The messaging system is responsible for the following tasks:

- Signaling events or states that can occur on the system or in the process:
- A state is reported immediately following its occurrence.
- The messages are presented to the operator as a function of their significance (priority).
- Support in eliminating the cause of error conditions:
- Messages provide in-depth information on the causes of errors (diagnostics).
- The process might be influenced as a result of the message.
- Reporting: The message events are output to a printer.

5.8.2 The components of a message

Message structure

A message consists of:

- Message number
- Message text
- Message tag
- Help text

The following messages are displayed on the operating unit but cannot be edited in ProTool:

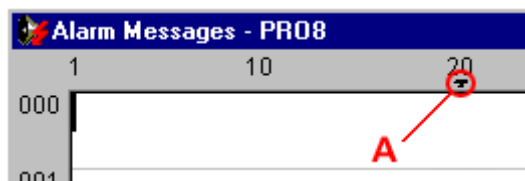
- The message number cannot be modified in system messages, standard diagnostic results (S7 system messages) and NC alarms. (Only with OP 7 and OP 17).
- Message numbers of user defined diagnostic results can be freely defined in SIMATIC STEP 7 within certain limits.
- The message number is assigned to Alarm_S messages in SIMATIC STEP 7.

Message number

The message number is used to reference a message. In ProTool, you have a free choice of message number (within the range 0 to 2000) and message text.

Message text

Message text contains the description of a message. The length of the message text depends on the operating unit. The number of characters per line is marked by this character (A) at the top border of the window during configuration.



By choosing "Edit" > "Style" from the menu, you can select the following styles, for example, for the message text, depending on the operating unit: flashing, underscore, italic.

Note

You can also configure operator instructions as a message.

Message tags

A message can contain output fields with tags. They are also referred to as "message tags".

By choosing "Edit" > "Style" from the menu, you can select from the following styles for output fields, depending on the operating unit: flashing, underscore, italic.



Insert an output field by selecting the symbol illustrated.

Note

The values of message tags are updated in the message buffer when messages are active or are cleared, but not when messages are acknowledged.

Help text

Help text containing further details on a message can be configured for every message. Help text is displayed for the operator in a separate window on the operating unit by pressing the "HELP" key.



Enter Help text by selecting the button illustrated or by using the menu command "View" > "Help Text".

Other message components

When configuring message views for certain devices, other message components can be displayed - for example, details of the error location (on the PLC).

5.8.3 Message properties

Configurable properties

You can configure the following parameters for messages:

- Priority
- Acknowledgement group
- Print

Priority

High-priority messages are displayed before low-priority messages on the operating unit. The lowest priority is 1.

- If several messages having the same priority are waiting to be displayed, the most recent (last) is displayed.
- If several unacknowledged alarm messages having the same priority are waiting to be displayed, you can choose whether the most recent (last) or the oldest (first) should be displayed.

Configure the priority in the "Attributes" dialog box for every single message. Set the sort criterion by choosing "System" > "Messages" > "Settings" from the menu.

Acknowledgement group

Alarm messages can be assigned to acknowledgement groups. Configure the assignment to an acknowledgement group for every single message. If you acknowledge an alarm message in one acknowledgement group, all the alarm messages in that group are acknowledged simultaneously ("group acknowledgement").

Print

If you select "Print", the message event (active, cleared, acknowledged) is logged automatically on the printer if you selected "Print upon Message Event" after choosing "System" > "Messages" > "Settings" from the menu.

Configure printing in the "Attributes" dialog box for every single message.

5.8.4 Acknowledging messages

Principle

An alarm message can be acknowledged either by the operator on the operating unit or by the PLC program. By acknowledging an alarm message, you confirm that you have taken notice of it.

Assigning acknowledgement groups

You can assign several alarm messages to a single acknowledgement group when you configure alarm messages. This means that when the first alarm message is acknowledged for example, the cause of the malfunction- all the other alarm messages in the same acknowledgement group (consequential malfunctions) are acknowledged together.

A blank field in the attribute window of the message is synonymous with entering 0. The value 0 results in "individual acknowledgement" - in other words, only that particular alarm message is acknowledged in the alarm message acknowledgement process. If you acknowledge an alarm message in one acknowledgement group, all the alarm messages in that group are acknowledged simultaneously ("group acknowledgement").

You can allocate the messages to one of 4 acknowledgement groups.

5.8.5 Settings for message classes

Properties of message classes

You can configure the following parameters for message classes:

- Acknowledgement
- Printout

Acknowledgement

Alarm messages have to be acknowledged. Alarm messages are displayed until they have been acknowledged.

- Single acknowledgement:
When you acknowledge a message, only that particular message is acknowledged.
- Group acknowledgement:
When you acknowledge a message belonging to an acknowledgement group, all the queued messages of this group are acknowledged, too.

Printout

Printing is enabled or disabled by selecting the "Print" attribute, or is enabled when the message buffer overflows. The messages are printed on a printer attached to the operating unit.

Configure your printout by choosing "System" > "Messages" > "Settings" from the menu.

5.8.6 System messages

Displaying system messages

System messages are always implemented on the operating unit and cannot be configured in ProTool. They are displayed in a process window.

What is reported?

A system message consists of a "message number" and "message text". The message text may contain internal system tags that provide further details on the cause of an error message.

System messages provide information on operating unit operating states. The wealth of possible system messages ranges from notes to serious errors.

Note

You will find a list of system messages of the operating units, their causes and, if possible, remedial action in an appendix to the equipment manuals and the "Communication User's Guide".

Displaying system messages

Choose "System" > "Messages" > "System Messages" from the menu system to set the length of time you want to have the system messages displayed on the operating unit.

Note

The 0 setting means the display is static. The process window is not closed until you press ESC.

On operating units OP 7 and OP 17 (and accordingly C7-633 and C7-634) you can also activate display of the following "system messages (example)":

- SIMATIC S7 (Minimal): The message numbers of the S7 system messages (time stamped) are output. You can refer to the cause of the error in your S7 manual by means of the number.
- SIMATIC S7 (Standard): In addition to minimal display, the message text of the S7 system message is output and you can display it using the arrow keys.
- SIMATIC S7-FM: The message text of FM system messages is output.
- SIMATIC S7-NC: The message text of NC system messages is output.

Note

The `..\PROTOOL\SYMSMSG` folder contains system messages for the S7-NC and the S7-FM in several languages.

5.8.7 Logging messages

Enabling and disabling message logging

To output messages to the printer, open the "Attributes - Message" dialog box by choosing "View" > "Message Attributes" from the menu and select "Print". The messages are logged when their status changes (active, cleared, acknowledged).

By choosing "System" > "Messages" > "Settings" from the menu, you can select the following settings for message logging:

- Message event
Message logging is activated for all message events.
- Buffer overflow
When the specified remaining buffer capacity is reached, all messages are printed out irrespective of whether printing is enabled or not. The message buffer is then deleted.
- Off
Message logging is disabled.

You use the "Message Log ON/OFF" function to enable and disable automatic printing of messages.

5.8.8 Configuring printers for the operating unit

Printer for logging

Attach a printer to your operating unit to log process states or process data reports.

For this you can configure one or more printers.

- In ProTool, some printers in the list box have already been defined. Parameters have already been assigned to these printers.
- You can add more "new printers" to the list box in ProTool. You have to enter the specific control characters contained in the printer manuals concerned for these printers.

Perform the settings for the printers and the interface parameters by choosing "System" > "Printer" from the menu.

5.8.9 Displaying messages on the operating unit

Principle

Messages are displayed in special output windows. You can still operate the operating unit when messages are queued and displayed.

Set the display of messages on the operating unit by choosing "System" > "Messages" > "Settings" from the menu.

Select "Separate" or "Together":

- "Together"
The display on the operating unit is split. Event messages are displayed in the one half and alarm messages in the other. If no event messages or alarm messages are queued, the corresponding section remains empty.
- "Separate"
Event messages and alarm messages are displayed separately from each other on the operating unit. They are displayed according to priority:
 - Unacknowledged alarm messages
 - Event messages
 - Acknowledged alarm messages
 - Standby message

If, for example, at least one unacknowledged message is pending, no event messages are displayed.

Sort criterion for alarm messages

If several unacknowledged alarm messages of the same priority are queued, select the sort criterion by choosing "System" > "Messages" > "Settings" from the menu:

"First" The first (oldest) alarm message is displayed first.

"Last" The last (most recent) alarm message is displayed first.

If you configure the function `Select Function Screen` and configure "Screen Name" using the value "AM First/Last" as the parameter, you can change the sort order on the operating unit.

Note

This function has already been implemented on the `System Settings` standard screen.

Standby message

The "standby message" is a special event message. The standby message is the event message having message number 0. It is displayed when no other messages are queued on the operating unit.

Note

The standby message can have only message text and output fields containing the date and time.

5.8.10 Contents of message buffers

Definition

A message buffer is a buffered memory area in the operating unit RAM in which message events are stored in chronological order. It takes the form of a FIFO buffer with a specified size and does not have to be explicitly configured.

The message buffer can store 256 alarm message events as well as 256 event message events.

Data storage in message buffer

Every message event is stored with the following information:

- Message number
- Identification of the event
("K" for Active, "G" for Cleared, "Q" for Acknowledged)
- Time stamp consisting of date and time
- Acknowledgement group "QG" (with alarm messages only)
- Message text
- Value of the message tag at the time of arrival or departure

Example

Below is an example of output from the message buffer to the printer:

```
0010 G 11:58:08 27.03.98 QGR02
Boiler pressure too high: 7.9 bar
```

```
0029 Q 11:40:47 03.27.98 QGR00
Oil supply shut off
0029 KQ 11:38:09 03.27.98 QGR00
```

```
Oil supply shut off.
0010 Q 11:35:18 03.27.98 QGR02
```

```
Boiler pressure too high: #### bar
0010 KQ 11:34:26 03.27.98 QGR02
```

```
Boiler pressure too high: 12.7 bar
```

If a message contains process values, then those values that were available when the message event arrived or departed are stored in the message buffer. In the case of the "acknowledged" message status, the operating unit does not acquire any current process values.

Note

The last four characters cannot be displayed on the operating unit on the first line of the message buffer on account of the message number being displayed. If a message tag has been configured at this point, it is not displayed.

Behavior on overflow

Choose "System" > "Messages" > "Settings" from the menu to select whether an overflow warning should be output when the specified remaining buffer capacity is reached.

Before the messages are deleted, they are output to the printer. This applies to all messages even if they are not marked with the "Print" attribute .

Using a standard screen

The following functions have already been implemented on the standard screen known as "Event Messages" (Z_MESS_EVENT):

- Display event message buffer
- Print event buffer
- Delete event buffer
- Output Overflow Warning
- Display number of event messages

The following functions have already been implemented on the standard screen known as "Alarm Messages" (Z_MESS_ALARM):

- Display alarm message buffer
- Print Alarms Buffer
- Delete alarm buffer
- Output Overflow Warning
- Show number of alarm messages

5.8.11 Exporting message text and screens

Export file

An export file is a text file that you edit with an editor in ANSI format and can then reimport.

For more on this subject refer to the example relating to an export file with event messages.

Usage

You choose "Edit" > "Export" from the menu to export strings of "message text and screen entries" which you want to apply to another project, for example, or which you want to translate in another editor.

5.8.12 Importing message text and screens

Import file

The import file is a text file that you created with an editor in ANSI format or exported from a project.

Usage

You choose "Edit" > "Import" from the menu to import strings of "message text and screen entries" which you want to borrow from other projects, for example, or which you have translated into another language.

For more on this subject refer to the example relating to an export file with event messages.

Note

Before creating an import file, you should export a message or a screen in order to familiarize yourself with the syntax used.

5.8.13 Communication areas for messages

Communication area required for operating unit/PLC communication

For communication between the operating unit and the PLC to function properly, establish an assignment to the following communication areas in the project window of your ProTool project at "Area Pointers": "Event messages" and/or "Alarm messages".

These areas are imperative if you configure event messages and alarm messages.

They must be chosen at least large enough for a bit to be available for every configured message. If the communication area is not made large enough, a warning will be issued during compilation of the project.

If you wish, you can create the following communication areas:

- PLC Acknowledgement
- OP Acknowledgement

Optional communication areas: Acknowledgement areas for messages

If the PLC is required to send an acknowledgement automatically, create the following acknowledgement areas in the project window at "Area Pointers".

- "PLC Acknowledgement"
The acknowledgement bit is set by the PLC program and thus causes acknowledgement of the corresponding alarm message to be displayed on the operating unit.
The "PLC Acknowledgement" acknowledgement area
 - must be contiguous with the associated alarm message area
 - must have the same acquisition cycle as the alarm message area
 - must not be longer than the associated alarm message area.
- "OP Acknowledgement"
The operator acknowledges an alarm message on the operating unit and thus sets the acknowledgement bit of this alarm message on the PLC. When he does so, the entire acknowledgement area is transferred to the PLC. The "OP Acknowledgement" acknowledgement area must not be longer than the associated alarm message area.

5.8.14 Message procedure:

Message bit procedure

The message procedure identified the transfer path of messages and thus also the parameters of the messages. The message procedure in ProTool is the message bit procedure.

With this message procedure, the operating unit detects the arrival, departure or acknowledgement of a message by setting a bit in the address area, the bit being assigned by choosing "System" > "Area Pointers" from the menu to the event/alarm message area.

Message number procedure

The second message procedure used in ProTool is the message number procedure "ALARM_S".

A message is event-driven and is issued when a bit is set in the PLC. The setting and resetting of the bit and acknowledgement are known as a message event.

Active (K)	The message bit has been set and the message is waiting to be displayed.
Cleared (G)	The message bit has been reset because the cause that gave rise to the message no longer exists.
Acknowledge (Q)	With alarm messages only: The operator (or the PLC) acknowledges the message to confirm that note has been taken of the message.

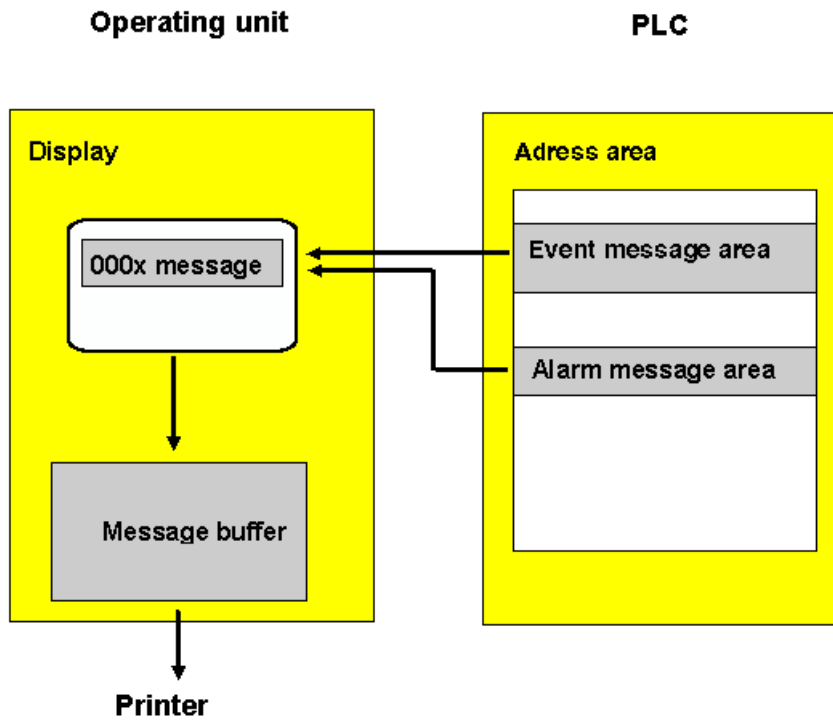
The message events have been acquired by the operating unit and time stamped.

The operating unit automatically enters all message events in the message buffer. In this way the message events can be viewed at a later time again.

Communication areas for messages

The display of messages on the operating unit is initiated by the PLC by a bit being set on it in a defined communication area.

You can see which communication areas for messages have to be created on the PLC in the following figure:



Displaying messages

5.8.15 Examples of configuring messages

These examples show you:

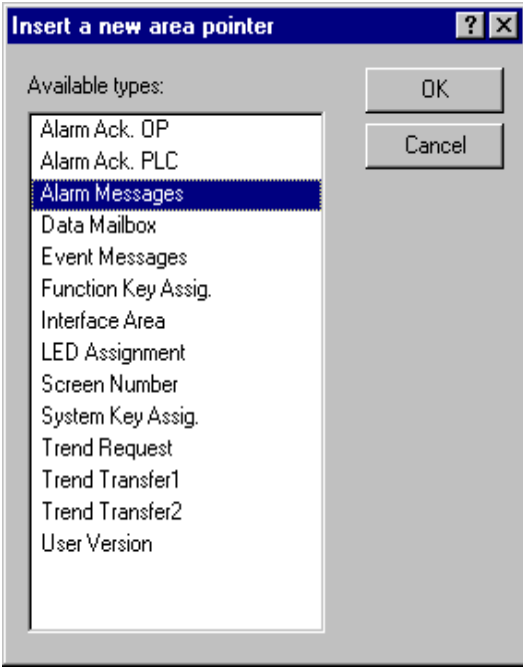
- How to configure an alarm message.
- How to create message areas for different devices.
- How system messages might appear, depending on the operating unit.
- The contents of the export file for event messages.

5.8.15.1 How to configure alarm messages

Objective

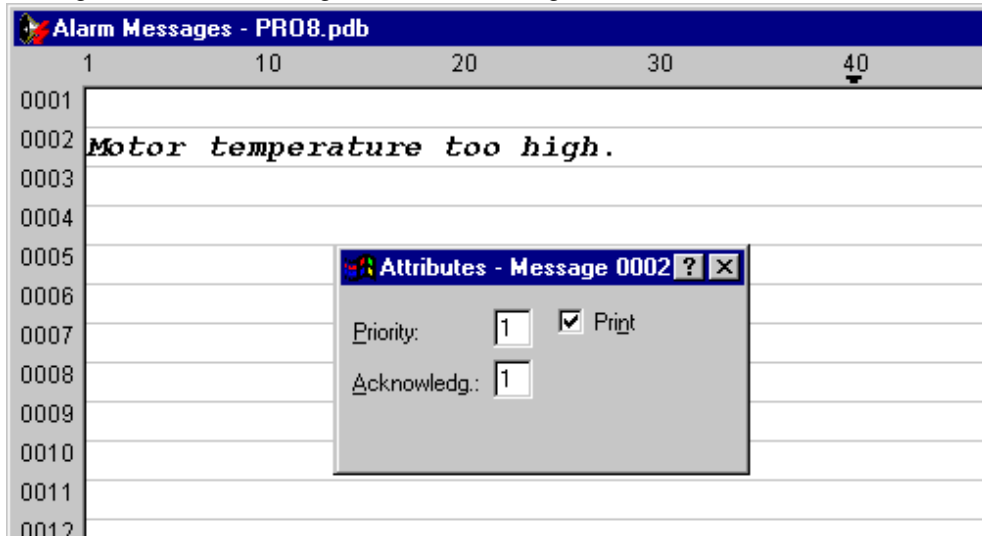
You would like to set the alarm message area first and configure an alarm message with a SIMATIC 300 or a SIMATIC 400 PLC.

Procedure

Procedure:	
1	<p>Left double-click in the project window on "Area pointers" to create the alarm message area. The "Area Pointers" dialog box is opened.</p> 
2	Here you select the "Alarm Messages" area pointer. Click OK.

Procedure:	
3	The "Alarm Messages" dialog box is opened. Enter the following at "Address": DB: 10 DW: 2 Length: 2 PLC: PLC_1 You have then created an alarm message area for 32 alarm messages.
4	Confirm all settings by clicking OK.
5	Double-click the Alarm Messages window to open it. Position the cursor at message No. 2.
6	Enter the following message: Motor temperature too high
7	Perform the following settings in the "Attributes" window: Priority: 1 Acknowledgement: 1 Print: <input checked="" type="checkbox"/>

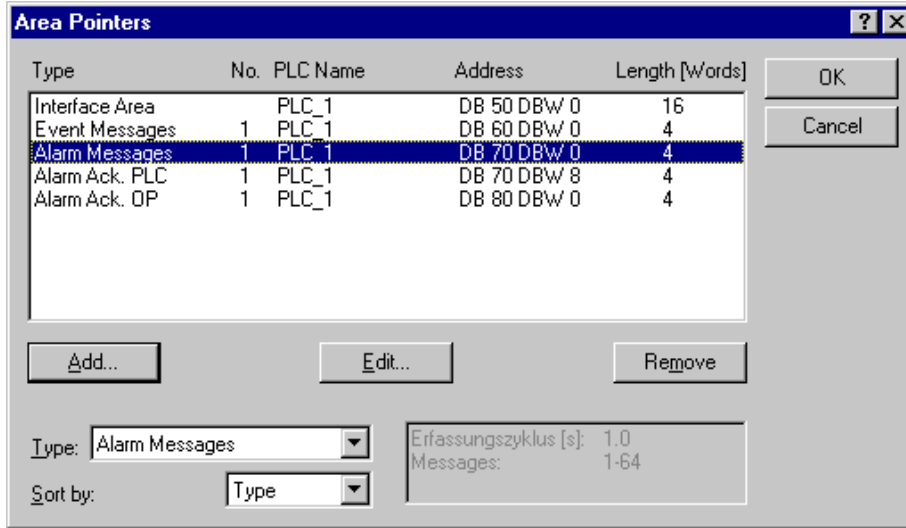
The figure shows the configured alarm message:



5.8.15.2 How to create message areas

Objective

Create the following message areas taking an OP 17 and a SIMATIC S7-300 as an example:



Procedure

Procedure:	
1	Double-click "Area Pointers" on the left of the project window.
2	Select "Event Messages" at "Type" and then click OK. A new dialog box is opened.
3	Select the PLC on the "Address" tab. Enter 4 at "Length".
4	At "Area" enter "DB 60" and confirm by clicking OK.
5	To configure the other communication areas, repeat steps 2 to 4 and enter the corresponding values.

Result

Areas have been created for "event messages" and "alarm messages". At "Length", four words have been panned, meaning that you can configure $4 \cdot 16 = 64$ messages in each case.

Note

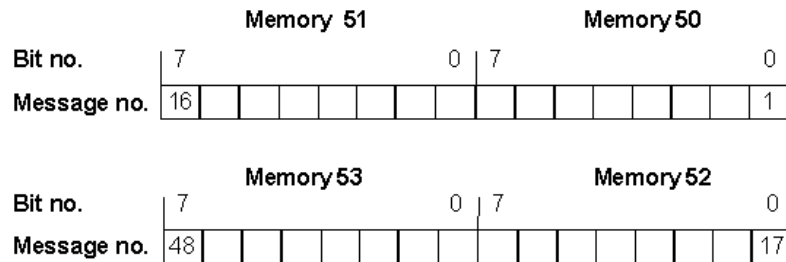
The "PLC acknowledgement" area must be contiguous with the "alarm messages" area.

5.8.15.3 Message areas for SIMATIC S5

Memory on a SIMATIC S5

The message area is defined in memory words - for example:

FW 50
Length 2

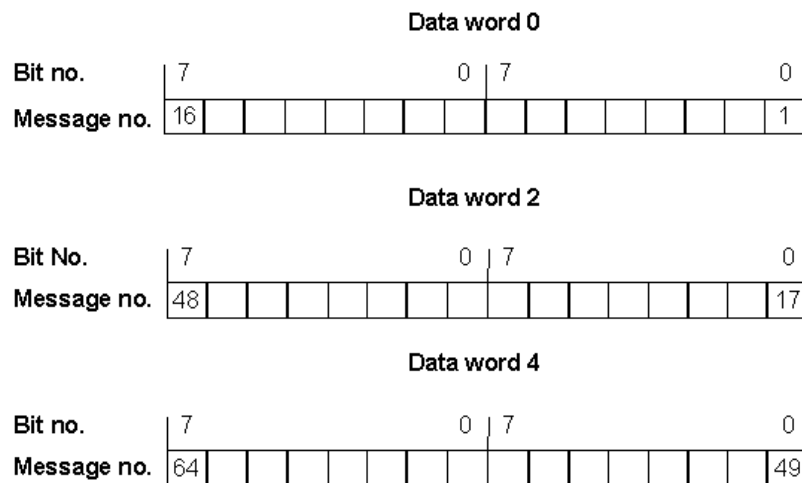


5.8.15.4 Message areas for SIMATIC S7

Data words on a SIMATIC S7

The message area is defined in a data block - for example:

DB 70
DBW 0
Length 4



5.8.15.5 Examples of displaying system messages

Introduction

You will find examples of system messages and how they are displayed on the operating unit in the following

SIMATIC OP

The system messages of the operating unit are read out.

For example, \$ 339 startup completed

Some system messages expect confirmation or a decision by the operator - for example:

557 Save data record?

0 Yes / 1 No

You decide on how you want to proceed by entering 0 (Yes) or 1 (No).

SIMATIC S7 (Minimal)

The message numbers of the S7 system messages are output. You can refer to the cause of the error in your S7 manual by means of the number.

MESSAGE S4303 03.07.98 15:16:34

SIMATIC S7 (Standard)

In addition to the minimal display, the message text of the S7 system message is output. For this, select the corresponding message with the help of the arrow key.

MESSAGE S4303 07.03.98 15:16:34

If you press the RIGHT arrow key:

PLC_1:

STOP by operating Stop switch

SIMATIC S7-FM

The message text of FM system messages is output.

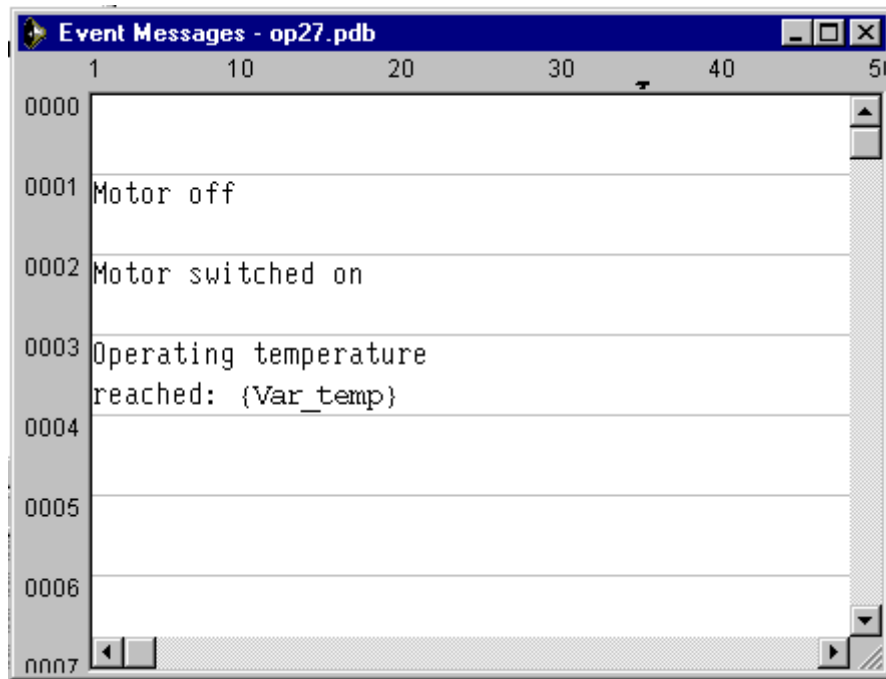
SIMATIC S7-NC

The message text of NC system messages is output.

5.8.15.6 Event messages export file

Structure

Below you can see how the export file of the illustrated event messages is structured:



SIMATIC ProTool/Pro B5.0.0.20 d 16.06.98 11:31:20

Legend:

:N: = Number

:T: = Text

:I: = Help text

:A: = Attributes

:V: = Tag

:L: = Text lists

Pieces of text may be distributed over several ':T:' lines,

Help text may be distributed over several ':I:' lines.

In message text (:T:), the following control characters are possible:

'\n' = New line

'\b' = Flash (Start/End)

'\u' = Underscore (Start/End)

'#' or '&' = Placeholders for message tags

The following identifications are used in the attribute line:

Px = Priority x

Ax = Output (port number) x

R+- = Relay ON (+) or OFF(-)

D+- = Print (+) or do not print (-)

:N: 0001

:T: "Tank1 empty:####"

:A: P1 A0 D+ R-

:V: "Z_BAUDR" Dd TO

...

:N: 0005

:T: "Mixer full, \n"

:T: "Valves of Tanks 1 to 3 closed"

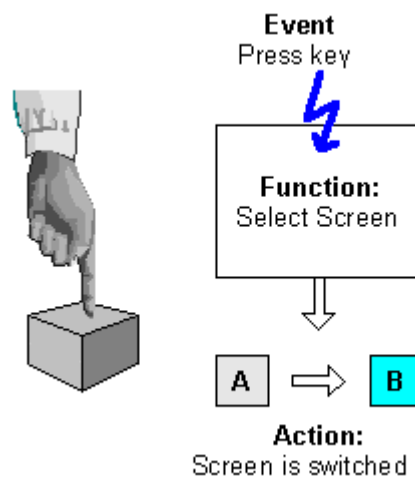
:A: P1 A0 D- R-

5.9 Use functions

Basic principle

In ProTool you can link "events" (such as "Key pressed") with predefined functions. If the event occurs during operation, the function executes a specific action on the operating unit or the PLC.

For example, the "Select Screen" function on the operating unit opens a particular project screen.



Triggering a function

Areas of application

In general, you can use functions to:

- Set up the project for specific processes (for example, to switch from one screen to another)
- Control the process (for example, to set a bit in order to switch on a motor with it)
- Use features of the operating unit (for example, to display or print out the message buffer)
- Perform system settings online on the operating unit (for example, change modes)

In most cases you can configure the behavior of the functions precisely by means of parameters. If you wish to initiate several actions, you can also combine different functions.

Configuration

You configure functions on the "Functions" tab in the "Properties" dialog box of the object in question.

In addition, you can define global entry points (for example, for change of screens, buffer overflow and change of password) for many operating units by choosing "System" > "Functions" from the menu.

5.9.1 Events for triggering functions

Necessity

The execution of a function is always linked to a specific event. The function is only triggered when this event occurs.

The events that can be linked to a function depend on the type of the function. Many functions are only effective with certain specific events.

Examples of events

Examples of events that can trigger functions are the events "press key" and "release key". In the case of the former, the function is executed the moment a particular function key is pressed; in the latter case, it is executed the moment the function key is released again.

Object-linked functions

Functions and events are generally linked to a specific object. The following objects can be linked to functions, for example:

- Function keys, soft keys and buttons
- Screen objects
- Screens
- Tags

Functions with tags are triggered only if the tag is displayed on the screen (default) or "Read Continuously" is selected on the "Options" tab in the Properties dialog box for the tag.

A function which you have configured for an internal tag (without PLC connection) whose value is modified by another function is not executed. Functions are executed only as a result of changes of values triggered by the PLC.

Note

Depending on the operating unit, it might not be possible to configure functions for all these objects.

Global functions

You can also link some functions to global, object-independent events - for example:

- Changing screen
- Buffer overflow
- Change of password

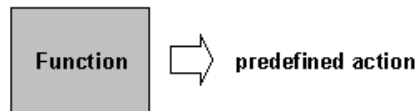
The configurable global events depend on the operating unit:

You will find a detailed description of all the permissible events in online Help under the keyword "Configurable events".

5.9.2 Function parameters

Necessity

Many functions can only execute one particular action. For example, the `Events - Delete Buffer` function empties the buffer for event messages.



Function without input parameters

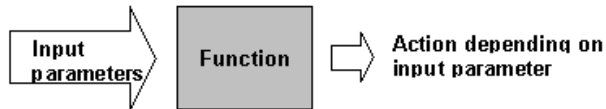
However, many functions can also work in various ways.

Input parameters

Imagine that you want to open another screen using a key on the operating unit. To do this, you configure the `Select Screen` function. However, your project will generally have several screens. Which of these screens should ProTool open?

You therefore have to give the function more information. This is done using parameters. For the `Select Screen` function, you specify as a parameter the name of the screen to be opened, for example.

Another example is the `Language` function. In this case, the parameter you specify is the language to be set.



Function with input parameters

Some functions require a single parameter; others require several.

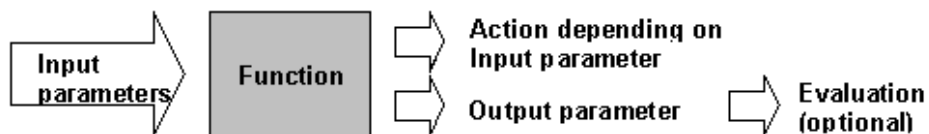
Output parameters

Some functions write the result of their execution (i.e. the current status) to a tag. You can then further evaluate the value of this tag, for example in order to display a setting-dependent text on the operating unit.

One example is the function `Scaling Linear`. Specify tag values as input parameters; the function provides the scaling result as the output value.

Note

Output parameters cannot be configured for all operating units.



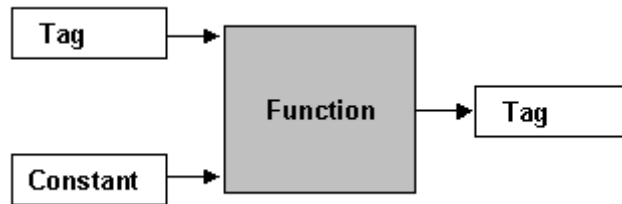
Function with input and output parameters

Special case: program-controlled behavior

In the case described above, the behavior of the functions does not change at run time. However, in the case of some operating units and some functions, you can also pass the value of a tag as an input parameter. The behavior of the function can thus be controlled by the program.

General principle

The following figure illustrates the principle of how a function works:



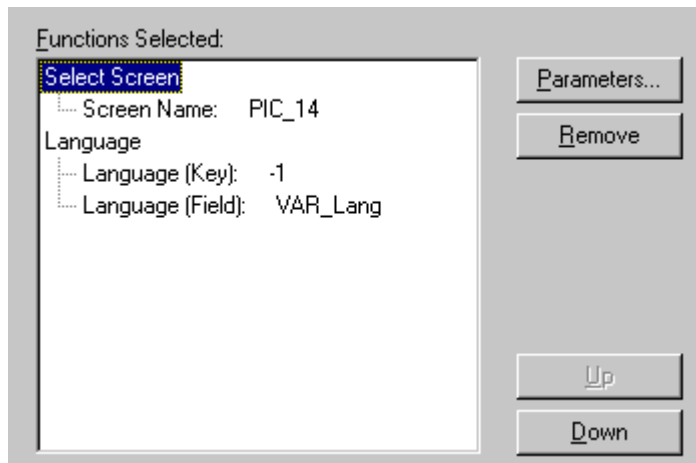
How a function works

An input parameter is specified for the function. This can be either constant or read from a tag. The tag may be local or it may have a connection to the PLC. If there is a connection to the PLC, the value is set by the process. The result of the function is written to a tag, which itself can either be local or have a connection to the PLC.

5.9.3 Combining multiple functions

Multiple functions with one object

You can also assign an event several functions. The functions are then initiated one after the other. You set the order in which this occurs in the "Functions" dialog box during configuration. You can change the order of the functions by using the "Up" and "Down" buttons.



Multiple functions with one object

Note

On the OP 3, OP 5 and OP 15 operating units you can only configure a single function for each object.

Sequence

The list of functions is processed from the top down.

Note

If an error occurs during the processing of a function list (for example, a limit value is exceeded), processing is aborted. The subsequent functions in the list are not executed in this case.

5.9.4 Function screens

Select Function Screen function

The `Select Function Screen` function accesses internal screens. These screens are stored in the firmware of the operating units and cannot be changed in the project. When a function screen is called, a screen is displayed in which the operator can then execute the function.

The function screens are integrated during configuration by means of the `Select Function Screen` function. Some functions can be called both directly by means of a function (individual function) and by means of a function screen. Other functions are available only via function screens or only as individual functions.

In the case of an individual function, you specify a parameter. The function is then executed directly with the set parameter. In function screens, the operator can select a parameter and then execute the function.

If a function exists in the project as both an individual function and a function screen, the current status of the function is displayed when the function screen is called.

All the existing function screens are used with the supplied standard screens.

Example

A soft key is assigned the function `Alarms - Display First/Last` and the parameter `Last`. If you press the key on the operating unit, the setting `Last` is applied.

Another soft key is assigned the function `Function Screen` and the parameter `Alarms - Display First/Last`. If you press this key on the operating unit, the function screen for setting the alarm message display is called.

It indicates the current status:

Message Display: Last

You can then use the arrow keys on the operating unit to select a different setting and then press ENTER to accept it.

5.9.5 Special features with conversion functions

Problems

When conversion functions are applied to tags that use the same tag as a parameter, incorrect calculations can result.

Example

You have configured a screen with two tags, x and y: tag x for an input/output, tag y for an output. Both are PLC tags.

Tag x has been assigned the `Scale Value` function as follows: $y=10*x$. The function is to be executed when a value is entered.

Process

Let us assume that the value of x is currently 1 on the PLC and the operating unit. If you then enter 2 as the value of x on the operating unit, the wrong value of 10 will appear for y. The reason for this is as follows:

The function is executed when a value is entered. However, the new value x is not yet on the PLC. The function thus takes the old value for x from the PLC. Consequently, the result is incorrect.

Action

In order to get around this problem, set `Value Output` as the condition for execution. The function is thus not triggered until the value changes on the PLC.

Note

The usage of this function with OP 7/17 and the connection to a SIMATIC S5 can lead to rounding errors, as with the OP 7/17 internal calculations are made with double values which are then redisplayed as integer tags.

5.9.6 Example of configuring a function

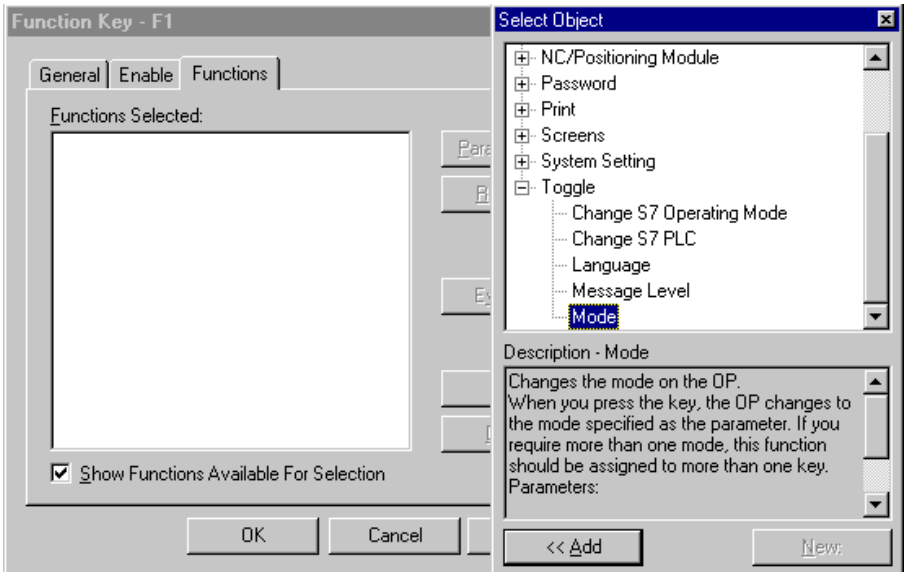
This example shows you how to configure the "Mode" function with parameters so that "Online" and "Offline" modes can be set with function keys. In addition, the result of the operation will appear on the operating unit.

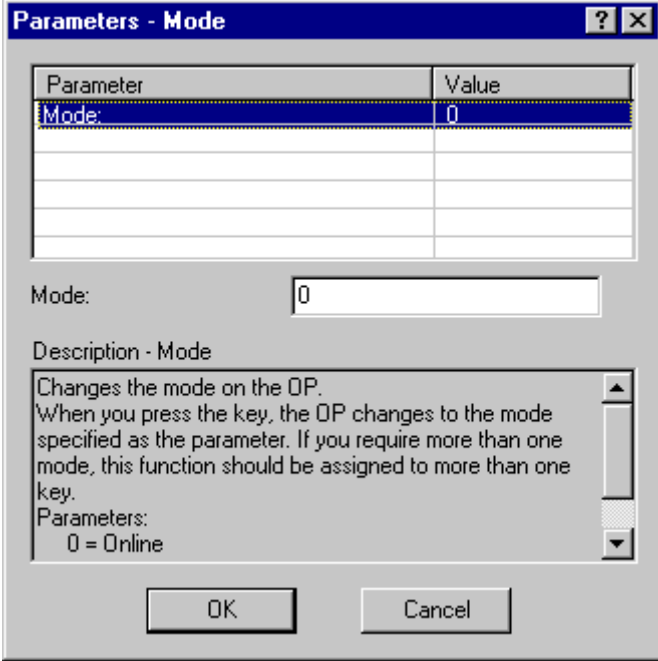
5.9.6.1 How to change the operating mode

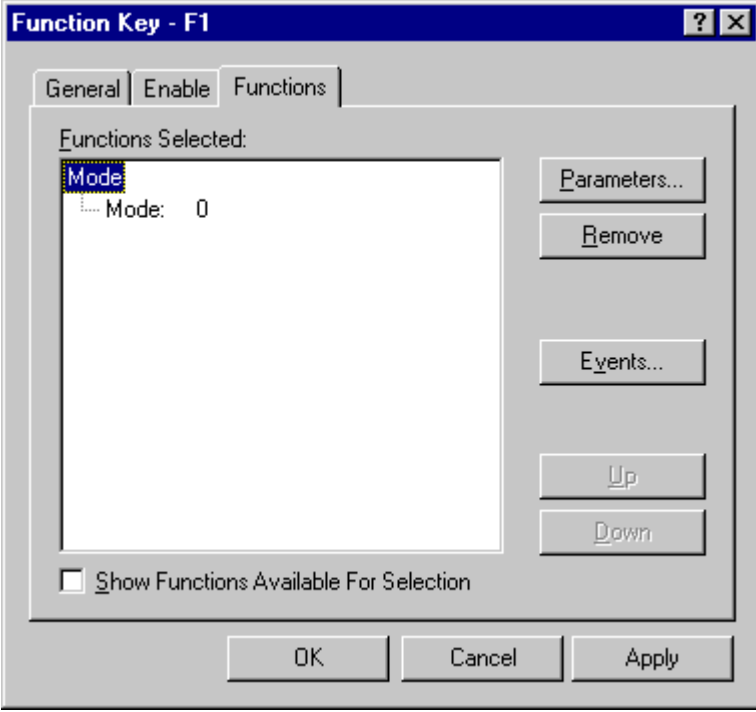
Objective

You want to set the `Online` and `Offline` operating modes by means of two function keys. To do this, you configure the `Mode` function with a parameter.

Procedure

Procedure:	
1	Create and open the screen in which the switchover and display take place.
2	Click the function key that you want to use to enable the <code>Online</code> operating mode. The "Function Key" dialog box appears.
3	Select the "Functions" tab.
4	Select the "Display Selectable Functions" check box. The "Select Function" window appears.
5	Select the <code>Mode</code> function at the "Toggle" function group: 

Procedure:	
6	<p>Click the "Add" button. The "Parameters" dialog box appears.</p> 
7	<p>Select the <code>Operating Mode</code> parameter from the list, and enter the value <code>0</code> in the input field under the list. This parameter controls the behavior of the "Mode" function, so the mode changes to online.</p>

Procedure:	
8	<p>Click OK to close the "Parameters" dialog box. The function then appears in the "Selected Functions" list.</p> 
9	<p>Close the "Function Key" dialog box by clicking "OK". Your configuration of the function for enabling the Online operating mode is thus complete.</p>
10	<p>Repeat steps 2 to 9 for the second function key. In step 7, however, use 1 this time as the parameter . At run time, the operator can then set the operating mode using the two configured function keys.</p>

5.10 Create recipes

Requirements

In order to be able to configure recipes, you require one of the following operating units:

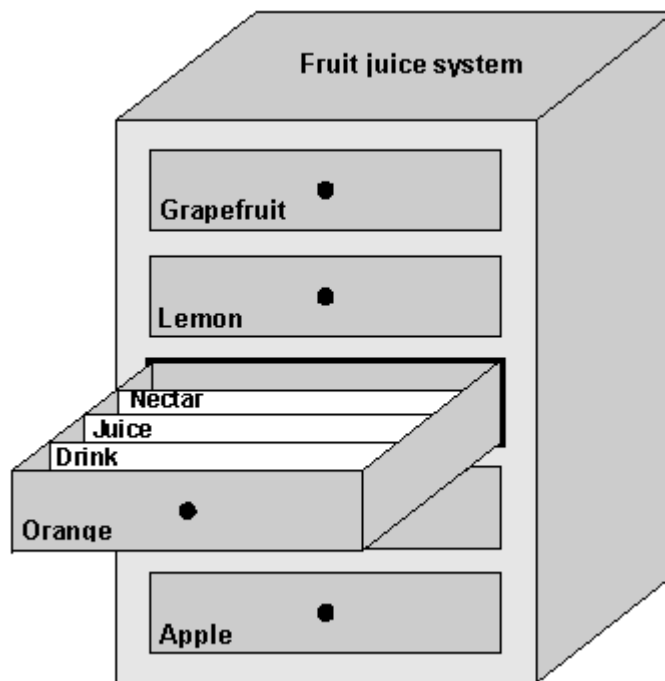
- OP 5, OP 15
- OP 7, OP 17
- C7-623, C7-624
- C7-633, C7-634

Purpose

The purpose of recipes is to transfer a group of related data to the PLC, "together" and "synchronously".

Recipe and data record

The terms "recipe" and "data record" are defined below using the example of a bottling plant for a fruit juice system:



Recipe and data record illustrated by analogy with a filing cabinet

- "Recipe"
 Recipes correspond to the drawers of the filing cabinet in the figure (for example, Orange or Lemon). The reference value fields (tags) that belong to the recipe are defined in the recipe. You use the recipe to define the data structure in your ProTool project. You cannot change this structure subsequently on the operating unit. You can configure up to 99 recipes in ProTool.
- "Data record"
 Data records correspond to the filing cards in the drawers of the cabinet (Drink, Juice and Nectar). A data record contains the values for a recipe. You create, delete and modify data records on the operating unit. You can create up to 99 data records for a recipe.

Example of a recipe

The filling station above is used to produce orange drink, orange juice and orange nectar. The mixing proportions for each of these are different. The ingredients are always the same.

Let us assume that a recipe called "Mixture" is created, containing the following data structure:

Tag	Designation
Var_23	Name
Var_11	l orange
Var_7	l water
Var_19	kg sugar
Var_21	g flavor

The tag designations Name, l orange, g flavor etc. are known as "entry names". The entry names are displayed as well on the operating unit. Tag Var_11, for example, can thus be identified as the tag designating the mixture ingredient orange.

The data records contain the values for the different drink types. The data records could be as follows, for example:

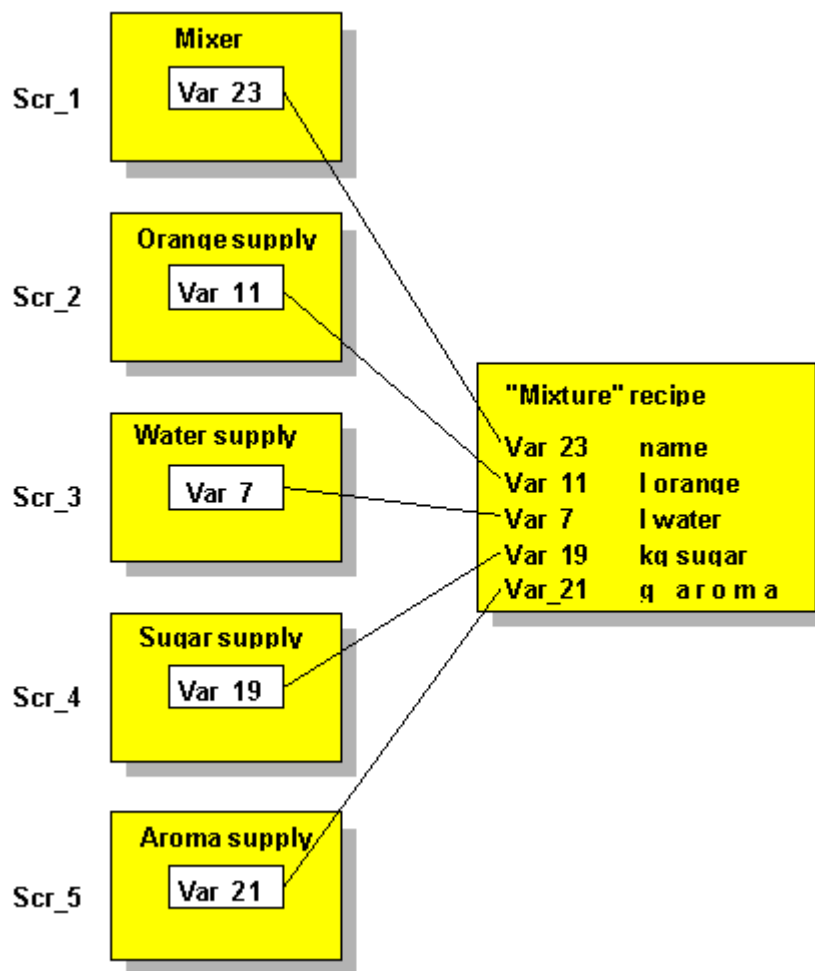
Data record name	Orange drink value	Orange juice value	Orange nectar value
Name	"Drink"	"Juice"	"Nectar"
l orange	"90"	"95"	"70"
l water	"10"	"5"	"30"
kg sugar	"1,5"	"0,5"	"1,5"
g flavor	"200"	"100"	"400"

Same tags in screens and the recipe

For each ingredient (orange, water, etc.) there is a separate screen in the above example, containing a supply tank, valves, an overview of the quantities used and other information. The screens contain input fields that allow you to set the various supply quantities for the mixer. You can thus enter the mixing proportions screen by screen. The mixer is then started. This process is repeated for each drink type.

If the tags of the input fields are formed into a recipe, you can store finished mixtures for the different drink types by creating data records on the operating unit. The figure below shows how to use the same tags in screens and in the recipe.

To produce a specific drink type, the corresponding data record is transferred to the PLC. All tags are thus assigned the required values at the same time.



Same tags in screens and the recipe

5.10.1 Configuring a recipe

Identifying a recipe on the operating unit

You create a recipe in your project with a symbolic name. This name is only relevant on the configuration computer, not on the operating unit. The recipe is identified on the operating unit by means of the "recipe number" and "recipe heading" set in the project.

You create the recipe heading in the recipe editor by choosing "Edit" > "Properties". In addition, ProTool automatically assigns a number to the recipe. You can also change this number by choosing "Edit" > "Properties".

Both the recipe number/name and recipe heading are visible on the operating unit and enable you to select the recipe from the recipe directory.

Identifying a data record

You create a data record on the operating unit with a symbolic name. This name is only relevant on the operating unit. In addition, the operating unit automatically assigns a number to the data record. When a data record is transferred to the PLC, only the recipe number and data record number are transferred with the data, not the symbolic names.

Since the data record's number is its unique identification attribute, you can create several data records with the same name but not with the same data record number.

The operating unit writes the data and number of the data record and of the associated recipe to specified locations on the PLC:

SIMATIC S5	
Numbers:	Recipe number mailbox
Data:	Recipe mailbox, possibly successive recipe mailbox
SIMATIC S7	
Numbers:	Data mailbox
Data:	To the addresses directly

You will find more information on the recipe number mailbox, recipe mailbox, successive recipe mailbox and data mailbox in the "Communication User's Manual".

Tags in recipes

Tags that you use in recipes must have an address on the PLC. Only these tags will be transferred to the PLC when a data record is transferred. Tags without an address are not transferred.

Note

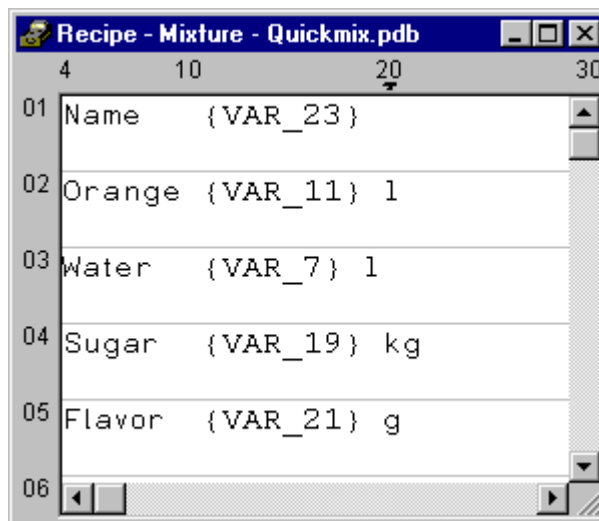
Functions you have assigned to recipe tags are not executed in recipes.

Standard screen for recipes

The standard screen Z_RECORD is available so that you can create, edit, delete and transfer data records on the operating unit. This screen is already integrated in the standard project and can be displayed on the operating unit by means of a function key.

Recipe entries

Recipes consist of individual entries. Each entry consists of a maximum of one input field and an optional text. You can configure direct or symbolic entries for the input field. By way of example, the figure below shows the "mixture" recipe with its entries.



In contrast to screens, the operating unit can display several entries for recipes at the same time. The table shows how many lines and characters per line are available with the different operating units.

Operating Unit	Lines	Characters per line
OP 5	2	17
OP 7	2	17
OP 15A	1	36
OP 15C	2	17 / 36
OP 17	2	17 / 36
C7-623	2	17
C7-624	2	17
C7-633	2	17
C7-634	2	17 / 36

Recipe entries: number of available lines and characters per line

Note

When you download a new project to the operating unit, the configuration memory is deleted, and with it all the data records created there.

5.10.2 Transferring data records

Note

How to create data records and transfer them to the PLC is described in detail in the manual of your operating unit.

Transferring data records when working on the operating unit (standard case)

The transfer of data records from the operating unit to the PLC and vice versa is the standard case. The special cases are described in the "Communication User's Manual". We recommend that you only transfer data records by using the operating unit. To do this, use the standard screen `Z_RECORD`.

- **Creating data records**
Data records can only be created on the operating unit and saved in the flash memory there. The operating unit automatically creates a data record with the number `1` for each recipe. All the values of the data record are preset with `0`.

Copy this data record and save it by a different name in order to create other data records.

- **Synchronization during transfer**
An essential feature of recipes is that the data are transferred with synchronization and uncontrolled overwriting of the data is thus prevented. In order to ensure coordinated operation when data records are transferred, bits are set in the control and acknowledgment area of the interface area.

The interface area for the SIMATIC PLCs is described in the "Communication User's Manual". For non-SIMATIC PLCs, the interface area is described in "Communication areas for non-SIMATIC PLCs".

- **Functions**
ProTool offers functions for:
 - Transferring data records from the PLC to the operating unit
 - Transferring data records from the operating unit to the PLC

Assign a function like this to a function key. The parameters of the function contain the recipe name and the data record number.

- **Transfer screen**
A transfer screen is available on the operating unit for transferring data records. This allows you to transfer data records in the following directions:
 - From the operating unit to the PLC
 - From the PLC to the operating unit
 - From the operating unit to the operating unit (which corresponds to copying a data record)

Transferring data records by means of a PLC program

You can transfer data records from the PLC to the operating unit and the other way round by means of PLC jobs 69 and 70. Data records can be read directly into the FLASH memory or read from it using PLC jobs.

5.11 Prompting the operator

Purpose

In addition to the option of customizing the user interface of your operating unit to make it easier for you to use, ProTool features other options for supporting and prompting you on your operating unit as a function of the situation. This means you can implement mechanisms and decision-making aids that can prevent possible incorrect operations on the operating unit.

ProTool makes the following methods available for the implementation of operator prompting:

- Providing Help text
- Assigning dynamic attributes
- Evaluating key operation
- Driving light-emitting diodes
- Assigning operator authorization

5.11.1 Help information on the operating unit

Purpose

Help text provides additional information and operator instructions on screens, input and output fields, and buttons and messages to the operator at run time. Help text provides additional information that can be defined for screens, input/output fields, buttons and messages when configuring with ProTool. For example, Help text may be in the form of the permissible range of values for an input field or the cause and elimination of a malfunction in the case of an alarm message. Help text is displayed on the operating unit in the language you set.

You configure Help text on the "Help Text" tab in the "Properties" dialog box of the object in question.

In addition to Help text, you can configure tooltips, which are displayed at run time, for some devices and screen objects.

Displaying Help text on the operating unit

- Operator Panels
The availability of Help text is indicated on the operating unit by the lit "HELP" LED. On touch panels, the "HELP" button is displayed. The configured Help text can be output by pressing the "HELP" key.

Detailed information about activating Help texts is given in the equipment manual for your operating unit.

5.11.2 Dynamic attributes

Purpose

To draw the operator's attention on the operating unit to specific situations for example, specified limit values have been reached or exceeded you can configure the dynamic attribute "Flashing" for output fields. This enables you activate or deactivate the flashing attribute for the displayed text according to the value of a tag.

Index tag

You can either link the dynamic attribute directly to the tag of an output field or you can define a separate index tag for it. You can influence several output fields simultaneously with a separate index tag.

5.11.3 Evaluating key operation

Purpose

Keystrokes executed on the operating unit can be transferred to and evaluated by the PLC. This means, for example, that you can issue a message that will draw the operator's attention to the incorrect operation of a key.

Requirements

For the PLC to be able to evaluate whether and, possibly, which key has been operated on the operating unit, you have to create specific data areas on the PLC and specify them in your project, in the project window, at "Area Pointers". These are the two data areas "system keyboard assignment" and "function keyboard assignment", depending on which keys you wish to evaluate. You set the assignment of the function keys to the bits in the function keyboard assignment when you configure the function keys.

You will find a description of the keyboard assignments for the different operating units in the "Communication User's Manual".

You will find more information on communication by your operating unit with a non-SIMATIC PLC in "Keyboard assignment of the operating unit".

5.11.4 Light-emitting diodes on the operating unit

Purpose

The light-emitting diodes (LEDs) on the function keys of the operator panel can be driven on the PLC. By means of a light-emitting or flashing LED, you can indicate to the operator that, for example, the device is expecting a certain function key to be operated.

Requirements

For the PLC to be able to drive the LEDs, you have to create the "LED assignment" data area on the PLC and specify it in your project, in your project window, at "Area pointers". Set the assignment of the individual LEDs to the bits in the LED assignment when you configure the function keys.

You will find a description of the LED assignment and the LED functions for the different operating units in the "Communication User's Manual".

You will find more information on communication by your operating unit with a non-SIMATIC PLC in "LED assignment of the operating unit".

5.11.5 Assigning operator permissions

Purpose

ProTool allows you to use a password to prevent controls such as input fields and function keys from being used by those unauthorized to do so. This means that when you are creating your project you can restrict the use of functions that relate to security to specific people or groups of operators. Important parameters and settings can thus only be changed by authorized personnel.

The access protection that you configure allows you to guard against incorrect usage and increase the security of the system or machine.

Password hierarchy

During the configuration phase you can assign operator authorization to specific groups. At run time, individuals can be allocated to one of these groups, as appropriate, and they thus automatically receive the access rights of that group.

ProTool provides hierarchically organized password levels from level 0 to 9. If a user is assigned password level 4, for example, this user is authorized to execute the functions of password levels 0 to 4.

- Password level 0
Password level 0 is the default in ProTool. Use this lowest level in the hierarchy for functions that have little or no effect on the operational sequence. These are generally functions that do not require any input, such as the display of messages. There is no need to enter a password on the operating unit in order to execute functions with password level 0.
- Password levels 1 to 8
Assign functions to password levels 1 to 8 according to their importance. Before you execute these functions, the operating unit prompts the operator to enter a password.
- Password level 9
The authorization to execute functions at password level 9 is granted only to the system administrator or service engineer. He has access to all the functions of the operating unit.

You define the password of the system administrator by choosing "System" > "Settings" from the menu. The default setting is 100.

The administrator's password setting cannot be changed on the operating unit at run time. All other passwords are entered at run time; you have to configure a password list for this.

You can find more information on password administration in the equipment manual for your operating unit.

Logging into and out of the operating unit

- When a password-protected operation is executed, the operating unit automatically prompts the operator to enter an appropriate password. In order to eliminate the possibility of unauthorized persons gaining access, a password level greater than 0 should not remain active on the operating unit for any length of time.
- If you do not enter an input on the operating unit for a configured period of time (logout time), the operating unit automatically resets the current password level to 0. You set the logout time by choosing "System" > "Settings" from the menu. The system default setting is 5 minutes.

Note

Login and logout operations are automatically output as system messages. If you have configured a message archive, all login and logout operations on the operating unit will be archived.

Setting the password level on the operating unit

The following PLC jobs are available for setting a defined password level on the operating unit:

- You can use PLC job 23 to set a password level of your choice on the operating unit from the PLC in order to allow access by a defined user group, for example.
- You can use PLC job 24 to reset the password level back to 0 from the PLC.

In online Help, you will find a list of all possible PLC jobs with job numbers and parameters in PLC jobs in alphabetical order and PLC jobs in numerical order.

5.12 Configuring in foreign languages

This chapter shows you what you need to know in order to create a project with a user interface in a foreign language.

You can create a monolingual or a multilingual project. In a multilingual project you can decide:

- Whether to make several languages available on an OP and provide the user with a key for switching between them.
- Whether to download only one language to a specific OP.

5.12.1 System requirements for foreign languages

Languages available

With the exception of Russian, you can configure all foreign languages without having to make changes to your Windows system configuration.

To be able to configure in Russian (OP 7, OP 15C, OP 17 and TD 17 only), you have to enable Russian language support in Windows 98 ("Control Panel" > "Software" > "Windows Setup" > "Language Support" > "Details"). This is not necessary in Windows NT.

Alternatively, of course, you can also install a Russian version of Windows.

Not all the characters of the ANSI font can be displayed on the screen, depending on the panel. The precise assignment of ANSI code and displayed character will be found in the character map for the operating unit concerned.

5.12.2 Languages in ProTool

User interface language and project languages

ProTool makes a distinction between two language levels:

- The "user interface language" in ProTool
This is the language in which the menu and dialog box text blocks are displayed when you configure in ProTool/Pro CS. The user interface language is selected from ProTool's Setup.
- The "project languages"
These are the languages in which the blocks of text in your project appear on the operating unit. You can create the project in any language available in Windows on the configuration computer.

The two language levels are completely independent of each other. For example, you can create French projects with an English ProTool, or English projects with a French ProTool.

Multi-lingual projects

If you want your project to run in different languages, store all language-dependent objects in the desired languages in the project. This applies, for example, to:

- Event messages
- Alarm messages
- Screens
- Recipes
- Text lists
- Help texts

You can store text for any project in as many project languages as you like. When creating your configuration, however, note that the languages supported at run time depend on the operating unit.

You cannot edit system messages in ProTool. They have been stored for every operating unit for a number of languages already. If you are configuring a language for which no system messages are available, all the system messages will appear in English.

Editing language

The project language in which you edit text at any given time on the configuration computer is the "editing language".

The toolbar and the status bar show the current editing language setting.

Reference language

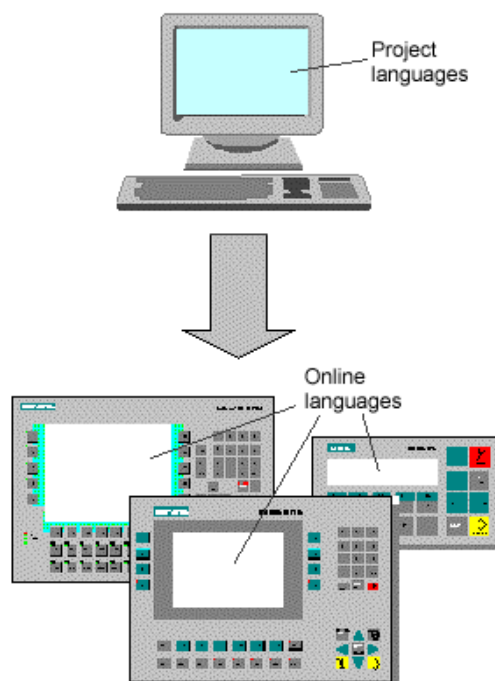
One of the project languages can be used as the "reference language". You can first create all the blocks of text in the Reference language and then use them as a basis for other translations when you enter your translated text directly into the project.

When you are configuring, you can toggle between the reference language and the editing language you have set.

Online languages on the operating unit

You can even download several of these project languages simultaneously to the operating unit, depending on the operating unit. For the operator to be able to toggle between these languages, you must provide him with a suitable control.

When creating your configuration, note that the languages supported at run time depend on the operating unit.



Language levels in ProTool

Exchanging text with translators

If you wish to send the blocks of text in the reference language for translation, you can export all blocks of text in a project from ProTool. The translator can edit the blocks of text outside ProTool, either in Excel, for example, or a text editor. The translated blocks of text are then imported into your ProTool project and automatically inserted at the correct places.

5.12.3 Configurable languages

Languages

You can create projects for text-based devices in the following languages:

- OP 7, OP 17, TD 17
 - Danish
 - German
 - English
 - Finnish
 - Flemish
 - French
 - Greek
 - Italian
 - Norwegian
 - Polish
 - Portuguese
 - Russian
 - Swedish
 - Spanish
 - Czech
 - Turkish
 - Hungarian

- OP 3, OP 5, OP 15A/C
 - German
 - English
 - French
 - Italian
 - Spanish

In addition, you can use Russian for the OP 15C.

Note

If you make do without language dependent special characters, you can enter text in a different language too.

For example, you can select "English" as the language in ProTool, but enter text in Dutch. However, all system messages will continue to appear in English, since they cannot be edited in ProTool.

Standard projects

The following languages are supplied in the standard projects supplied as part of the package:

- German
- English
- French
- Italian
- Russian
- Spanish

Should you wish to configure another language, you have to add it yourself and also translate the pieces of text in the standard projects.

5.12.4 Language dependent keyboard assignment

Language dependence

The characters on a PC keyboard are language dependent. For example, no German or French special characters are available on an English keyboard. Further, the letters are arranged somewhat differently.

As soon as you change the editing language in ProTool, it modifies the assignment of your keyboard to the layout of the foreign language concerned.

On-screen keyboard

In order to facilitate the assignment of the characters printed on your keyboard and those actually entered, ProTool displays a language-dependent on-screen keyboard. You can see on the on-screen keyboard where the deviating characters are located.

There are two options to choose from for entering a language-specific character:

- Orientate yourself on the on-screen keyboard and enter the character on the keyboard of the configuration computer.
- Click your mouse to enter the character directly via the on-screen keyboard.



Example of language-dependent on-screen keyboard with French as the editing language

The on-screen keyboard is hidden automatically as soon as you reset the editing language back to the current Windows language. You can also enable and disable display of the on-screen keyboard by choosing "View" > "Keyboard".

Note

You can only use the on-screen keyboard if the corresponding keyboard layout has been installed under Windows. Enable the keyboard at "Start" > "Settings" > "Keyboard". If you have not done it, ProTool will resort to the international (US) layout.

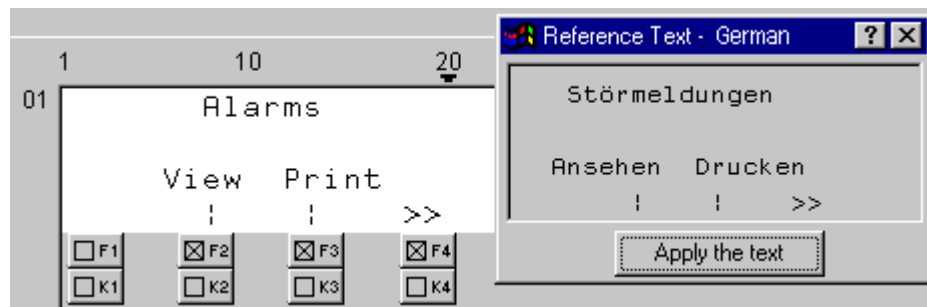
5.12.5 Reference text

Principle

When you create a project for several languages, you normally configure all the pieces of text in your native tongue first.

If you then change the editing language to enter text in a foreign language, all the text fields appear blank again.

ProTool features a user-friendly reference text function so that you have a basis for your translations. In dialog boxes and in screen editors, you can display an additional window with blocks of reference text.



Reference text

In the editor you can insert the translation of the blocks of text in the reference window text without having to switch from one language to another.

Note

Text can be exported by choosing "Edit" > "Language" > "Export" from the menu or by using the shortcut menu in the project window. The blocks of text can be translated independently of ProTool in this way, and then imported in your project.

5.12.6 Steps to creating a multilingual project

Scenarios

The basic approach is identical no matter whether:

- You configure a project in a language other than that of your ProTool installation. (Example: you have ProTool in German and would like to create a French project.)
- You want to sell a project to several countries, in the language of the countries concerned. (Example: you are sending a machine to Germany, England and France. You want all pieces of text to be displayed on the operating unit in the language of the countries concerned.)
- You supply a project to a multilingual country. (Example: you are selling a machine to Switzerland. You want the operator to be able to choose between German, French and Italian on the operating unit.)

In any case, you should always attempt to create and test the project in one language first. This language then acts as your reference language for the translations.

Steps

Configuring in foreign languages consists of the following specific work steps:

1. Satisfy the necessary system requirements.
2. Define the configured languages (choose "Edit" > "Language" > "Select" from the menu).
3. Select a language as the first editing language (choose "Edit" > "Language" > "Select" from the menu).
Create and test the complete project in this language first, before proceeding to translate all the pieces of text together later .
4. Configure a language switch (only if you want to offer several languages simultaneously on one operating unit).
5. Translate the pieces of text.
If you want to enter blocks of text in a foreign language, switch the "editing language" (choose "Edit" > "Language" > "Select" from the menu). You select the language in which you have created the project to be your "reference language" (likewise option "Edit" > "Language" > "Select"). You can now have reference language text displayed and enter the text in the editing language.
If you want to send text for translation, you can export it in csv format (choose "Edit" > "Language" > "Export" on the menu). After being translated external to ProTool, you can accept them into your project (choose "Edit" > "Language" > "Import" from the menu).
6. Select the languages to be downloaded to a specific operating unit (choose "System" > "Language Assignment" from the menu). You can select up to three languages simultaneously.
7. Compile the project.
8. Download the project to the operating unit.

Note

Avoid moving fields in event messages and alarm messages when you modify a project that has been created in several languages. Since there is no permanent assignment between the field and its position within the text, you should move the pieces of text if necessary instead of the fields.

5.12.7 Exchanging text with translators

Editing blocks of text external to ProTool

If you configure a project in several languages, the simplest approach is to create and test the complete project in one language first.

You can then pass all the blocks of text to translation and, after that, include the translated text in your project.

The advantages of this procedure are as follows:

- The workload of the configuration engineer is reduced, since he only has to create the user interface in a language familiar to him.
- The translator can edit the blocks of text outside ProTool, either in Excel or a text editor.
- The translated blocks of text will be complete and consistent.

Scope of text export/import

Using the ProTool's text export/import function, you can export and import blocks of text for the whole project, text from specific editors or text of separate objects. The scope of export/import depends on the command:

- Export/import blocks of text for the complete project.
When you issue a command to export/import text by choosing "Edit" > "Language" > "Export" or "Import" on the menu, all blocks of text for the complete project are exported or imported. The import operation cannot be undone. But you can remove all blocks of text in a language from the project by deleting that language. You will find detailed information by referring to "Deleting a project language".
- Export/import blocks of text of a certain editor or object.
You can start exporting/importing text in the project window by means of the shortcut menu (right-click) of the editors and objects. Only those blocks of text can be exported or imported that belong to the selected editor or object. A text import operation started from the shortcut menu can be undone.

Exporting different text types

When exporting, you can select the types of text you would like to export:

- Text visible on the screen (such as labeling, names)
It is stored in the file called "Labeling.csv".
- Info text (such as Help text for screen objects and messages)
It is stored in the file called "InfoHelpText.csv".
- Message text (event messages and alarm messages)
It is stored in the file called "MessageText.csv".
- Other text (message settings, text lists)
It is stored in the file called "MiscText.csv".

The default setting is export of all text types.

The classification of the text types is done in accordance with the requirements that have to be taken into account in translation. For example, the placeholders have to be preserved in message text, and when text visible on the screen is translated it might be necessary to take the limited text length into account.

Importing text

You can insert translated blocks of text in your project by choosing "Edit" > "Language" > "Import" or by using the shortcut menu of the editors and objects in the project window. The individual blocks of text are automatically assigned to the objects in the project.

Note

You can undo an import of alarm message text.

To view imported text in foreign languages, set the editing language to the language concerned.

- If you did not specify a target language for the translation when you exported the text, you must specify the language into which the text was translated when you import it.
- If this language is not available as a "configured language" in your project, it is created automatically.

Note

Remember not to change or add text manually in the time between exporting and importing the text but to have these changes translated in good time. Manually changed or added text will be overwritten by the text in the import file on being imported.

5.12.8 Special characters and language dependent characters

Special characters and language dependent characters

Special characters and language dependent characters can also be used when configuring text. This applies to:

- Messages
- Screens
- Recipes
- Information text
- Text or graphic lists
- Headers and footers

The characters can be viewed right on the screen.

Characters that cannot be represented

However, the operating unit cannot represent all characters. On certain equipment variants, a language is loaded complete with its language dependent characters. It is not possible to mix language dependent characters such as ä and é.

If you edit in a character that cannot be represented on the operating unit, a space is displayed instead.

Cyrillic font

Operator panels OP 7, OP 15 C and OP 17 as well as text display TD 17 can also display the Cyrillic character set. If you have selected Russian by choosing "Edit" > "Language" > "Select", from the menu, you can enter both Cyrillic and Latin characters on the keyboard:

- All lowercase letters produce Cyrillic characters.
- All uppercase letters produce Latin characters.
- Digits and punctuation continue to be available.

The precise assignment of Latin and Cyrillic characters depends on the operating unit. You will find more on this topic in the character map for the OP 7, OP 15C, OP 17 and TD 17.

Character maps for the different operating units

From the character map applicable to the configured operating unit you can see

- which characters can be displayed on the operating units, and
- how the assignment is between the displayed character and the ANSI Code.

Entering special characters

You can enter special characters on the numeric keypad on the keyboard. Enter ALT + "0XXX", where "XXX" is the ANSI Code from the character map applicable to the configured operating unit.

By choosing "Window" > "keyboard" from the menu, you can open a keyboard assignment on the screen. If you keep ALT GR pressed down, the on-screen keyboard displays ANSI characters. You then enter these characters either on your keyboard or on the on-screen keyboard by clicking the mouse on the corresponding keys.

5.12.8.1 Character map for OP 7, OP 15C, OP 17 and TD 17

Entering special characters

You can enter special characters on the numeric keypad on the keyboard. Enter "ALT" + "0XXX", where "XXX" is the ANSI code from the character map.

If you choose "Window" > "Keyboard" from the menu, you can open a keyboard assignment on the screen. If you keep ALT GR pressed down, the on-screen keyboard displays ANSI characters. You then enter these characters either on your keyboard or on the on-screen keyboard by clicking the mouse on the corresponding keys.

Cyrillic font

Operator panels OP 7, OP 15 C and OP 17 as well as text display TD 17 can also display the Cyrillic character set. If you have selected Russian by choosing "Edit" > "Languages" > "Select" from the menu, you can enter both Cyrillic and Latin characters on the keyboard:

Refer to the following table for the assignment of keys and the ANSI Code:

OP7 OP15C OP17 TD17	OP7 OP15C OP17 TD17	Code	OP7 OP15C OP17 TD17	OP7 OP15C OP17 TD17	Code	OP7 OP15C OP17 TD17	OP7 OP15C OP17 TD17	Code	OP7 OP15C OP17 TD17	OP7 OP15C OP17 TD17	Code
Blank	Blank	32	X	X	88	Й	Й	144	Й	Й	200
!	!	33	Y	Y	89	Й	Й	145	É	É	201
"	"	34	Z	Z	90	Й	Й	146	■	■	202
#	#	35	[	[	91	Й	Й	147	α	α	203
\$	\$	36	\	\	92	Й	Й	148	Γ	Γ	204
%	%	37	]	]	93	·	·	149	xx	xx	205
&	&	38	^	ú	94	†	†	150	Σ	Σ	206
'	'	39	—	—	95	↓	↓	151	σ	σ	207
(	(	40	`	b	96	→	→	152	τ	τ	208
)	)	41	a	À	97	-	-	153	Ñ	Ñ	209
*	*	42	b	Á	98	†	†	154	*	*	210
+	+	43	c	Â	99	†	†	155	ø	ø	211
,	,	44	d	Ã	100	†	†	156	Ω	Ω	212
-	-	45	e	Ä	101	†	†	157	š	š	213
.	.	46	f	Å	102	†	†	158	Û	Û	214
/	/	47	g	Ä	103	†	†	159	∞	∞	215
0	0	48	h	Ö	104	†	†	160	∞	∞	216
1	1	49	i	È	105	i	i	161	ç	ç	217
2	2	50	j	É	106	†	†	162	n	n	218
3	3	51	k	Ê	107	£	£	163	≡	≡	219
4	4	52	l	Ë	108	†	†	164	Û	Û	220
5	5	53	m	Ì	109	≠	≠	165	≥	≥	221
6	6	54	n	Í	110	=	=	166	≤	≤	222
7	7	55	o	Î	111	†	†	167	ß	ß	223
8	8	56	p	Ï	112	±	±	168	à	à	224
9	9	57	q	Ï	113	†	†	169	á	á	225
:	:	58	r	Ò	114	ª	ª	170	â	â	226
;	;	59	s	Ñ	115	«	«	171	í	í	227
<	<	60	t	Û	116	¬	¬	172	ä	ä	228
=	=	61	u	Ü	117	†	†	173	ÿ	ÿ	229
>	>	62	v	Æ	118	†	†	174	æ	æ	230
?	?	63	w	À	119	†	†	175	ç	ç	231
@	@	64	x	Ú	120	ª	ª	176	è	è	232
A	A	65	y	Û	121	±	±	177	é	é	233
B	B	66	z	Ç	122	²	²	178	ê	ê	234
C	C	67	{	Ø	123	†	†	179	ë	ë	235
D	D	68	|	Ý	124	†	†	180	ì	ì	236
E	E	69	}	Û	125	†	†	181	í	í	237
F	F	70	~	x	126	†	†	182	î	î	238
G	G	71	■	■	127	·	·	183	ï	ï	239
H	H	72	■	■	128	†	†	184	ÿ	ÿ	240
I	I	73	■	■	129	†	†	185	ñ	ñ	241
J	J	74	†	†	130	°	°	186	ò	ò	242
K	K	75	f	f	131	»	»	187	ó	ó	243
L	L	76	■	■	132	¼	¼	188	ô	ô	244
M	M	77	■	■	133	½	½	189	»	»	245
N	N	78	■	■	134	†	†	190	ö	ö	246
O	O	79	|	|	135	¿	¿	191	÷	÷	247
P	P	80	→	→	136	†	†	192	↓	↓	248
Q	Q	81	†	†	137	■	■	193	ù	ù	249
R	R	82	†	†	138	■	■	194	ú	ú	250
S	S	83	†	†	139	†	†	195	û	û	251
T	T	84	†	†	140	À	À	196	ü	ü	252
U	U	85	†	†	141	Ä	Ä	197	°	°	253
V	V	86	†	†	142	Æ	Æ	198	■	■	254
W	W	87	†	†	143	Ç	Ç	199	ÿ	ÿ	255

5.12.8.2 Character map for OP 3, OP 5, OP 15A (with LCD)

Entering special characters

You can enter special characters on the numeric keypad on the keyboard. Enter "ALT" + "0XXX", where "XXX" is the ANSI code from the character map.

By choosing "Window" > "keyboard" from the menu, you can open a keyboard assignment on the screen. If you keep ALT GR pressed down, the on-screen keyboard displays ANSI characters. You then enter these characters either on your keyboard or on the on-screen keyboard by clicking the mouse on the corresponding keys.

Zeichen	Code	Zeichen	Code	Zeichen	Code	Zeichen	Code
Blank	32	X	88		144		200
!	33	Y	89		145		201
"	34	Z	90		146		202
#	35	[	91		147	α	203
\$	36	\	92		148		204
%	37	]	93		149	π	205
&	38	^	94	^	150	Σ	206
'	39	_	95	▼	151	σ	207
(	40	`	96	→	152		208
)	41	a	97	—	153		209
*	42	b	98		154		210
+	43	c	99		155		211
,	44	d	100		156	Ω	212
-	45	e	101		157		213
.	46	f	102		158	Ö	214
/	47	g	103		159	∞	215
0	48	h	104		160		216
1	49	i	105		161	ι	217
2	50	j	106		162		218
3	51	k	107		163		219
4	52	l	108		164	Û	220
5	53	m	109		165		221
6	54	n	110		166		222
7	55	o	111		167	ß	223
8	56	p	112		168	à	224
9	57	q	113		169	á	225
:	58	r	114		170		226
;	59	s	115		171		227
<	60	t	116		172	ä	228
=	61	u	117		173		229
>	62	v	118		174		230
?	63	w	119		175	ç	231
@	64	x	120	°	176	è	232
A	65	y	121		177	é	233
B	66	z	122		178		234
C	67	{	123		179		235
D	68	|	124		180	ì	236
E	69	}	125	μ	181	í	237
F	70	~	126		182		238
G	71	■	127	·	183		239
H	72		128		184		240
I	73		129		185		241
J	74		130		186	ò	242
K	75		131		187	ó	243
L	76		132		188		244
M	77		133		189		245
N	78		134	J	190	ö	246
O	79		135	¿	191	÷	247
P	80	←	136	¡	192	√	248
Q	81		137	■	193	ù	249
R	82		138		194	ú	250
S	83		139		195		251
T	84		140	Ä	196	ü	252
U	85		141		197		253
V	86		142		198		254
W	87		143		199		255

5.12.8.3 Character map for OP 15A-VF (with VF display)

Entering special characters

You can enter special characters on the numeric keypad on the keyboard. Enter "ALT" + "0XXX", where "XXX" is the ANSI code from the character map.

By choosing "Window" > "keyboard" from the menu, you can open a keyboard assignment on the screen. If you keep ALT GR pressed down, the on-screen keyboard displays ANSI characters. You then enter these characters either on your keyboard or on the on-screen keyboard by clicking the mouse on the corresponding keys.

Zeichen	Code	Zeichen	Code	Zeichen	Code	Zeichen	Code
Blank	32	X	88		144		200
!	33	Y	89		145		201
"	34	Z	90		146		202
#	35	[	91		147	α	203
\$	36	\	92		148		204
%	37	]	93		149		205
&	38	^	94	^	150		206
'	39	_	95	▼	151	σ	207
(	40	`	96	→	152		208
)	41	a	97	—	153		209
*	42	b	98		154		210
+	43	c	99		155		211
,	44	d	100		156	Ω	212
-	45	e	101		157		213
.	46	f	102		158	Ö	214
/	47	g	103		159	∞	215
0	48	h	104		160		216
1	49	i	105		161		217
2	50	j	106		162		218
3	51	k	107		163		219
4	52	l	108		164	Û	220
5	53	m	109		165	z	221
6	54	n	110		166	≤	222
7	55	o	111		167	ß	223
8	56	p	112		168	à	224
9	57	q	113		169	á	225
:	58	r	114		170		226
;	59	s	115		171		227
<	60	t	116		172	ä	228
=	61	u	117		173		229
>	62	v	118		174	æ	230
?	63	w	119		175	ç	231
@	64	x	120	°	176	è	232
A	65	y	121	±	177	é	233
B	66	z	122		178		234
C	67	{	123		179		235
D	68	|	124		180	ì	236
E	69	}	125	µ	181	í	237
F	70	~	126		182		238
G	71	■	127		183		239
H	72		128		184		240
I	73	■	129		185		241
J	74		130		186	ò	242
K	75	f	131		187	ó	243
L	76		132	¼	188		244
M	77		133	½	189		245
N	78		134		190	ö	246
O	79		135	¿	191		247
P	80	←	136		192		248
Q	81		137		193	ù	249
R	82		138		194	ú	250
S	83		139		195		251
T	84		140	Ä	196	ü	252
U	85		141		197		253
V	86		142	Æ	198		254
W	87		143		199		255

6 Testing projects

Principle

Once you have completed your entire project or self-contained parts within it, the "test phase" starts.

The following steps must be taken:

1. Compile your project: Your project is transformed into a file that is capable of running on the operating unit.
2. Download your project: The project is downloaded to the operating unit. You have to perform some settings for this.
3. Test your project: Should you find other errors, troubleshoot them and start again at step 1.

Note

If you are using a SIMATIC S5 or S7, configure "Status/Force" in order to test specific tags in the PLC program.

6.1 Downloading the executable project file

Basic procedure

To download the project file, you have to do the following:

1. Set the transfer mode.
2. Select an interface on the configuration computer.
3. Select a storage medium on the operating unit.
4. Download the project file.

Note on text-based displays

When a new project file is downloaded to the operating unit, the memory is deleted, and with it all the data records on the operating unit.

Special features

These deviations from the basic procedure are only to be carried out the first time:

- Download mode: The first download is always a "serial download".
- Firmware: Before a compiled project file can be downloaded to the operating unit for the first time, the firmware of the operating unit is downloaded automatically. A corresponding status message is issued.

Download not possible

If no connection to the operating unit can be established, a status message to this effect is output. Check the physical connection between the operating unit and the configuration computer.

Note

The project file must not be downloaded directly from the configuration computer to the module, but must first be loaded into the flash memory on the operating unit, since the memory organization of the two storage media differs. If the project file were to be downloaded directly to the module and then loaded into the flash memory on an operating unit, error states can result.

In the DRAM the data are lost when the operating unit is switched off.

6.2 Peculiarities of MPI download

Requirements

- MPI download is possible with the following operating units: all graphics displays and OP 3, C7-623, and C7-624.
- An MPI module is required on the configuration computer.
- The configuration computer and operating unit are connected physically to the MPI network.
- An MPI network can only be set up with a SIMATIC S7 PLC.

Setting the MPI address on the operating unit

If you have downloaded the compiled project file for the first time, and serially at that, the operating unit has the configured MPI address.

To carry out an "MPI download", the standard screen "System Settings" must be configured in the project and the "MPI Download" operating mode must be selected.

Multiple operating units in the MPI configuration

If you want to integrate multiple operating units in the MPI configuration, you can only do it successively.

1. Connect the first operating unit physically.
2. Change to serial transfer mode, and download first the firmware and then the compiled project file.
3. Then connect the next operating unit physically, and so on.

Note

If you were to connect several operating units physically and then download the project, this would lead to an address conflict. All the operating units would have the same default MPI address, namely 1 which is not permissible in the MPI configuration.

6.3 Directly accessing values on the PLC (Status/Force tag)

Purpose

At runtime you can directly access the connected PLC (SIMATIC S5 and SIMATIC S7) from the operating unit to read and write values. This means you can monitor and change the PLC operands easily on the operating unit without having to connect a programming device or PC to the PLC as well.

This is very advantageous particularly during the testing and commissioning phase of your project.

Requirements

In order to be able to access values on the PLC directly at runtime, the following requirements must be met:

- The connected PLC must be a SIMATIC S5 or SIMATIC S7
- You must have integrated the two standard screens "Status Tag" and/or "Force Tag" in your project.

Standard screens

The programming device function "STATUS TAG" is called in the standard screen "Status Tag". This allows you to monitor PLC operands on the operating unit. Write access is not possible in this screen.

The programming device function "FORCE TAG" is called in the standard screen "Force Tag". This allows you to monitor and change PLC operands on the operating unit.

You will find detailed descriptions about working with the two standard screens in the "equipment manual" for your operating unit.

6.4 Troubleshooting

If error messages are issued in the course of working with your project, such as when you are compiling or downloading your project, you will learn here how you take remedial action.

6.4.1 Error messages during compilation

Possible messages

While the ProTool compiler is compiling a project, status messages on the progress of the compilation process are output to a window.

The following messages make a check of your project necessary:

- **Notes:** It is possible that logical operations in the project are either not correct or do not exist. Check the project for logical relationships in accordance with the messages. The compilation process has been properly completed.
- **Warnings:** The project contains errors that might result in incomplete display on the operating unit. The full compilation process has been completed.
- **Errors:** Correct the errors listed and recompile the project. The compilation process is not completed.

6.4.2 Error messages while downloading

Possible problems while downloading

While a project is being downloaded to the operating unit, status messages on the progress of the compilation process are output to a window.

If problems occur while the project is being downloaded to the operating unit, the cause in the majority of cases is too high a baud rate or the simultaneous use of other drivers on the configuration computer for example, when connected to a network.

The most common causes of discontinuation of the download process are listed below.

Downloading is aborted after a Line Error message

Possible Cause	Action
The connecting cable is too long.	Select a lower baud rate.
The connecting cable is poorly shielded or spurious signals are imported onto the cable by other devices.	Select a lower baud rate.
Computer performance is inadequate.	Select a lower baud rate.
Another driver is running in the background for example, with networking.	Select a lower baud rate.

Downloading stops and crashes

Possible Cause	Action
Computer performance is inadequate.	Select a lower baud rate.

Downloading does not take place

Possible Cause	Action
Connection to the operating unit cannot be established (message in the system message window).	Check the physical connection between the configuration computer and the operating unit.
The standard communication driver is not entered in the Windows device manger.	Check the device status of the COM port in the Properties window of the device manager.
Interrupt problems. Various modules are using the same interrupt.	Modify the configuration of your computer or install ProTool on a stand-alone computer.
Other programs block the interface for example, STEP 5.	Exit from the programs and reboot your computer, if necessary.

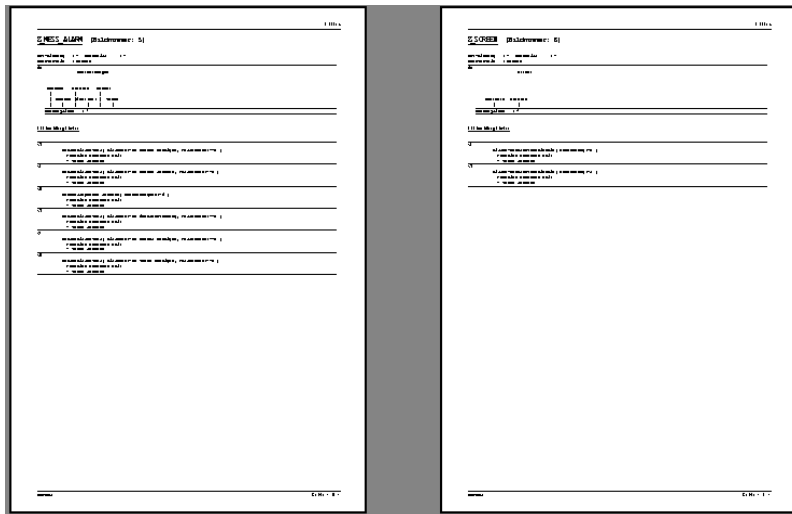
7 Documenting and managing projects

This chapter details the multiplicity of functions offered by ProTool for printing out, documenting and managing and archiving your project data.

7.1 Printing project data

Print function

ProTool provides a comprehensive printout function that can be accessed by choosing "File" > "Print" from the menu. It provides detailed lists for documenting all project-relevant data such as screens, messages, tags, symbol tables, etc.



Print function in ProTool

In this way it provides the facility for documenting your complete project. An up-to-date printout can also be very helpful while you are configuring.

Note

When configuring, as an alternative to the printout function, there is also the user-friendly cross-reference function offered by ProTool.

Chapter

ProTool subdivides printouts into "sections" arranged by subject according to object types. For example, one chapter contains all the definitions on the subject of screens, another contains a list of all the tags and yet another a list of all the defined text or graphic lists.

You can print several chapters at once or just print single chapters.

Reports

ProTool offers you the facility of customizing printouts to suit your individual requirements.

- You can limit a printout to single chapters or single pages.
- You can set the order in which the chapters appear.
- You can decide which data you want to output within a chapter.
- You can set margins, define your own headers and footers and embed your own graphic in the cover.

These definitions are stored in a "report". Frequently required reports have been defined in ProTool in advance. But you can also create your own reports, as you wish. All reports are common to all projects.

Every time you want to print, you choose the report with which you would like your output to conform.

7.2 Project management with integrated operation

ProTool integrated in SIMATIC STEP 7

If you are working with ProTool integrated in SIMATIC STEP 7, use SIMATIC Manager to manage your projects. You can then copy, move, back up and restore your projects in the same way as you have been used to from SIMATIC STEP 7. For further information refer to the documentation on SIMATIC Manager.

Note

ProTool's Project Manager is not available to you in the event of integrated operation. ProTool data can no longer be viewed independently in this event, since the data is always linked to a STEP 7 project. It therefore has to be managed and backed up using this application.

7.3 Managing projects in stand-alone operation

Project Manager

If you installed ProTool as a "stand-alone" application – in other words, if you are not operating it under SIMATIC STEP 7 – there is a user-friendly project manager integrated in ProTool instead of SIMATIC Manager. You can use it to manage your projects in a user-friendly way.

Usage

With Project Manager, it is simple for you to:

- Archive projects (Backup), using more than one floppy disk too
- Restore archived projects (Restore)
- Open projects
- Delete projects

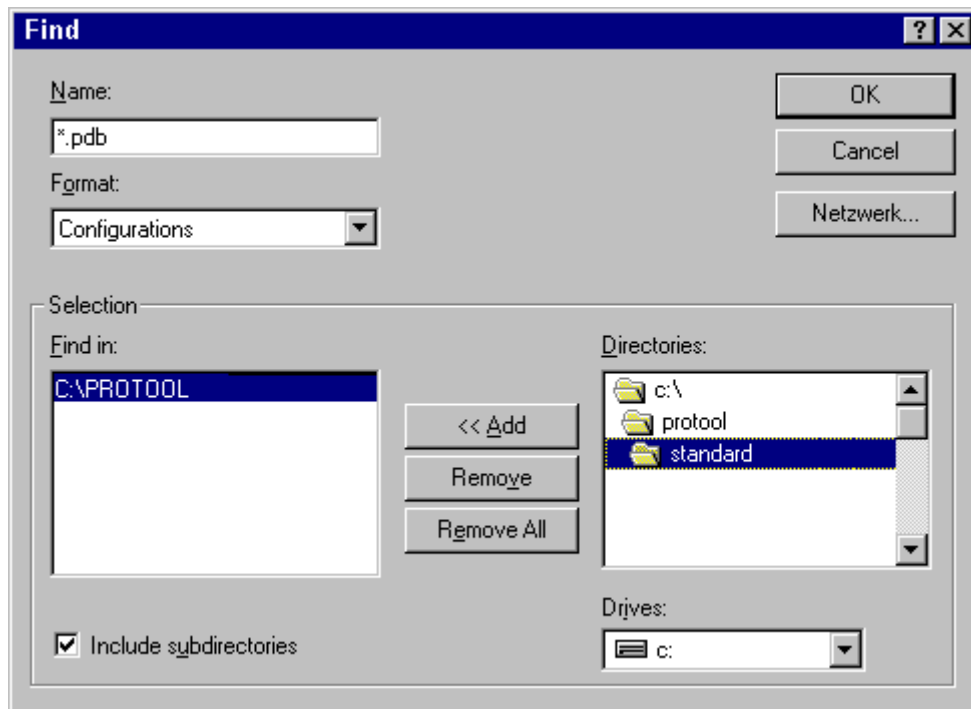
Backup and restore

The Backup and Restore functions are not possible between devices of different types.

Backup and Restore are directly possible on the operating units. Refer to your equipment manual for further information.

Call

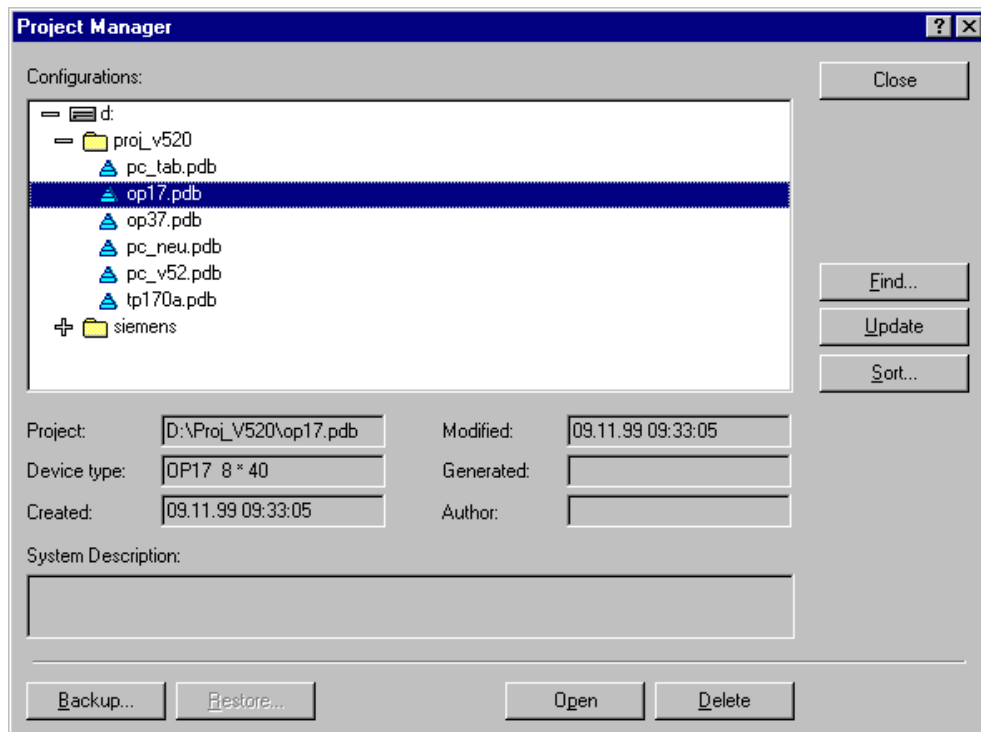
You start Project Manager by choosing "File" > "Project Manager" from the menu. When you call Project Manager for the first time, the "Find" dialog box is displayed initially. Here you choose the drives and directories which have to be searched for ProTool files. Only those projects that are located within these directories are displayed by Project Manager.



"Find" dialog box

After you have selected the appropriate directories, or when you call Project Manager later again, the Project Manager window proper appears.

Display



Project Manager

In the left segment of the Project Manager you will see a hierarchical structure of all the projects located in the directories in which Project Manager searched. Here you can select a project in order to open it, delete it or back it up.

In the center segment of the window you will find detailed information on the project highlighted on the list.

Using the buttons in the area on the right, you can extend the list of scanned directories ("Find" button), have the directories searched again ("Update" button) and have the list sorted by different project data such as "project name", "device type", "date created", etc. ("Sort" button).

7.4 Constraints with printing

Printer drivers

Note the following constraints with certain printer drivers:

- It might not be possible to print the project with CANON drivers. Printing will be discontinued in this case.
- With the Apple laser printer, the first line is not printed. This problem does not occur with drivers for the HP LaserJet III, PostScript or PostScript printers.

ASCII character set

With some printers, it is not enough simply to set the ASCII character set in the project. Make sure the ASCII character set is set on the printer too.

7.5 Example of documenting a project

This example shows you how to create a customized printout.

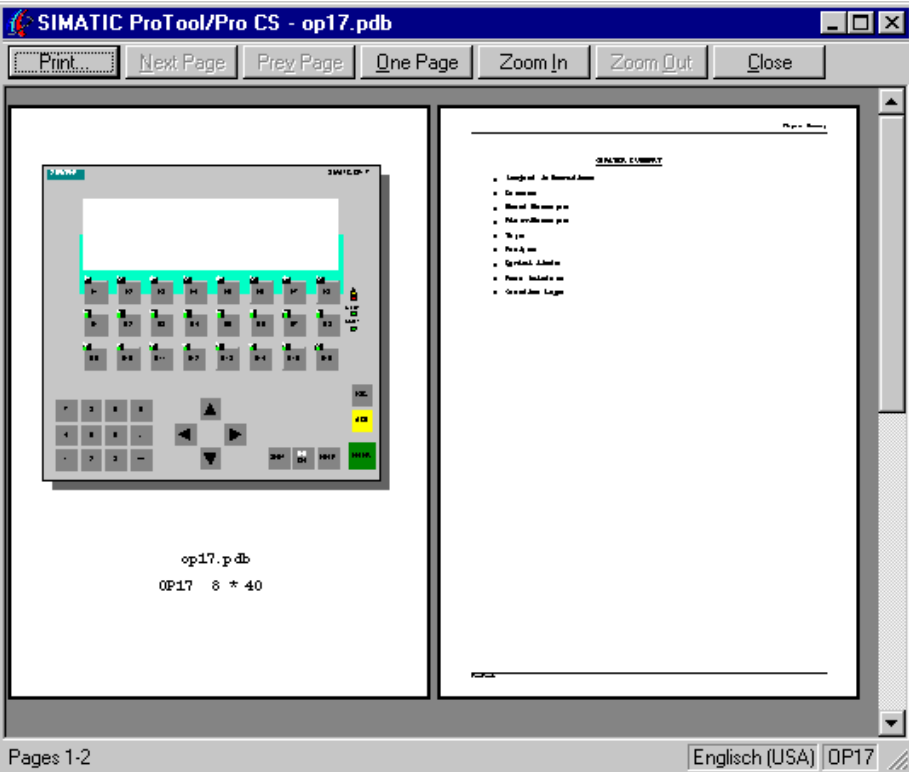
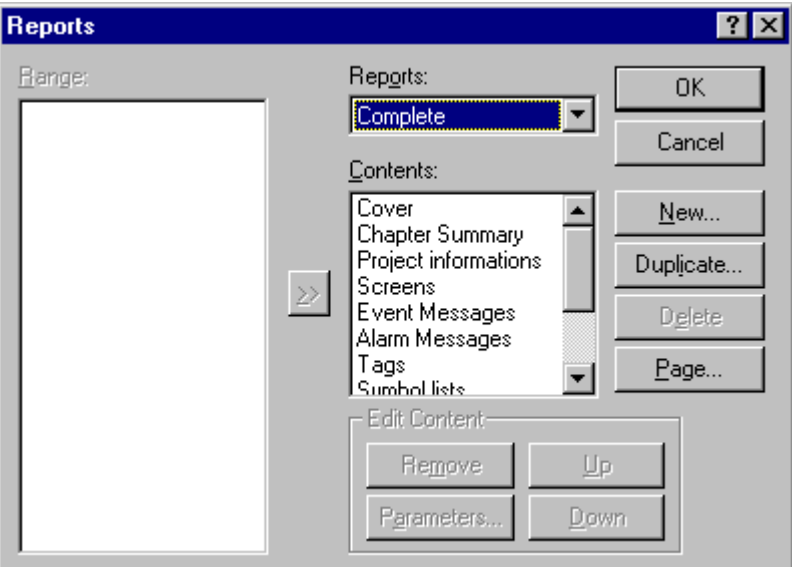
7.5.1 How to create a customized printout

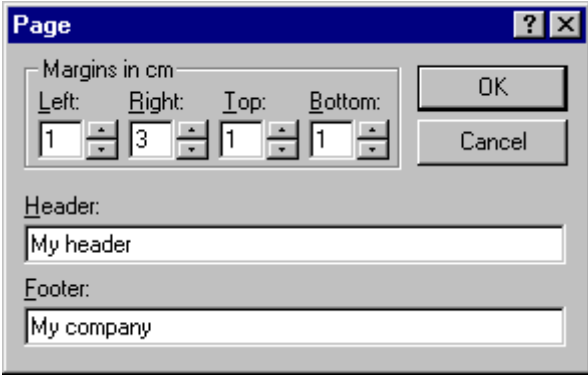
Objective

You wish to print all the data in your project. Unlike the default setting, you do not want the ProTool graphic but your company logo, which you have already used in your project under the name of `LOGO`, to be printed on the cover sheet. You want to leave a margin for handwritten comments on the right side of the printout.

Procedure

Procedure:	
1	Open the project from which you wish to print data.
2	Choose "File" > "Print" from the menu.
3	In the "Print" dialog box at "Reports", choose the <code>Complete</code> report. You will now see the individual chapters in the "Contents" list in the order in which they will later be output.

	<p>Procedure:</p>
<p>4</p>	<p>Click the "Preview" button. The print preview shows you how your printout will look later. You want to replace the graphic on the first page (cover) with your company logo. You want the right border to be much wider.</p> 
<p>5</p>	<p>Exit from the preview by clicking the "Print" button.</p>
<p>6</p>	<p>To perform the changes you require, click the "Reports" button. The "Reports" dialog box is opened.</p> 

Procedure:	
7	To modify the margin, click the "Page" button.
8	<p>Enter the value you require for the right border at "Right" - for example, 3 for 3 cm. If you like, you can specify a piece of text here for the headers and footers at the same time.</p> 
9	Confirm your input by clicking OK. You are now back in the "Reports" dialog box.
10	To modify the definition for the cover sheet, select the entry <i>Cover Sheet</i> in the "Contents" list and click the "Parameters" button.
11	In the "Cover Sheet" dialog box, select the graphic called <i>LOGO</i> with your company logo at "Graphic".
12	Click OK twice until you are back in the "Print" dialog box.
13	Finally, click the OK button to activate the printing process.

8 Tips for efficient configuration

Here you can obtain useful tips on how to design your configuration in ProTool even more efficiently.

8.1 Optimizing performance

Principle

If you want to optimize performance to the maximum possible while the operating unit is operating, the best way to achieve this is by having the best possible setting for the "update time and acquisition cycle".

The acquisition times specified for the area pointers and the acquisition times of the tags are important factors for the update times that can actually be achieved.

The following applies to calculation of the update time:

Update time = acquisition cycle plus transfer time plus processing time.

You achieve optimum update times by taking the following points into account while you are configuring:

- Create the different data areas as small as possible and as large as necessary.
- Define contiguous data areas where they belong. The actual update time improves if you create one large area instead of several small ones.
- If you select too small an acquisition cycle, it has an adverse degrades overall performance. Set the acquisition cycle in line with the update rate of the process values.

Example:

The temperature variation of a furnace, for example, is considerably less dynamic than the variation in speed of an electric drive.

The guide figure for the acquisition cycle is approx. 1 second.

- If necessary, dispense with the cyclic download of user data areas (data entry cycle 0) to improve update times. Instead, use PLC jobs to download user data areas spontaneously.
- Place all message or screen tags in a data area.
- For the operating unit to be able reliably to detect changes on the PLC, the changes must be queued during the actual acquisition cycle.

8.2 Using a tag in several fields

Background

If you use a tag on the operating unit in an input field and simultaneously in an output field, this may result in unexpected display behavior. The value of the tag at this address can be modified both by the PLC and by means of an input on the operating unit.

Example:

You enter a new value on the operating unit. The output field is updated immediately with the new value. In the meantime, a value is read from the PLC which is still the old value. The old value is then displayed briefly in the output field and in the input field. While that is happening, the new value is being transferred to the PLC. The new value is then displayed in both fields upon the next update.

Action

We recommend for this reason that you configure different tags for the input field and the output field.

8.3 Tags with configured decimal places

Special features when inputting limit values

Limit values for tags are entered without a point. The constant for the limit value is interpreted differently, depending on whether decimal places have been specified for the tag.

The number of specified decimal places determines how many places of the limit value are interpreted as decimal places.

The table shows an example.

Decimal places	Limit Value Entered	Interpreted by ProTool
0	2275	2275
1	2275	227,5
2	2275	22,75

Appendix

- A HMI System Messages**
- B Standard screens reference**
- C Communication areas for non-SIMATIC PLCs**
- D Abbreviations**

A HMI System Messages

In this chapter

This chapter contains a selection of important HMI system messages for Windows-based systems. The table indicates when the messages occur and how they, or their cause, can be cleared. Not every message is relevant for each operating unit.

HMI system message parameters

The HMI system messages may contain parameters which are not decoded for the user but which are relevant in respect of the cause of an error since they provide a reference to the source code of the runtime software. These parameters are issued according to the text "Error code:".

Notice

HMI system messages are issued in the language currently set on the operating unit.

Procedure in the case of "internal errors"

Please proceed as follows in the case of all system messages related to "internal errors":

Start up the operating unit again.

Download the configuration again.

Switch the operating unit off, stop the PLC and then restart both.

If the error occurs again, please contact the SIMATIC Customer Support. Make reference to the specified error number and message tags.

Number	Effect/Cause	Remedy
10000	The print job could not be started or was terminated for an unknown reason. The printer is incorrectly configured. Or: There are no rights for a network printer available.	Check the printer settings and cable connections. If a fault occurs repeatedly, contact the hotline.
10001	No printer has been installed or no standard printer configured.	Install a printer and/or mark one as standard printer.
10002	The intermediate buffer for printing graphics is full. Up to two graphics can be buffered.	Do not issue print jobs so quickly in succession.
10003	Graphics can be buffered again.	-

Number	Effect/Cause	Remedy
10004	The intermediate buffer for printing lines in text mode (e.g. messages) is full. Up to 1000 lines can be buffered.	Do not issue print jobs so quickly in succession.
10005	Lines of text can be buffered again.	-
10006	The Windows print system reports an error. For information on the cause, refer to the text printed and, if available, the error number. Printing is not performed or it is incorrect.	Repeat the action, if necessary.
20010	A fault has occurred in the script line called in from the specified script. Execution of the script function was, therefore, terminated. In this case, it is advisable to check any previous system messages too.	Select the specified script line in the configuration. Check tags, whether the types used are permissible. Check Functions, whether the number and types of parameter are correct.
20011	An error has occurred in a script called in by the script specified. Execution of the script function– has, therefore, been terminated in the subscript. In this case, it is advisable to check any previous system messages too.	Select the scripts from the configuration which are called in directly or indirectly via the specified script. Check tags, whether the types used are permissible. Check Functions, whether the number and types of parameter are correct.
20012	Inconsistent configuration data is present. Therefore, the script could not be created.	Compile the configuration again.
20013	VBScript.dll is not correctly installed. Therefore, no scripts can be executed.	Re–install ProTool/Pro RT.
20014	A value is returned by the script function which is not written in any configured return tag.	Select the specified script in the configuration. Check whether the script name has been assigned a value.

Number	Effect/Cause	Remedy
20015	Too many scripts have been triggered in quick succession. If more than 20 scripts are queued to be processed, any subsequent scripts are rejected. In this case, the script indicated in the message is not executed.	Check where the scripts are being triggered from. Extend the times, e.g. the polling time of the tags, which trigger the scripts.
30010	The tag could not accept the function result, e.g. in the case of exceeding the value range.	Check the tag type of the function parameter.
30011	A 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.
40010	The 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 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	The operating unit receives data faster than it is capable of processing. Therefore, no further data is received until the data currently available has been processed. Data exchange then resumes.	-
50001	Data exchange has been resumed.	-
60000	This message is generated by the function "Display system messages". The text to be displayed is transferred to the function as a parameter.	-
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 NT user has no access rights to one of the two files.	Restart the function or check the paths of the source/target files. Using Windows NT with NTFS: The user executing ProTool/Pro RT must be granted access rights for the files.

Number	Effect/Cause	Remedy
60011	An attempt was made to copy a file to itself. It is possible that the Windows NT user has no access rights to one of the two files.	Check the path of the source/target file. Using Windows NT with NTFS: The user executing ProTool/Pro RT must be granted access rights for the files.
70010	The application could not be started because it could not be found in the path specified or insufficient memory space was available.	Check whether the application exists in the specified path or close other applications.
70011	The system time could not be modified. The error message only appears in connection with area pointer Date/Time PLC. Possible causes: - an impermissible time was transferred in the PLC job, - the Windows NT user has no user rights to modify the system time. If the first parameter in the system message is displayed with the value 13, the second parameter indicates the byte containing the incorrect value.	Check the time which is to be set. Under Windows NT: The user executing ProTool/Pro RT must be assigned the rights to modify the system time from Windows NT (administration/user manager, guidelines).
70012	An error occurred when executing the function Exit Runtime with the option Exit also Windows. Windows and ProTool/Pro RT are not terminated. A possible cause is that other applications cannot be terminated.	Terminate all applications currently running. Then terminate 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 impermissible time was transferred - the Windows NT user has no user rights to modify the system time, - Windows rejects the setting request.	Check the time which is to be set. Under Windows NT: The user executing ProTool/Pro RT must be assigned the rights to modify the system time from Windows NT (administration/user manager, guidelines).
70015	The system time could not be read because Windows rejects the reading function.	-

Number	Effect/Cause	Remedy
70016	An attempt was made to select a screen by means of a 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.	Check the screen number in the function or job with the screen numbers configured. Refer the number to a screen, if necessary.
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	Acknowledgement that the password list has been successfully imported.	-
70019	Acknowledgement that the password list has been successfully exported.	-
70020	Acknowledgement for activation of message recording.	-
70021	Acknowledgement for deactivation of message recording.	-
70022	Acknowledgement to starting the Import Password List action.	-
70023	Acknowledgement to starting the Export Password List action.	-
70027	Backing up the RAM file system has been started.	-
70028	Backing up of the RAM file system has been completed successfully. The files from the RAM have been copied in the Flash memory. Following a restart, these saved files will be copied back in 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 OP Properties dialog and save the RAM file system using the Save Files button in the Persistent Storage tab control.
70030	The parameters configured for the function are faulty. The connection to the new PLC was not established.	Compare the parameters configured for the function with the parameters configured for the PLC and correct them as necessary.

Number	Effect/Cause	Remedy
70031	The PLC configured in the function is not an S7 PLC. The connection to the new PLC was not established.	Compare the S7 PLC name parameter configured for the function with the parameters configured for the PLC and correct them as necessary.
80001	The archive 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 archive.	-
80003	The copying process for archiving was not successful. In this case, it is advisable to check any subsequent system messages, too.	-
80006	Since archiving 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 path was incorrectly entered in ProTool, this causes a permanent loss of the functionality.	Configure the path for the respective archive again and restart the system when the full functionality is required.
80012	Archive values are stored in a buffer. If the values are read to the buffer faster than they can be physically written (e.g. using a hard disk), overloading may occur and recording is then stopped.	Archive less values. Or increase the recording interval.
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.	-
80016	The archives are separated by the function Close archive and the incoming entries exceed the defined buffer size. All the jobs in the buffer are deleted.	Reconnect the archives.

Number	Effect/Cause	Remedy
80017	The incoming entries cause the defined buffer size to be exceeded. This can be caused, e.g. by several copying actions being activated at the same time. All the copy jobs in the buffer are deleted.	Terminate the copy process.
80018	All the archives are reconnected by means of the DB layer, e.g. after executing the function Open_archive. Values are then written back into the tables.	-
80019	All the archives are separated from the DB layer and all connections terminated, e.g. after executing the function Close_archive. Values are temporarily buffered and written in the tables when the connection is re-established. There is no connection to the storage medium and a change can take place.	-
80020	The max. number of simultaneously activated copy actions has been exceeded. Copying is not executed.	Wait until the current copying actions have been completed and restart the last copy action.
80021	An attempt was made to delete an archive which is still involved with a copy action. Deletion has not been executed.	Wait until the current copying action has been completed and restart the last action.
80022	An attempt was made to start a sequence archive, which is not a sequence archive, from an archive using the function Start_sequence_archive. No sequence archive is created.	Check the project for the following: - the function Start_sequence_archive is correctly configured. - the variable parameters are being correctly provided at the operating unit.
80023	An attempt was made to copy an archive to itself. The archive is not copied.	Check the project for the following: - the function Copy_archive is correctly configured. - the variable parameters are being correctly provided at the operating unit.

Number	Effect/Cause	Remedy
80024	The function Copy_archive is configured not to permit copying when the target archive already contains data (Parameter: Write mode). The archive is not copied.	Modify the function Copy_archive in the project, if necessary. Before initiating the function, delete the target archive.
80025	The copy action is interrupted. Data written up to this point is retained. Deletion of the target table (if configured) is not executed. The cancellation is documented by an error entry \$RT_ERR\$ at the end of the target table.	-
80026	The message is issued after all the archives have been successfully initialized. Values are written in the archives from this moment on. Prior to this, no values are archived even though the runtime software is operating.	-
80027	The internal Flash memory has been specified as the memory location for an archive. This is not permissible. No values will be archived for this archive and the archive will not be created.	Configure "Storage Card" as the memory location or a network path.
80028	The message serves as a status acknowledgment that initialization of the archives is currently running. No values are archived until system message 80026 is issued.	-
80029	The number of archives specified in the message could not be initialized. Initialization of the archives has been completed. The faulty archives are not available for archiving jobs.	Evaluate the additional system message, related to this message, which is also issued. Check the configuration, the ODBC (Open Database Connectivity) and the specified drive.
80030	The structure of the table(s) available does not match the archiving structure expected. The archiving process is stopped for this archive.	Delete the existing tables manually, in advance.

Number	Effect/Cause	Remedy
80032	Archives can be configured with a function trigger. This is triggered as soon as the archive is full. If runtime is started and the archive is already full, the trigger function will not be initiated. The archive specified no longer archives data since it is full.	Stop the runtime, delete the archive and restart the runtime again. Or: Configure a button in the runtime which contains the same actions as the function trigger and press it.
110000	The operating mode status has been changed. The operating mode is now offline.	-
110001	The operating mode status has been changed. The operating mode is now online.	-
110002	The operating mode status has not been changed.	Check the connection to the PLCs. Check whether the address area for the area pointer "Coordination" in the PLC is available.
110003	The operating status of the PLC specified is changed by the function Connect/Disconnect PLC. The operating mode is now offline.	-
110004	The operating status of the PLC specified is changed by the function Connect/Disconnect PLC. The operating mode is now online.	-
110005	An attempt was made to use the function Connect/Disconnect PLC to switch the specified PLC to operating mode online although the entire system is in operating mode Offline. This switch-over is not permissible. The PLC remains in operating mode offline.	Switch the complete system to operating mode online and execute the function again.
110006	The Colorado system has been extended by the addition of the User Version area pointer. If the user version is not correct, the runtime is stopped.	Check the user versions. Either the wrong version was entered in the PLC or configuration or the wrong configuration was started for the PLC user version.
120000	The trend is not displayed because an incorrect axis to the trend, or incorrect trend, has been configured.	Change the configuration.

Number	Effect/Cause	Remedy
120001	The trend is not displayed because an incorrect axis to the trend, or incorrect trend, has been configured.	Change the configuration.
120002	The trend is not displayed because the tag assigned tries to access an invalid PLC address.	Check whether the data area for the tag exists in the PLC, the configured address is correct or the value range for the tag is correct.
130000	The action was not executed.	Close other applications. 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 other applications. Delete files no longer required from the hard disk.
130003	No target data carrier is inserted. The process is stopped.	Check, for example, whether: - access has been made to the correct data carrier - the data carrier has been inserted
130004	The target data carrier is write-protected. The process is stopped.	Check whether access has been made to the correct data carrier. Remove the write protection.
130005	The file is write-protected. The process is stopped.	Check whether access has been made to the correct file. Modify the file attributes, if necessary.
130006	No access to file is possible. The process is stopped.	Check, for example, whether: - access has been made to the correct file - the file exists - a different action prevents simultaneous access to the file

Number	Effect/Cause	Remedy
140000	Online connection to the PLC has been successfully established.	-
140001	Online connection to the PLC has been disconnected.	-
140003	No tag updating or writing is executed.	Check the connection and whether the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PU/PC interface". Restart the system.
140004	No tag updating or writing is executed because the access point or the subrack configuration is incorrect.	Check the connection and whether the PLC is switched on. Check the access point or the subrack configuration (MPI, PPI, PROFIBUS) in the Control Panel with "Set PU/PC interface". Restart the system.
140005	No tag updating or writing is executed because the address of the operating unit is incorrect (possibly too high).	Use a different operating unit address. Check the connection and whether the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PU/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 ProTool/Pro (according to subrack, profile, communication peer, etc.).

Number	Effect/Cause	Remedy
140007	<p>No tag updating or writing is executed because the bus profile is incorrect (see %1). The following parameters could not be entered in the registry:</p> <ul style="list-style-type: none"> 1: Tslot 2: Tqui 3: Tset 4: MinTsdr 5: MaxTsdr 6: Trdy 7: Tid1 8: Tid2 9: Gap Factor 10: Retry Limit 	<p>Check the user defined bus profile. Check the connection and whether the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PU/PC interface". Restart the system.</p>
140008	<p>No tag updating or writing is executed because the configuration data is incorrect: The following parameters could not be entered in the registry:</p> <ul style="list-style-type: none"> 0: General errors 1: Incorrect version 2: Profile cannot be entered in the registry. 3: Sub-network type cannot be entered in the registry. 4: Target rotation time cannot be entered in the registry. 5: Highest address (HSA) incorrect. 	<p>Check the connection and whether the PLC is switched on. Check the parameter definitions in the Control Panel using "Set PU/PC interface". Restart the system.</p>
140009	<p>No tag updating or writing is executed because the module for the S7 communication was not found.</p>	<p>Re-install the module in the Control Panel using "Set PU/PC interface".</p>
140010	<p>No S7 communication peer could be found because the PLC is switched off. DP/T: The option "Is not active as the only master" is set in the Control Panel under "Set PU/PC interface".</p>	<p>Switch the PLC on. DP/T: If only one master is connected to the network, deactivate the option "Is not active as the only master" in "Set PU/PC interface". If the network has more than one master, switch this master on. Do not modify any settings here, otherwise a bus fault may occur.</p>
140011	<p>No tag updating or writing is executed because communication is interrupted.</p>	<p>Check the connection and that the communication peer is switched on.</p>

Number	Effect/Cause	Remedy
140012	There is an initialization problem (e.g. when ProTool/Pro RT has been terminated in the Task Manager). Or: another application (e.g. STEP7, WINCC) is active with different bus parameters and the driver cannot be started with the new bus parameters (e.g. baud rate).	Restart the operating unit. Or start ProTool/Pro RT first and then the other applications.
140013	The MPI cable is not plugged in and, thus, there is no power supply.	Check the connections.
140014	-	Modify the operating unit address in the configuration in PLC.
140015	Incorrect baud rate Or: incorrect bus parameter (e.g. HSA) Or: OP address HSA Or: incorrect interrupt vector (interrupt does not arrive at the driver)	Correct the incorrect parameters.
140016	-	Change the interrupt number.
140017	-	Change the interrupt number.
140018	The consistency check was deactivated by Simotion Scout. Only one appropriate note appears.	Activate the consistency check with Simotion Scout again and load the configuration in the project once more.
140019	Simotion Scout loads a new project in the PLC. Connection to the PLC is interrupted.	Wait until the end of the reconfiguration.
140020	The version in the PLC and that in the configuration (FWD file) do not match. Connection to the PLC is interrupted.	Remedy: - Load the current version in the PLC using Simotion Scout. - Generate the anew project using ProTool CS, end ProTool RT and start with the new configuration.
150000	No more data is read or written. Possible causes: - The cable is defective. - The PLC does not respond, is defective, etc. - Connection is established via the wrong interface. - The system is overloaded.	Check that the cable is plugged in, the PLC is operational, the correct interface is used. Reboot the system if the system message is displayed continuously.

Number	Effect/Cause	Remedy
150001	Connection is re-established because the cause of the interruption has been eliminated.	-
160000	No more data is read or written. Possible causes: - The cable is defective. - The PLC does not respond, is defective, etc. - Connection is established via the wrong interface. - The system is overloaded.	Check that the cable is plugged in, the PLC is operational, the correct interface is used. Reboot the system if the system message is displayed continuously.
160001	Connection is re-established because the cause of the interruption has been eliminated.	-
160010	There is no connection to the server because the server identification (CLS-ID) cannot be established. Values cannot be read or written.	Check the access rights.
160011	There is no connection to the server because the server identification (CLS-ID) cannot be established. Values cannot be read or written.	Check, for example, whether: - the server name is correct - the computer name is correct - the server is registered
160012	There is no connection to the server because the server identification (CLS-ID) cannot be established. Values cannot be read or written.	Check, for example, whether: - the server name is correct - the computer name is correct - the server is registered Information for experienced 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 ProTool/Pro RT runtime software.	Configure the server as OutProc Server or Local Server.

Number	Effect/Cause	Remedy
160014	Only one OPC server project can be started on a PC/MP. An error message appears 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 from external sources.	Do not start a second project with OPC server functionality on the computer.
170000 ¹⁾	S7 diagnostics messages are not displayed because it is not possible to logon to the S7 diagnostics with this unit. The service program is not supported.	-
170001 ¹⁾	The S7 diagnostics buffer cannot be displayed because communication with the PLC has been switched off.	Switch the PLC online
170002 ¹⁾	The S7 diagnostics buffer cannot be displayed because reading in the diagnostics buffer (SZL) was terminated due to an error.	-
170003 ¹⁾	The display of an S7 diagnostics message is not possible. An internal error %2 has been reported.	-
170004 ¹⁾	The display of an S7 diagnostics message is not possible. An internal error with error class %2, error number %3 has been reported.	-
170007 ¹⁾	It is not possible to read in the S7 diagnostics buffer (SZL) because it was terminated with an internal error with error class %2 and error code %3.	-
¹⁾	The optional parameter %1 at the start of the message may contain an identification for the S7 connection when several S7s are in parallel operation and are connected to diagnostics equipment.	
180000	A component/OCX receives configuration data with a version identification which is not supported.	Install a newer component.

Number	Effect/Cause	Remedy
180001	The system is overloaded because too many actions have been activated simultaneously. Not all the actions can be executed, some are rejected.	Remedy: - Increase the configured cycle times or basic clock. - Generate the messages slower (polling). - Trigger the scripts and functions at greater intervals. - If the message appears more frequently: Restart the operating unit.
180002	The screen keyboard could not be activated. Possible causes: - The screen keyboard is not generally supported under Windows 95. - The file "TouchInputPC.exe" was not registered due to an incorrectly executed Setup.	If Windows 95 is not available: Install the runtime software again.
190000	It is possible that the tag will not be updated.	-
190001	The tag is updated following an error status after the cause of the last error state has been eliminated (return to normal operation).	-
190002	The tag is not updated because communication to the PLC has been switched off.	Switch on communication via the function "Set Online".
190004	The tag is not updated because the configured address is not available for this tag.	Check the configuration.
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 tag type.	Check the configuration.
190007	The tag values are not modified because the connection to the PLC has been terminated or the tag is offline.	Switch Online or re-establish connection to the PLC.

Number	Effect/Cause	Remedy
190008	The threshold values configured for the tag have been violated, e.g. by - an entered value, - a function, - a script.	Observe the configured or current threshold value of the tag.
190009	An attempt has been made to assign a value to a tag which is outside the value range permitted for this type. E.g. a value of 260 entered for a byte tag or a value of -3 for a signless word tag.	Observe the value range for the tag type.
190010	The tag is described with values too often (e.g. in a loop triggered by a script). Values are lost because the maximum of 100 event have been stored in the buffer.	Increase the time interval between the multi-writing tasks.
190011	Possible causes: - The value entered could not be written to the configured PLC tag because it was either above or below the value range. - The input is rejected and the original value is reset.	Ensure that the value entered is within the value range of the PLC tags.
190011	Possible causes: - Connection to the PLC has been interrupted.	Check the connection to the PLC.
190012	It is not possible to convert a value from a source format to a target format, e.g.: - A value should be assigned to a counter which is outside the valid, PLC-dependent value range. - A tag of the type Integer should be assigned a value of the type String.	Check the value range or type of the variable.

Number	Effect/Cause	Remedy
190100	The area pointer is not updated because the configured address for this area pointer is not available. Type: 1 Event messages 2 Alarm messages 3 PLC acknowledgment 4 Operating unit acknowledgment 5 LED assignment 6 Trend request 7 Trend transfer 1 8 Trend transfer 2 No.: is the consecutive number displayed in ProTool/Pro.	Check the configuration.
190101	The area pointer is not updated because it is not possible to map the PLC type in the area pointer type. Parameter type and no.: See message 190100	-
190102	The area pointer is updated following an error status after the cause of the last error state has been eliminated (return to normal operation). Parameter type and no.: See message 190100	-
200000	Coordination is not executed 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.
200001	Coordination is not executed because the address configured in the PLC cannot be written.	Change the address or set up the address in the PLC in an area which can be written.
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 status has been eliminated (return to normal operation).	-
200004	It is possible that coordination is not executed.	-
200005	No more data is read or written. Possible causes: - The cable is defective. - The PLC does not respond, is defective, etc. - The system is overloaded.	Check that the cable is connected and the PLC is in order. Reboot the system if the system message is displayed continuously.

Number	Effect/Cause	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 the address configured in the PLC cannot be written to/read from.	Change the address or set up the address in the PLC in an area which can be written to/read from.
210002	Commands are not executed because the address format of the area pointer does not match the internal storage format.	Internal error
210003	The job mailbox is processed again because the last error status has been eliminated (return to normal operation).	-
210004	It is possible that the job mailbox is not processed.	-
210005	A PLC job was triggered by an impermissible number.	Check the PLC program.
210006	A fault occurred while attempting to execute the PLC job. The PLC job is, therefore, not executed. Observe the subsequent/previous system message, if appropriate.	Check the parameter types in the PLC job. Compile the configuration again.
220000 ²⁾	-	-
²⁾	A WinCC channel provides the message texts via an interface. This text is issued via this message. ProTool/Pro RT has no influence on this texts.	
220001	The tag is not downloaded because the associated channel/the unit does not support downloading the data type bool/bit.	Change the configuration.
220002	The tag is not downloaded because the associated channel/the unit does not support downloading the data type byte.	Change the configuration.
220003	The associated driver could not be uploaded. It is possible that the driver is not installed.	Install the driver by re-installing ProTool/Pro RT.
220004	Communication is terminated and no update is executed because the cable is not connected or is defect etc.	Check the connection.
220005	Communication is running.	-
220006	The connection is established to the specified PLC at the specified interface.	-

Number	Effect/Cause	Remedy
220007	The connection to the specified PLC at the specified interface is disconnected.	Check that: <ul style="list-style-type: none"> - the cable is plugged in - the PLC is OK - the correct interface is used - the configuration is OK (interface parameters, protocol settings, PLC address). Reboot the system if the system message is displayed continuously.
220008	The PLC driver cannot access the specified interface or open it. It is possible that another application is using this interface or an interface is used which is not available on the target device. There is no communication with the PLC.	Terminate all the programs which access the interface and reboot the computer. Use another interface which is available in the system.
230000	The value entered could not be accepted. The entered value is rejected and the previous value is specified again. Either the value range has been exceeded or impermissible characters were entered.	Enter a permissible value.
230002	Since the current password level is inadequate or the password dialog box was closed with ESC, the entry is rejected and the previous value is specified again.	Activate an adequate password level using Login.
230003	Changeover to the specified screen is not executed because the screen is not available/configured. The current screen remains selected.	Configure the screen. Check the selection function.
240000 ³⁾	Runtime is operating in Demo mode. There is either no Stopcopy license or it is defect.	Load the license.
240001 ³⁾	Runtime is operating in Demo mode. Too many tags are configured for the installed version.	Load an adequate license / powerpack.
240002 ³⁾	Runtime is operating with a time-limited standby authorization.	Restore the full authorization.
³⁾	The specified text comes from the component resources.	

Number	Effect/Cause	Remedy
240003	Authorization cannot be executed. ProTool/Pro RT is running in Demo mode.	Restart ProTool/Pro RT or reinstall it.
240004	Error during reading the standby authorization. ProTool/Pro RT is running in Demo mode.	Restart ProTool/Pro RT, install the authorization or repair the authorization (see Commissioning Instructions Software Protection).
250000	The tag in the specified line in Status/Control is not updated because the address configured for this tag is not available.	Check the set address and then check that the address has been set up in the PLC.
250001	The tag in the specified line in Status/Control is not updated because the PLC type configured for this tag is not available.	Check the set address.
250002	The tag in the specified line in Status/Control is not updated because it is not possible to map the PLC type in the tag type.	Check the set address.
250003	No connection could be established to the PLC. The tags will not be updated.	Check the connection to the PLC. Check that the PLC is switched on and online is activated.
260000	A password has been entered which is unknown to the system. Therefore, the lowest password level has been set. This corresponds to the status following Logout.	Enter a known password in the password input field (with corresponding level).
260001	A password has been entered whose assigned level does not permit execution of the function. The password level currently set is displayed for information purposes.	Modify the password level in the password input field enter a password with a sufficiently high level.
260003	The user has logged off from the system. If the password level is 0, no user is logged on.	-
270000	A tag is not displayed in the message 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 or the value range for the tag is correct.

Number	Effect/Cause	Remedy
270001	<p>There is a unit-dependent limit as to how many messages may be queued simultaneously in order to be displayed (see GHB). This limit has been exceeded.</p> <p>The display no longer contains all the messages.</p> <p>However, all the messages are recorded in the message buffer.</p>	-
270002	<p>Messages are displayed from an archive are displayed for which there is no data in the current project.</p> <p>Placeholders are issued for the messages.</p>	Delete older archive files, if necessary.
270003	<p>The service cannot be set up because too many devices was to set up this service.</p> <p>A maximum of four devices can execute this action.</p>	Connect fewer operating units which want to use the service.
280000	<p>Connection is re-established because the cause of the interruption has been eliminated.</p>	-
280001	<p>No more data is read or written.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> - The cable is defective. - The PLC does not respond, is defective, etc. - Connection is established via the wrong interface. - The system is overloaded. 	<p>Check that the cable is plugged in, the PLC is operational, the correct interface is used.</p> <p>Reboot the system if the system message is displayed continuously.</p>
280002	<p>A connection is used which requires a function module in the PLC.</p> <p>The function block has replied.</p> <p>Communication can now proceed.</p>	-

Number	Effect/Cause	Remedy
280003	A connection is used which requires a function module in the PLC. The function block does not reply.	Check that the cable is plugged in, the PLC is operational, the correct interface is used. Reboot the system if the system message is displayed continuously. The remedy is dependent on the error code: 1: The function block must set the COM bit in the response container. 2: The function block may not set the ERROR bit in the response container 3: The function block must respond within the specified time (timeout) 4: Establish an online connection to the PLC
280004	The online connection to the PLC has been interrupted. There is no data exchange at present.	Check the PLC parameters in ProTool Pro: baud rate, block length, station address. Check that the cable is plugged in, the PLC is operational, the correct interface is used. Reboot the system if the system message is displayed continuously.
290000	The tag could not be read or written. It is assigned the start value. The message can be entered in the message buffer for up to four more failed tags, if necessary. After that, the message number 290003 is issued.	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 tag which is outside the value range permitted for this type. The message can be entered in the message buffer for up to four more failed tags, if necessary. After that, the message number 290004 is issued.	Observe the value range for the tag type.

Number	Effect/Cause	Remedy
290002	It is not possible to convert a value from a source format to a target format. The message can be entered in the message buffer for up to four more failed tags, if necessary. After that, the message number 290005 is issued.	Check the value range or type of the variable.
290003	This message is issued when message number 290000 is triggered more than five times. In this case, no further individual messages are generated.	Check in the configuration that the tag addresses have been set up in the PLC.
290004	This message is issued when message number 290001 is triggered more than five times. In this case, no further individual messages are generated.	Observe the value range for the tag type.
290005	This message is issued when message number 290002 is triggered more than five times. In this case, no further individual messages are generated.	Check the value range or type of the variable.
290006	The threshold values configured for the tag have been violated by values entered.	Observe the configured or current threshold value 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 record tag which is not available in the source structure. The data record tag specified is assigned its start value.	Insert the specified data record 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 record tag which is not available in the target structure and therefore cannot be assigned. The value is rejected.	Remove the specified data record tag in the specified recipe from the project.
290010	The storage location configured for the recipe is not permitted. Possible causes: Impermissible characters, write protected, data medium full or does not exist.	Check the path specification configured.
290011	The data record specified by the number does not exist.	Check the source for the number (constant or variable value).

Number	Effect/Cause	Remedy
290012	The recipe specified by the number does not exist.	Check the source for the number (constant or variable value).
290013	An attempt was made to save a data record under a data record number which already exists. The process is not executed.	Remedy: - Check the source for the number (constant or variable value). - Delete the data record beforehand. - Change the function parameter "Overwrite".
290014	The file specified to be imported could not be found.	Check that: - Check the file name. - Ensure that the file is in the specified directory.
290020	Acknowledgement that downloading of data records from operating unit to PLC has started.	-
290021	Acknowledgement that downloading of data records from operating unit to PLC has been completed without any errors.	-
290022	Acknowledgement that downloading of data records from operating unit to PLC has been terminated due to an error.	Check the configuration: - have the tag addresses been set up in the PLC? - does the recipe number exist? - does the data record number exist? - has the function parameters "Overwrite"?
290023	Acknowledgement that downloading of data records from the PLC to the operating unit has started.	-
290024	Acknowledgement that downloading data records from the PLC to the operating unit has been completed without any errors.	-

Number	Effect/Cause	Remedy
290025	Acknowledgement that downloading of data records from the PLC to the operating unit has been terminated due to an error.	Check the configuration: - have the tag addresses been set up in the PLC? - does the recipe number exist? - does the data record number exist? - has the function parameters "Overwrite"?
290026	An attempt has been made to read/write a data record although the data mailbox is not free at present. This error may occur in the case of recipes for which downloading with synchronization has been configured.	Set the data mailbox status to zero.
290027	No connection to the PLC can be established at present. Therefore, the data 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 message is issued after reselecting a screen that contains a recipe display in which a data record has already been selected.	Reload the data record from the data medium or retain the current values.
290031	While saving, it was detected that a data record with the specified number already exists.	Overwrite the data record or cancel the process.
290032	While exporting data records, it was detected that a file with the specified name already exists.	Overwrite the file cancel the process.
290033	Confirmation request before deleting data records.	-

Number	Effect/Cause	Remedy
290040	A data record error with error code %1 has occurred which cannot be described in more detail. The action was canceled. It might be that the data mailbox has not been installed correctly on the PLC.	Check that the data carrier, the data record, the data mailbox and, if necessary, the connection to the PLC. Trigger the action again after waiting a short period. If the error occurs again, please contact the Customer Support. Specify the error code displayed.
290041	A data record or file cannot be saved because the data medium 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 data records.	-
290044	The data store for the recipe has been destroyed and will be deleted.	-
290050	Acknowledgement that the exportation of data records has started.	-
290051	Acknowledgement that the exportation of data records has been completed successfully.	-
290052	Acknowledgement that the exportation of data records has been terminated due to errors.	Ensure that the structure of the data records on the data medium and the current recipe structure on the operating unit are identical.
290053	Acknowledgement that the importation of data records has been started.	-
290054	Acknowledgement that the importation of data records has been completed successfully.	-
290055	Acknowledgement that the importation of data records has been terminated due to errors.	Ensure that the structure of the data records on the data medium and the current recipe structure on the operating unit are identical.

Number	Effect/Cause	Remedy
290056	The value in the specified line/column could not be read/written without errors. The action was canceled.	Check the specified line/column.
290057	The tags of the recipe specified have been switched from operating mode "offline" to "online". Each modification of a tag in this recipe is now immediately transferred to the PLC.	-
290058	The tags of the recipe specified were switched from operating mode "online" to "offline". Modifications to tags in this recipe are no longer immediately transferred to the PLC but must be transferred there explicitly by means of downloading a data record, if necessary.	-
290059	Acknowledgement that the specified data record has been stored successfully.	-
290060	Check-back message that the data record memory has been successfully erased.	-
290061	Check-back message, that erasing the data record memory was aborted with errors.	-
290068	Request to confirm whether all data records in the recipe should be deleted.	-
290069	Request to confirm whether all data records of all recipes should be deleted.	-
290070	The data record specified is not contained in the import file.	Check the source of the data record number or data record name (constant or tag value).
300000	Process monitoring (e.g. using PDiag or S7-Graph) has been incorrectly programmed: More messages are queued than specified in the technical data of the CPU. No further ALARM_S messages can be managed by the CPU and reported to operating systems.	Change the CPU configuration.
310000	An attempt is being made to print too many protocols simultaneously. Since only one protocol can be printed at a time, the print job is rejected.	Wait until printout of the last active protocol has been concluded. Repeat the print job, if necessary.

Number	Effect/Cause	Remedy
310001	An error occurred on triggering the printer. The protocol is either not printed or printed with errors.	Evaluate the additional system message, related to this message, which is also issued. Repeat the print job, if necessary.
320000	The movements have already been indicated by another device. The movements can no longer be served.	Select the movements on the other display units and select the movement screen on the required display unit.
320001	The network is too complex. The defective operands cannot be displayed.	Display the network in AWL.
320002	No diagnostics-capable alarm messages have been selected. The units related to the alarm messages could not be selected.	Select a diagnostics-capable alarm message in the message screen ZP_ALARM.
320003	No alarm messages exist in respect of the selected unit. No network can be displayed in the detail display.	Select the defective unit in the general view screen.
320004	The required signal statuses could not be read by the PLC. The defective operands cannot be established.	Check the consistency between the configuration on the display unit and the PLC program loaded.
320005	The project contains ProAgent partitions which are not installed. No ProAgent diagnostics can be performed.	In order to run the project, install the ProAgent option packet.
320014	The selected PLC cannot be evaluated for ProAgent. The message display configured with the Evaluate_message_display_fault function could not be found.	Check the parameters of the Evaluate_message_display_fault function.

B Standard screens reference

Screens in standard projects

The standard projects supplied with ProTool contain various screens that have already been configured; these are called standard screens. The names of the screens all start with the character "Z_". You can use standard screens in your projects without changing them or you can customize them to suit your requirements.

The following table shows the applications implemented in the different standard screens.

Note

Many of the screens and functions listed below are not available for all operating units.

Screen Name	Usage	Constraints
Z_SYSTEM_MEN	Basic standard screen. You can jump from this screen to other standard screens.	
Z_MESS_EVENT	Event messages: View Print Display number Delete buffer Overflow warning ON/OFF Display text	Not OP 3 or C7-621
Z_MESS_ALARM	Alarm messages: View Print Display number Delete buffer Overflow warning ON/OFF Display text	Not OP 3 or C7-621
Z_SETTINGS	System settings: Mode change Display first/last alarm message Display system message buffer Language Set date and time Printer parameters Interface parameters	Display first/last alarm message: not OP 3 or C7-621
Z_SCREEN	Screens: Edit Print	Print: not OP 3 or C7-621

Screen Name	Usage	Constraints
Z_PASSWORD	Password: Login Logout Edit	Login: not OP 3 or C7-621
Z_RECORD	Data records: Edit Print Transfer	Not OP 3 or C7-621
Z_COUNTER	Counter setpoints/actual values for S7-CPU314 or S7-CPU214: Set Display	OP 3 and C7-621 only
Z_TIMER	Integrated timer: Set Display	OP 3 and C7-621 only

C Communication areas for non-SIMATIC PLCs

Overview

This description applies to communication with the following PLCs:

- Allen-Bradley
- Mitsubishi
- Modicon
- Omron
- Telemecanique

The data areas for the SIMATIC PLCs are described in the "Communication User's Manual".

The operating unit and the PLC communicate with each other via these data areas:

- Interface area (refer to "Structure of the interface area")
- Keyboard assignment (refer to "Keyboard assignment of the operating unit")
- LED assignment (refer to "LED assignment of the operating unit")

The data areas are only required if you want to use the corresponding functions on your operating unit. Create the required data areas on the PLC, and enter them as area pointers in your project, in the project window, at "Area pointers".

The table provides you with an overview of which user areas are in principle possible with which operating unit.

Device-specific user data areas:

User data area	Operating Unit
Event messages	TD 17, OP 3, OP 5, OP 7, OP 15, OP 17
Alarm messages	OP 5, OP 7, OP 15, OP 17
PLC jobs	TD 17, OP 5, OP 7, OP 15, OP 17
Recipes	OP 5, OP 7, OP 15, OP 17
System keyboard assignment	TD 17, OP 3, OP 5, OP 7, OP 15, OP 17
Function keyboard assignment	OP 5, OP 7, OP 15, OP 17
LED assignment	OP 3, OP 5, OP 7, OP 15, OP 17
Scheduler	OP 15, OP 17
Date and time	TD 17, OP 3, OP 5, OP 7, OP 15, OP 17
User version	TD 17, OP 3, OP 5, OP 7, OP 15, OP 17
Screen number	OP 3, OP 5, OP 7, OP 15, OP 17
User version	TD 17, OP 3, OP 5, OP 7, OP 15, OP 17

Structure of the interface area for non-SIMATIC PLCs

Use of the interface area

The interface area is required when you use the functions for the following:

- Sending PLC jobs to the operating unit
- Comparing the date and time between the PLC and the operating unit
- Checking the version number
- Editing recipes (downloading data records)
- Detecting the startup of the operating unit in the PLC program
- Determining the operating mode of the operating unit in the PLC program
- Determining the life bit of the operating unit in the PLC program

Setting up the interface area

Set the interface area in the project window at "Area pointers". The area must also exist on the PLC. The figure below shows the structure of the interface area.

Data word	
n+0	Control bits
n+1	reserved
n+2	Job mailbox
n+5	
n+6	Acknowledgment bits
n+7	reserved
n+8	Version number
n+9	Time
n+11	
n+12	Date
n+14	
n+15	reserved
n+25	

Structure of the interface area in data words

Note

You will find a description of the interface area for SIMATIC PLCs in the "Communication User's Manual".

Control and acknowledgement bits for non-SIMATIC PLCs

Count direction of the bits

The count direction of the bits in a data word depends on the PLC. Each data word is shown below in two figures. In the explanation of the bits, the bit number is represented as follows depending on the count direction:

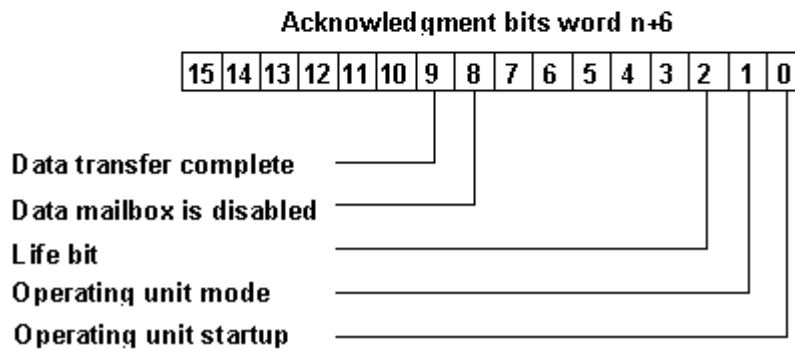
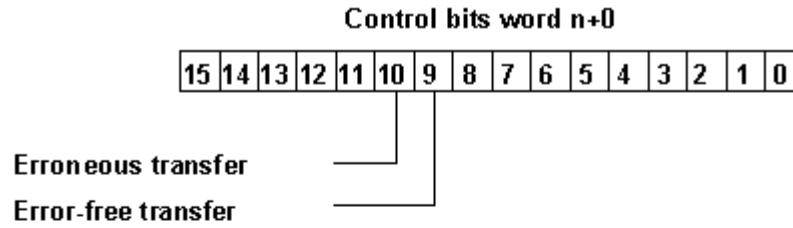
- From right to left (right > left), beginning with 0: without bracket
- From left to right (left > right), beginning with 1: with bracket

Structure of the control and acknowledgement bits

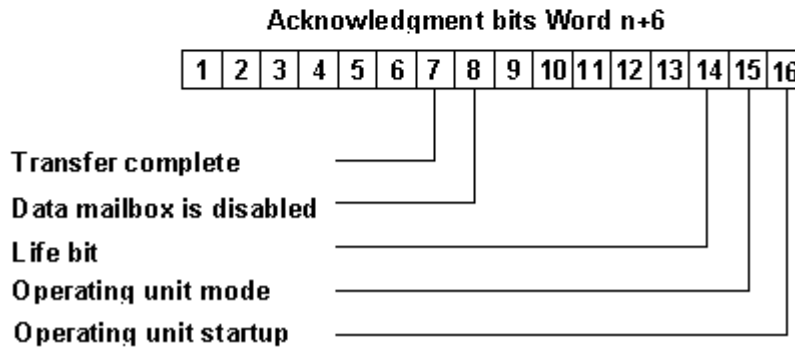
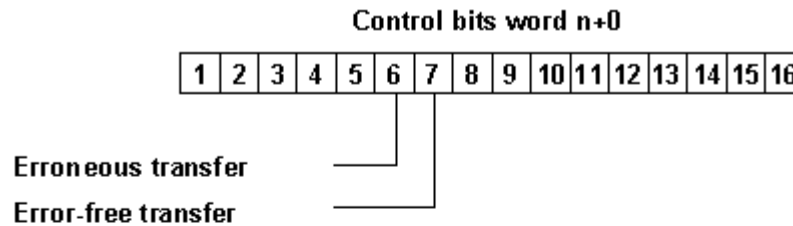
One word each is available in the interface area for the control and acknowledgement bits:

- "Word n+0"
Contains the control bits. These are written by the PLC and read by the operating unit.
- "Word n+6"
Contains the acknowledgement bits. These are written by the operating unit and read by the PLC.

The figures below show in detail the structure of the control and acknowledgement bits for different count directions.



Control and acknowledgement bits for the count direction right > left



Control and acknowledgement bits for the count direction left > right

Operating unit startup

"Bit 0 (16) in acknowledgement bits":

1 = Operating unit has started up

0 = Operating unit is starting up

The bit is set by the operating unit on completion of startup.

Operating unit operating mode

"Bit 1 (15) in acknowledgement bits":

1 = operating unit is offline

0 = operating unit is in normal mode

The bit is set if the operating unit is switched offline by the operator. When the operating unit is online, the bit is at 0.

Life bit

"Bit 2 (14) in acknowledgement bits":

The purpose of the life bit is to detect any interruption of the connection from the operating unit to the PLC immediately. The operating unit inverts the life bit in the interface area at regular intervals.

Synchronizing the download of data records

- Control bits:

"Bit 10 (6)"

1 = Data record/tag has an error

0 = No evaluation has taken place

"Bit 9 (7)"

1 = Data record/tag is error-free

0 = No evaluation has taken place

- Acknowledgement bits:

"Bit 9 (7)"

1 = Data transfer completed

0 = No evaluation has taken place

"Bit 8 (8)"

1 = Data mailbox is inhibited

0 = Data mailbox is free

The control and acknowledgement bits in the interface area synchronize the transfer of data records. By default the transfer is initiated by the operator at the operating unit.

Download from the operating unit to the PLC

The sequence described below indicates how the operating unit sets the synchronization bits and how the PLC program must respond to it.

1. The operating unit checks bit 8 (8) of the acknowledgement bits.
If the bit is set to 1 (data mailbox inhibited), the transfer is terminated with a system error message. If the bit is set to 0 (data mailbox free), the operating unit sets the bit to 1.
2. The operating unit enters the identifiers in the data mailbox.
3. In the case of a data record to be transferred "indirectly" (not with text-based displays), the values of the tags are written to the data mailbox.

In the case of a data record to be transferred "directly", the tag values are written to the configured address.

4. The operating unit sets bit 9 (7) of the acknowledgement bits to 1 (data transfer terminated).
5. Acknowledge in the PLC program whether or not the transfer was error-free:
Error-free: control bit 9 (7) is set to 1
Failed: control bit 10 (6) is set to 1
6. The operating unit resets bits 9 (7) and 8 (8) of the acknowledgement bits.
7. Reset control bits 10 (6) and 9 (7) in the control program.

Note

You will find a description of the control and acknowledgement bits for SIMATIC PLCs in the "Communication User's Manual".

Data areas in the interface area for non-SIMATIC PLCs

Overview

The PLC triggers an action on the operating unit via the job mailbox. All the other bytes are areas to which the operating unit writes data. These areas can be evaluated by the PLC program.

Job mailbox

Word n+2 to n+5:

You can transfer PLC jobs to the operating unit via the job mailbox and thus trigger actions on the operating unit.

The job mailbox consists of four words. The job number is in the first word of the job mailbox. The job parameters (up to 3) are entered in the subsequent words.

The figure below shows the structure of the job mailbox.

Data word	
n + 2	Job No.
	Parameter 1
	Parameter 2
n + 5	Parameter 3

Structure of the job mailbox

If the first word of the job mailbox is not equal to zero, the operating unit evaluates the PLC job. The operating unit then sets this data word to zero again. For this reason the parameters must be entered in the job mailbox first, followed by the job number.

You will find a list of all possible PLC jobs with job numbers and parameters in "PLC jobs in alphabetical order" and "PLC jobs in numerical order".

Version number

Word n+8:

The operating unit enters the version number of the driver in word n+8. You can evaluate the version number in the PLC program.

Date and time

Time: Word n+9 to n+11

Date: Word n+12 to n+14

PLC job 41 allows you to initiate the transfer of the date and time from the operating unit to the PLC.

The figure below shows the structure of the data area. All the information is BCD-encoded.

Data word	Left byte	Right byte	
n + 9	not assigned	Hour (0..23)	} Time
n + 10	Minute (0..59)	Second (0..59)	
n + 11	not assigned		
n + 12	not assigned	Day of week (1..7)	} Date
n + 13	Day (1..31)	Month (1..12)	
n + 14	Year (0..99)	not assigned	

Structure of the "time" and "date" data areas

Note

You will find a description of the interface area for SIMATIC PLCs in the "Communication User's Manual".

In order to be able to verify that the date and time have been transferred, you should set the data words to 0 before sending off the PLC job.

Keyboard assignment of the operating unit for non-SIMATIC PLCs

Usage and prerequisite

Keystrokes executed on the operating unit can be transferred to and evaluated by the PLC. This means, for example, that you can issue a message to notify the operator of incorrect usage of a key.

In order to be able to do this, you must set up corresponding data areas known as assignments in the PLC and specify them as "area pointers" during configuration.

Download

The keyboard assignments are downloaded spontaneously to the PLC. The download takes place whenever a change is registered on the operating unit. It is therefore not necessary to configure a polling time. Only one depressed key is transferred.

The following applies to the keys of the operating unit (except to `SHIFT`):
For as long as the key is held down, the value of the relevant bit in the keyboard assignment is 1. Otherwise, its value is 0.

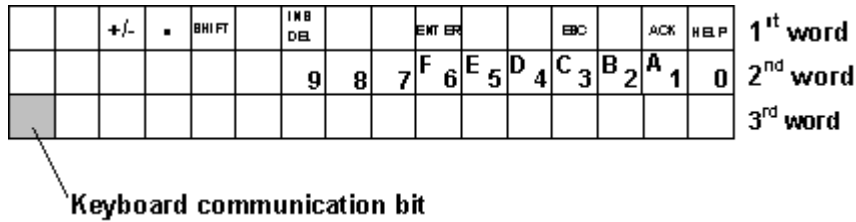
Note

If the operating unit is switched off or disconnected from the PLC with a key held down, the corresponding bit in the keyboard assignment remains set.

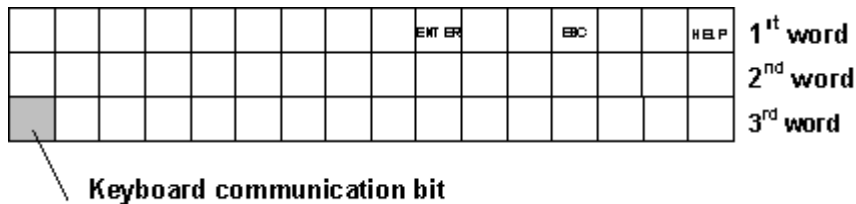
System keyboard assignment

The system keyboard assignment is a data area with a fixed length of three data words. In order to be able to use the system keyboard assignment, you must set up a data area of the type "system keyboard" in your project at "Area Pointers".

Precisely one bit in the system keyboard assignment is assigned to each key on the system keyboard on a fixed basis. The figures below show the keyboard assignments for the OP 7/OP 17 and TD 17.



Keyboard assignment for the OP 7/OP 17



Keyboard assignment for the TD 17

Note

Unused bits cannot be overwritten by the user program.

Keyboard communication bit

The keyboard communication bit is a control bit. Each time the keyboard assignment is transferred from the operating unit to the PLC, it is set to 1 and should be reset by the user program after evaluation of the data area.

Regular reading of the communication bit makes it possible in the user program to establish whether the assignment of the system keyboard has been transferred again.

Function keyboard assignment

The assignment of the function keyboard can be subdivided into up to 4 separate data areas. The total length of these data areas must not exceed 4 data words. In order to be able to use the function keyboard assignment, you must set up a data area of the type "function keyboard" in your project at "Area Pointers".

Key assignment

Set the assignment of the individual keys to the bits of the data areas when you "configure the function keys". For each key you specify the number in the assignment area.

Keyboard communication bit

The highest bit in the last data word of "each" data area is the keyboard communication bit. This is a control bit. Each time the keyboard assignment is downloaded from the operating unit to the PLC, the keyboard communication bit is set to 1. After the data area has been evaluated by the user program, the keyboard communication bit should be reset.

Regular reading of the communication bit makes it possible in the user program to establish whether a block has been downloaded again.

Note

You will find a description of the keyboard assignment for SIMATIC PLCs in the "Communication User's Manual".

LED assignment of the operating unit for non-SIMATIC PLCs

Usage

The light-emitting diodes (LEDs) on the function keys of the operating unit can be driven on the PLC. This makes it possible, for example, for a key LED to show the operator which key to press in a particular situation.

Data areas

The LED assignment can be subdivided into up to 4 separate data areas. The total length of these data areas must not exceed 9 data words. In order to be able to use the LED assignment, you must set up a data area of the type "LED assignment" in your project at "Area Pointers".

Polling time

If you specify a polling time of 0 for a data area, this is not downloaded cyclically to the operating unit. You must then use PLC job No. 42 to drive the LEDs.

LED assignment

Set the assignment of the individual LEDs to the bits of the data areas when you "configure the function keys". For each LED you specify the number of the assignment area and the bit number in this area.

Bit number n in the following tables designates the first of two successive bits that control a total of four different LED states.

Bit $n + 1$	Bit n	LED function
0	0	Off
0	1	Flashing at approx. 2 Hz
1	0	Flashing at approx. 0.5 Hz
1	1	On continuously

LED function for the right > left count direction

Bit n + 1	Bit n	LED function
0	0	Off
0	1	Flashing at approx. 0.5 Hz
1	0	Flashing at approx. 2 Hz
1	1	On continuously

LED function for the left > right count direction

The OP 17 has two-color LEDs integrated in the K keys. This results in the following LED functions:

Bit n + 1	Bit n	LED function
0	0	Off
0	1	Flashing red
1	0	Continuous red light
1	1	Continuous green light

LED function for the right > left count direction

Bit n + 1	Bit n	LED function
0	0	Off
0	1	Continuous red light
1	0	Flashing red
1	1	Continuous green light

LED function for the left > right count direction

Note

You will find a description of the LED assignment for SIMATIC PLCs in the "Communication User's Guide".

D Abbreviations

Overview

The meanings of the abbreviations used in this documentation are as follows:

ANSI	American National Standards Institute
AS 511	Protocol of the PU interface on the SIMATIC S5
ASCII	American Standard Code for Information Interchange
CPU	Central Processing Unit
DP	Distributed I/O
FM	Function module
HMI	Human Machine Interface
LED	Light-emitting diode
MPI	Multipoint Interface (SIMATIC S7)
OP	Operator panel
PC	Personal Computer
PU	Programming unit
RAM	Random access memory: memory with random access (working memory)
PLC	Programmable logic control
TD	Text-based display

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