SIEMENS

SIMATIC

Process Control System PCS 7 SIMATIC Route Control (V8.2)

Programming and Operating Manual

02/2016

A5E36414429-AA

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A5E36414429-AA
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1 Welcome

SIMATIC Route Control

Welcome to SIMATIC Route Control.

2 Preface

Purpose of this Documentation

This documentation provides a comprehensive overview of programming with SIMATIC Route Control. The documentation will help you to install and commission the software. Procedures for program creation, user-program setup and the individual language elements are presented.

The *SIMATIC Route Control* documentation is intended for the following people:

- Programmers
- Persons involved in project engineering, commissioning and servicing automation systems

We recommend that you familiarize yourself with the examples in the "Guide to Configuration" section.

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

Required Basic Knowledge

The following knowledge is required in order to understand this documentation:

- Basic knowledge of automation engineering
- Knowledge of how to use computers or PC-like equipment (such as programming devices) in the Windows 2003, Windows XP, Windows 7 or Windows Server 2008 operating systems.
- Experience with the STEP 7/PCS 7 basic software
  This topic is covered in the *Programming with STEP 7/PCS 7* manual.

Validity of the Documentation

This documentation is valid for the SIMATIC Route Control V8.2 software package.

Changes Compared with the Previous Version

You can find additional information about this in:

What's New in SIMATIC Route Control V8.2? (Page 23)

3 What's New in SIMATIC Route Control V8.2?

Below, you will find information on new and/or enhanced features of SIMATIC Route Control V8.2 as compared to the previous version 8.1.

Route Control software

- Saved routes can be used even after redundancy failover of the RC server
- Routes can now also be saved and saved routes can be started from the faceplates
- Dialogs in the RC Center have been improved
- The wizard processes long comments from the HW configuration
- The wizard can work with identical AS names in different projects
- The sort order of elements in partial routes is re-created when the element interface block is deleted.
- External parameter elements (in deactivation sequences) no longer display an error message after deactivation
- The response of routes in the event of element errors (and thus route errors) has been changed to the effect that an acknowledgment of the error – when element errors are still pending – does not enable a transition to Run

Route Control help / documentation

The help has been expanded to include information on messages, inversion of activation/ deactivation sequences, use of Wait elements, APL/Classic style block icons and import/export.

In addition, some navigational links of the help (with F1) have been added or directed to different help texts.

Additional information

Information on the previous versions can be found in the

section "What's new in earlier versions? (Page 559)"

Product Introduction 4

4.1 What is SIMATIC Route Control?

Definition

SIMATIC Route Control is a SIMATIC PCS 7 programming package for automated transport of materials in process cells.

Basic mode of operation

You request a material transport during runtime by specifying the source and destination locations. You can also define up to 10 intermediate locations for routing.
Route Control searches for a route through the route network, which is made up of partial routes, and controls material transport by opening valves and activating pumps, for example.

Range of Functions

SIMATIC Route Control encompasses both the configuration and the runtime system and provides many interfaces to the PCS 7 basic system and to user programs.

Route Control can provide everything from simple transport processes to a large number of complex route combinations, depending on the process cell design.

SIMATIC Route Control is primarily a tool for simplifying and standardizing the following tasks:

- Project configuration
- Processing during runtime
- Diagnosing material transports (routes)

Configuration Features

The following features characterize SIMATIC Route Control configuration:

- Simple configuration and interconnection of process-related elements in CFC
- Wizard-assisted configuration of the cross-coupling among the automation systems relevant for SIMATIC Route Control
- Wizard-assisted configuration of parameters for the connection between Route Control automation systems and Route Control Servers
- Transfer of configuration data from the S7 project to Route Control Engineering
- Insertion of elements in partial routes per drag-and-drop operation
- Efficient configuration using external tools, such as Microsoft Excel, with a simple interface in the form of CSV files

Runtime System Features

The following features characterize the SIMATIC Route Control runtime system:

- Activation of transports in up to 32 levels
- Automatic route search, combination of partial routes and the elements they contain
- Control and monitoring of routes and associated elements
- Diagnosis of routes and elements, including messages related to a route
- Redundant configuration of the Route Control Server possible for high availability
- Redundant configuration of Route Control automation systems possible

Note

SIMATIC Route Control is a system for use in controlling material transports. It is not designed for the automation of packaging sectors or package tracking (tracing packages / recording). Do not confuse this with material tracking. A material tracing and tracking system is not part of Route Control. However, Route Control returns information about the specific material assigned to a specific partial route or route.

Security

Route Control V7.0 SP1 or higher now handles tasks such as moving or copying files to other computers by means of an integrated communication and copy service. All of these data are transferred by way of SIMATIC Communication Service (SCS). This process does not require any open ports.

Languages

SIMATIC Route Control as of V7.0 SP1 supports the following operating languages:

- German
- English
- French
- Italian
- Spanish
- Chinese
- Japanese

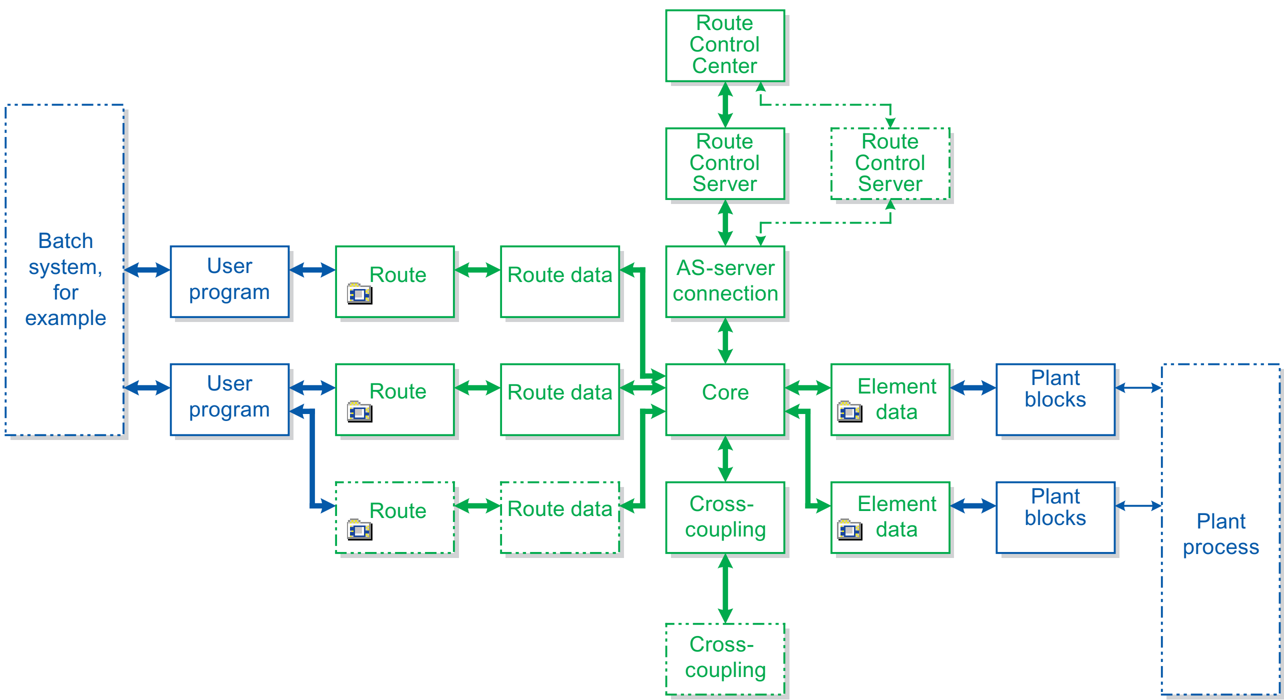
The documentation is available in the following languages:

- German
- English
- French
- Chinese

4.2 SIMATIC Route Control overview

SIMATIC Route Control overview

The figure below provides you with an overview of the tasks of the SIMATIC Route Control components.



xxx	No Route Control objects
xxx	Route Control objects
	Route Control interface blocks

4.3 Route Control Components

4.3.1 Component Overview

Overview

SIMATIC Route Control comprises the following components:

- "Route Control library" (Page 28) with interface blocks for interconnection with user blocks and process blocks
- "Route Control Wizard" (Page 29) for exporting configuration data from the S7 project and importing these data to Route Control Engineering
- "Route Control Engineering" (Page 29) for creating and managing any number of partial routes with elements
- "Route Control Server" (Page 30) for finding routes and which acts as an interface between the Route Control Center and/or PCS 7 OS and the automation systems
- "Route Control Center" (Page 30) for the control and detailed diagnosis of the route and its elements
- "Route Control Route Log" (Page 31) for saving and evaluating information relating to material transports
- "Route Control Operator Dialog" (Page 31) for the operator control and monitoring of a route
- "PCS 7 OS Web Option" (Page 32) for the operator control and monitoring of routes via Intranet/Internet

4.3.2 Route Control library

Route Control library

The Route Control library contains a number of function blocks and data blocks for operating the route controller and linking external blocks:

- Route Control interface blocks for routes
- Route Control interface blocks for elements
- Route Control interface blocks for the configuration
- Route Control interface blocks for diagnosing the cross-coupling
- Route Control kernel blocks for route execution
- Route Control kernel blocks for processing elements
- Route Control kernel blocks for the AS-server connection
- Route Control kernel blocks for the AS-AS connection

Additional information

A list and description of all blocks can be found in the following sections:

- "Interface Block Overview" (Page 100)
- "Overview of REMOTE Blocks" (Page 183)
- "Overview of Cross-Coupling Blocks" (Page 172)
- "Overview of Kernel Blocks" (Page 198)

4.3.3 Route Control Wizard

Route Control Wizard

The Route Control Wizard assists you in performing the configuration steps below for Route Control and the associated S7 project:

- Assigning unique element and route IDs, with a plausibility check
- Creating and checking the consistency of S7 connections for Route Control automation systems
- Exporting configured elements, routes, locations, and the plant hierarchy to the Route Control project
- Selecting the PCS 7 OS message server for Route Control server messages

You can find additional information in
"Actions in the Route Control Wizard". (Page 346)

4.3.4 Route Control Engineering

Configuration tasks

Route Control Engineering comprises the steps below:

Step	Procedure
1	Transfer elements, routes, locations, and automation systems from an S7 project.
2	Configure mode tables and function IDs.
3	Configure the partial routes of the route network.
4	Interconnect elements with partial routes and mode level assignment.
5	Configure materials, material groups and permitted successor relationships between materials and material groups.
6	Export and import via CSV files.

Test Application for Routes

For early diagnostics, Route Control Engineering has a "test application for routes". with this tool, you can perform the following functions:

- Use configuration data to determine whether routes can be found between certain locations and the elements that they contain. Information that does not become available until runtime can not yet be taken into consideration here. This can include such information as whether an element is faulty or must be operated manually.
- Checking consistency of the configuration data and of partial routes and their elements. Items checked by the test application:
  - The uniqueness of element IDs
  - Sorting order of elements
  - The variants (with partial routes)
  - Consistent activation of the same elements in the same mode level

Download

The Route Control Server is also downloaded from the configuration application. The new configuration must then be activated via the Route Control Center.

4.3.5 Route Control server

Route Control server

The Route Control server performs the following tasks:

- It searches for a suitable path through the route network;
- It downloads the element lists to the automation system;
- It provides a display of routes and elements for the clients (Route Control Center).

The Route Control server can be used in a redundant configuration.

4.3.6 Route Control Center

Route Control Center

The Route Control Center offers the most extensive options for controlling routes because it displays detailed information about a route or multiple routes.

You can start the Route Control Center in two ways:

- From a PCS 7 OS picture by means of the Route Control faceplate
- From the Windows start bar

Starting the Route Control Center from the Route Control faceplate will display information about one specific route. With concurrent routes that use the same function ID, all routes involved are displayed.

Starting the Route Control Center from the Windows start bar will display all the routes. You can then select a route from the list. The elements and their properties are displayed for the selected route.

4.3.7 Route Control Route Log

Route Control Route Log

The following information is recorded in a route log:

- Operator input by means of the Route Control faceplate
- Operator input by means of the Route Control Center
- Route status messages
- Route Control server status messages

Additional information

- Section "Route Log" (Page 515)

4.3.8 Route Control Operator Dialog

Route Control Operator Dialog

The Route Control operator dialog comprises two parts:

- A block icon (Page 481)
  This is inserted in PCS 7 OS pictures and displays information about the status of a route.
- A faceplate (Page 483)
  Clicking the block icon opens the faceplate.
  This is used to operate and diagnose routes.

You can call other applications from the faceplate:

- Route Control Center*
- Batch Control Center*
- SFC dialog containing the user program for this route**

* If these applications are installed on the computer

** If the SFC path is configured in the block icon

4.3.9 PCS 7 OS Web option

Operator Control and Monitoring with PCS 7 OS Web Option

The PCS 7 OS Web option enables you operate and monitor routes with the Route Control faceplate via Intranet/Internet. Only the buttons at the bottom of the Route Control faceplate are missing in the Web faceplate, because the applications they open are not on the Web client.

Note

While installing the Web client you need to download the "Web Components for SIMATIC Route Control Faceplate" plug-in.

You can find additional information in the *Process Control System PCS 7; PCS 7 Web Option* Manual.

4.4 Configuration options

4.4.1 Client/Server Architecture of Route Control

Client/Server Architecture of SIMATIC Route Control

SIMATIC Route Control comprises the following separate components:

- Client applications (Route Control Center)
- Operator dialog in PCS 7 OS (block icon, faceplate)
- Server application (Route Control server)

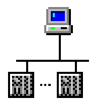
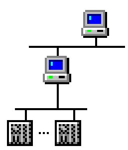
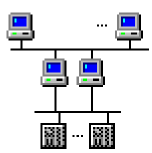
You can operate the client application together with the server application on one computer (single station). However, we recommend that these applications are separated, especially when used with a relatively large process cell.

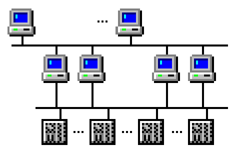
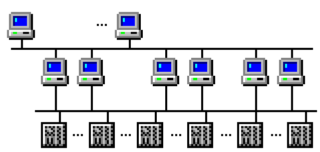
4.4.2 Basic Configurations

Route Control Basic Configurations

SIMATIC Route Control can be scaled to various levels.

A Route Control server supports a maximum of 32 clients (like a PCS 7 OS server).

No.	Figure	Level	Description
1		Standalone system	**Client/server computer:** Route Control server Route Control client PCS 7 OS client and Route Control block icon with faceplate PCS 7 OS server
2		Client-server Standalone	**Client computer:** Route Control client PCS 7 OS client and Route Control block icon with faceplate **Server computer:** Route Control server PCS 7 OS server
3		Client-server redundant	**Client computer:** Route Control client PCS 7 OS client and Route Control block icon with faceplate **Server computer (1):** Route Control server 1 PCS 7 OS server 1 **Server computer (2):** Route Control server 2 PCS 7 OS server 2

No.	Figure	Level	Description
4		Client-server redundant Separate server applications: PCS 7 OS Route Control	**Client computer:** Route Control client PCS 7 OS client and Route Control block icon with faceplate **Server computer (1):** Route Control server 1 **Server computer (2):** Route Control server 2 **Server computer (3):** PCS 7 OS server 1 **Server computer (4):** PCS 7 OS server 2
5		Client-server redundant Separate server applications: • PCS 7 OS • Route Control BATCH control	**Client computer:** Route Control client PCS 7 OS client and Route Control block icon with faceplate **Server computer (1):** Route Control server 1 **Server computer (2):** Route Control server 2 **Server computer (3):** PCS 7 OS server 1 **Server computer (4):** PCS 7 OS server 2 **Server computer (5):** BATCH Control server 1 **Server computer (6):** BATCH Control server 2

Additional information

You can find all tested configurations in

- "Configurations, Non-Redundant" (Page 34)
- "Configurations, Redundant" (Page 36)

4.4.3 Configurations, non-redundant

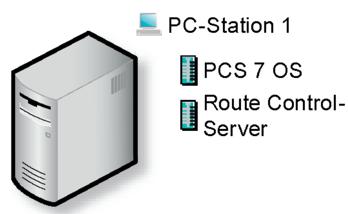
Overview

The following overview shows the tested combinations of PC stations with various software applications on a system bus in a project.

Route Control with PCS 7 OS

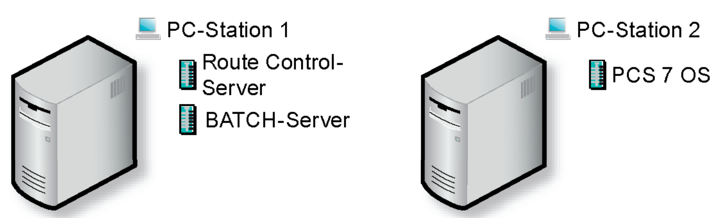
PCS 7 OS server is the message server for Route Control server messages.

PCS 7 OS and Route Control on a PC station



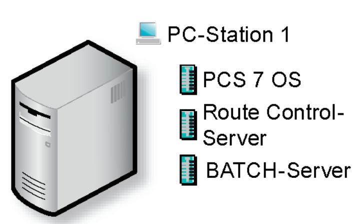
It is possible for BATCH Control to be on a second PC station.

Route Control and BATCH on a PC station



PCS 7 OS on a second PC station.

PCS 7 OS, Route Control and BATCH on a PC station



Limitations of this configuration:

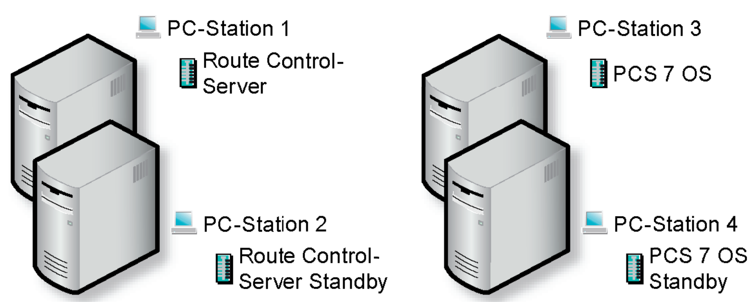
- BATCH: 300 process objects
- PCS 7 OS: 64k Tags
- Route Control: 100 Routes

4.4.4 Configurations, redundant

Overview

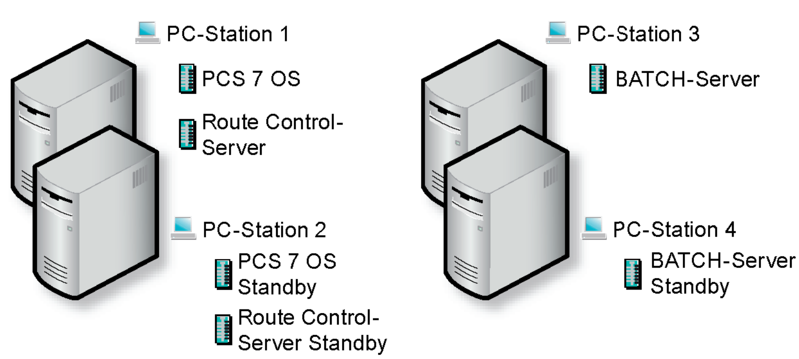
The following overview shows the tested combinations of redundant PC stations with various software applications on a system bus in a project.

Route Control with PCS 7 OS



Route Control uses its own redundancy monitoring.

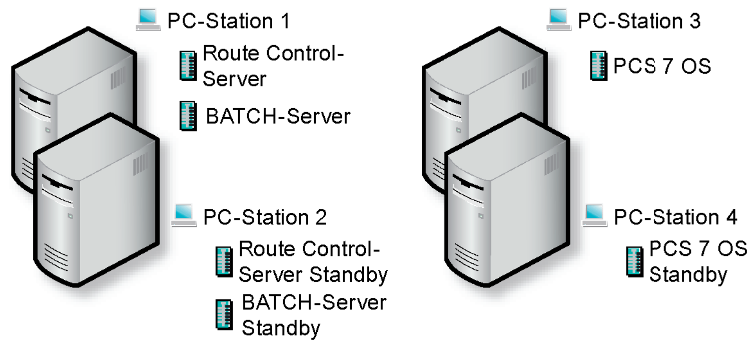
PCS 7 OS and Route Control with BATCH



With or without BATCH Control server pair.

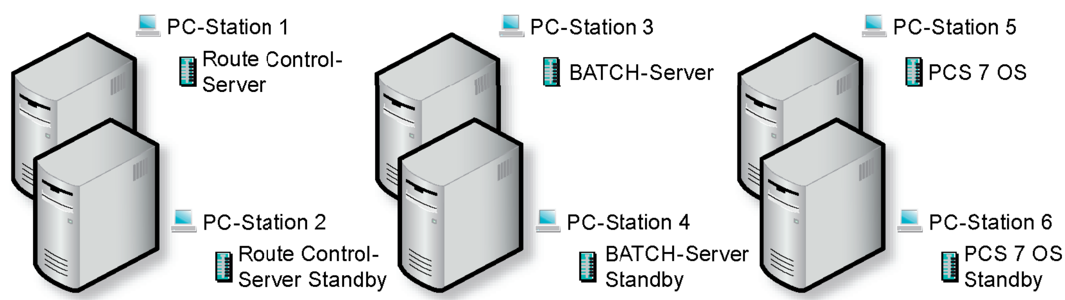
Route Control uses standard PCS 7 redundancy monitoring.

Route Control and BATCH with PCS 7 OS



All applications use the standard PCS 7 redundancy monitoring.

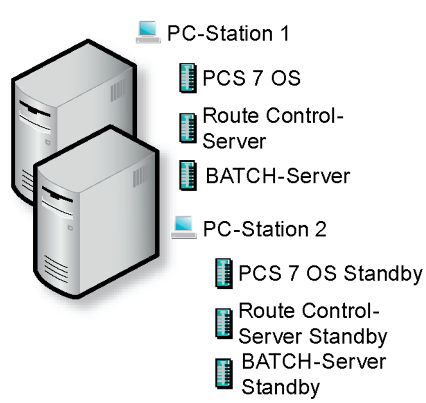
Route Control, BATCH and PCS 7 OS on separate PC stations



Route Control uses its own redundancy monitoring here.

BATCH Control and PCS 7 OS use standard PCS 7 redundancy monitoring.

PCS 7 OS, Route Control and BATCH on a PC station



Limitations of this configuration:

- BATCH: 300 process objects
- PCS 7 OS: 64k Tags
- Route Control: 100 routes

All applications use the standard PCS 7 redundancy monitoring.

4.5 Installing Route Control

4.5.1 Delivery form of Route Control

Introduction

SIMATIC Route Control is supplied with PCS 7 on DVD.
During installation you indicate which applications you need to run on your station.

You can find additional information in the manuals regarding PCS 7 installation.

The licenses for these applications are not included on the PCS 7 DVD and must be ordered separately.
You can find additional information in
"Overview of Authorization" (Page 44)

Delivery form of Route Control

SIMATIC Route Control offers the following packages:

- Route Control Engineering
- Route Control Center
- Route Control Server
- Route Control Routes (10 routes)
- Route Control Routes (50 routes (PowerPack))

4.5.2 Readme file with current information

Readme File

Note

The Route Control - Readme file is available in two versions:

- *Route Control - Readme* (offline on the DVD *Process Control System*; *SIMATIC PCS 7*)
- *Route Control - Liesmich* Readme (online in the Internet)

Documents available online may be more up-to-date than the version of documents installed with PCS 7 Setup.

Information on the readme file

You have the following options available for opening the file:

- Double-click on the routecontrol-readme.mht file in the setup directory on the DVD
- In the Windows start menu, select the menu command **SIEMENS Automation > Documentation > Readmes > English** and double-click *SIMATIC Route Control - Readme*

4.5.3 Installing Route Control components

Installing

As of V6.1, the installation program for SIMATIC Route Control is started from within PCS 7 system setup. It is called using the standard procedure for software installation in Windows.

Note

Refer also to the notes on installing SIMATIC Route Control in the *SIMATIC Route Control readme* file. You can also find the readme file in the Setup directory for SIMATIC Route Control.

Component installation options

As of SIMATIC Route Control V6.1, the Route Control installation program is called "silently" via PCS 7 system setup. Thus, no further action is required during installation.

With the basic package, the following applications are offered at the start of installation:

- Route Control Engineering
- Route Control single station
- Route Control server

- Route Control client
- User-defined installation

Select the applications you wish to install.

The SIMATIC Route Control basic software is installed automatically and, therefore, does not need to be selected.

Creating an image

To ensure you have a backup of partitions and hard disk data (after a new installation, for example), we recommend that you create an image of the installation.

Note

Please note that authorizations and license keys cannot and may not be backed up.

Move the authorizations and license keys to another medium (diskette, partition, etc.) before generating the image.

When choosing the image software, please note that it must be suitable for the operating system used.

To create an image, follow the image software manufacturer's instructions.

Removal

Route Control is removed via the Windows Control Panel (Add or Remove Programs), as are other PCS 7 components.

Installation in a redundant system

Note

You must take a number of special features into account in a redundant PCS 7 system.

You can find additional information in
"Monitoring Functions" (Page 397)

4.5.4 Installation requirements

4.5.4.1 ES and server hardware and software

Recommended Hardware for PCS 7

Recommended hardware configurations for PC stations can be found in the *Process Control System PCS 7; PC Configuration* manual.

Setting Operating System Partition C

Configure partition C to at least 50 GB for the operating system and PCS 7.

- For projects and the project database: Additional memory
- For the output of configured data (e.g. partial routes, elements): A graphics-compatible printer supported by Windows (the software was tested with HP Laser Jet)

Software requirements

Note

For the current status, refer to the PCS 7 description.

- SIMATIC Route Control V6.0 based on PCS 7 V6.0 SP2
- SIMATIC Route Control V6.0 SP1 based on PCS 7 V6.0 SP3
- SIMATIC Route Control V6.1 based on PCS 7 V6.1
- SIMATIC Route Control V6.1 SP1 based on PCS 7 V6.1 SP1
- SIMATIC Route Control V7.0 based on PCS 7 V7.0
- SIMATIC Route Control V7.0 SP1 based on PCS 7 V7.0 SP1
- SIMATIC Route Control V7.1 based on PCS 7 V7.1
- SIMATIC Route Control V7.1 SP1 based on PCS 7 V7.1 SP1
- SIMATIC Route Control V7.1 SP2 based on PCS 7 V7.1 SP2
- SIMATIC Route Control V8.0 based on PCS 7 V8.0
- SIMATIC Route Control V8.0 SP1 based on PCS 7 V8.0 SP1
- SIMATIC Route Control V8.1 based on PCS 7 V8.1

Route Control requires the PCS 7 operating system for client and server.

The following software is required to use Route Control components:

Components	Property
PC operating system	• Windows 7 SP1 (32-bit/64-bit) • Windows Server 2008 SP2 (32-bit) • Windows Server 2008 R2 SP1 (64-bit)
Internet Explorer	Microsoft Internet Explorer 7
TCP/IP configured	Windows system settings
CFC	Installed during the PCS 7 System Setup
SIMATIC Logon	Optional
PCS 7 OS	Installed during the PCS 7 System Setup

Readme Files

Note

Please also note the current notes in the following files:
- *SIMATIC Route Control - readme*
- *PCS 7 - readme*

SFC Typical

Note

If an SFC is not installed on the computer, an error message will appear when the Route Control library is opened. You can not then use the SFC Typical of Route Control. This does not affect the configuration of the other Route Control blocks with CFC.

4.5.4.2 AS hardware and software

Automation System Requirements

- Hardware requirements
  Route Control supports the CPU types below:
  - CPU 416-3 (Notice! Smaller quantity framework with approx. 30 routes)
  - CPU 417-4
  - CPU 417-4H
  - CPU 410-5H Process Automation
  - PCS 7 BOX

  SIMATIC Route Control has been tested with S7 F Systems and SIMATIC Safety Matrix for compatibility.
- Software requirements
  Route Control requires CPU firmware version 3.1.0 and higher for these CPU types.

You can find additional information in the
SIMATIC PCS 7 - Released PCS 7 Modules manual.

PCS 7 - Released PCS 7 Modules.

Route Control and WinLC RTX

Network addresses

When using a WinLC RTX as an AS in a Route Control project, all necessary connections are created correctly by the Route Control Wizard.

However, their IP and MAC addresses are displayed with default values in Route Control Engineering.

The default values are:

- IP address: 127.0.0.1
- MAC address: 00-00-00-00-00-00

Performance

There can be long request times for "long" routes due to the slower performance of the WinLC RTX.

Long routes are routes with a number of elements > 100.

Route Control: PA-CPU / CPU417 and redundant CPs

No fault-tolerant connections are created by the RC Wizard for certain hardware configurations with PA-CPU/PA-CPU-H and CPU 417/417H in connection with two external CPs per rack.

You have to create these fault-tolerant connections manually if they are necessary.

Resources required in the CPU

Set at least the following values for the local data of the OBs in HWConfig -> CPU Properties -> Save as listed below:

OB	Local data
1	1450
9	1200
11	1200
12	1400
25	1400
26	1400
27	1400
28	1400
29	20

4.5.4.3 Dependence on other components

Introduction

All components required to operate Route Control are installed during PCS 7 system setup.

Components for SIMATIC Route Control

Route Control Components	Components
Route Control server	• SIMATIC Authorization • SIMATIC Net (server-AS connection) • SCS (Siemens Communication System) • Redundancy Integration • PCS 7 Common Classes (date/time display, for example) • *SIMATIC Logon* (optional)
Route Control library	• STEP 7/CFC
Route Control faceplate	• PCS 7 OS
Route Control Center	• SIMATIC Authorization • *SIMATIC Logon* (optional)
Route Control Engineering	• SIMATIC Authorization • *SIMATIC Logon* (optional)

4.6 Licensing

4.6.1 Overview of Licensing

Introduction

The software of SIMATIC Route Control can only be used if the applications find the appropriate licenses.

A single license is always located on the hard disk of the computer on which the application runs.

Floating licenses can be managed on a central license server.
This allows you to install an application on any number of computers and start it as often as permitted by the number of licenses you have obtained.

You can find detailed information about installing and managing licenses in online help of the Automation License Manager.

Server License

The license for the server restricts the maximum number of simultaneously operating material transports to the number of installed route licenses up to a maximum of 300. If the number of route requests on the Route Control server exceeds this limit, a message is sent to the message system. The Route Control server continues to run and responds to the route request that caused the limit violation with a route request error.

Note

Always install only one server license on a Route Control server.

Client license

The Route Control Center is enabled via floating licenses.

Engineering license

Route Control Engineering is enabled via floating licenses.

Overview of route licenses as of V 8.0

As of version 8.0, you can combine licenses as desired for 10 or 50 material transports up to a maximum of 300 material transports. This replaces the previous licensing concept for routes.

Upgrade

You can upgrade Route Control licenses from PCS 7 V7.x and V8.x to V8.2 using various upgrade packages.

The upgrade packages contain the following licenses:

- Route Control Center
- Route Control Engineering
- Route Control Server

The "CountRelevant" licenses for routes are versionless and require no upgrade:

- Route Control Routes 10 routes
- Route Control Routes 50 routes

4.7 User rights

4.7.1 Introduction to authorization management

Integration of SIMATIC Logon in SIMATIC Route Control

SIMATIC Route Control supports the central user management *SIMATIC Logon* of PCS 7, which in turn is based on the mechanisms of the user management in Windows.

Principles of Authorization Management

- Users, user groups and passwords are centrally defined in Windows.
- For SIMATIC Route Control V6.0 and higher, the five relevant user groups are created in Windows during setup.
- You must create the SIMATIC Route Control user groups on all computers, on which SIMATIC Route Control is to operate with the user concept.
- You will require Windows administrator rights and expertise in order to set up users and assign them to groups.
- A user logs on and off by means of the following applications: Route Control Engineering tool, Route Control Center and Route Control server. Route Control is also notified when a user logs on or off outside of SIMATIC Route Control. After such a change occurs, corresponding functions are enabled or disabled.

Access protection

If you are using the components of *SIMATC Logon*, you can activate access protection in SIMATIC Manager from the "Options" menu. This provides password protection when opening projects and starting the Route Control Wizard.

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

Reaction without SIMATIC Logon

If *SIMATIC Logon* is not installed, all operator actions are allowed.
Access protection and change log are then not possible.

4.7.2 User roles and user rights

User Roles for SIMATIC Route Control

SIMATIC Route Control works with five user groups that are also valid in the user concept *SIMATIC Logon*.

The dependencies of these user groups are described in the following tables:

User group	includes
RC_ENGINEER	-
RC_OPERATOR_L1	-
RC_OPERATOR_L2	RC_OPERATOR_L1
RC_OPERATOR_L3	RC_OPERATOR_L2
RC_MAINTENANCE	RC_OPERATOR_L3 + RC_ENGINEER

Fixed operating authorizations are assigned to these user groups. Thus, each group contains a user role.

These user groups must be set up for the components below:

- Route Control Engineering
- Route Control server
- Route Control Center

User rights

The user groups have different authorizations within SIMATIC Route Control:

User group	Authorization (Overview)
RC_ENGINEER	To engineer and download to the Route Control server; To restart and shut down the server directly when the Route Control server is running on a computer without PCS 7 OS. Note: When the Route Control server is running on a PCS 7 OS server, it is started and shut down with the OS project.
RC_OPERATOR_L1	To perform simple operations in the Route Control Center, including holding a route
RC_OPERATOR_L2	Middle authorization level; includes access operations such as re-requesting the same route
RC_OPERATOR_L3	Highest authorization level for the operating personnel; Request a route with a different source/different destination; Enable a new loaded Route Control project in the Route Control Center
RC_MAINTENANCE	Full access, all rights, emergency personnel Restart and end the server

The following table illustrates the individual user rights in detail:

User group	Rights
Unprotected	• Update route
Unprotected	• Update elements
RC_ENGINEER	• To open and modify the configuration • Load Route Control server with new configuration
RC_OPERATOR_L1	• Manual and automatic switchover • Pause route

User group	Rights
RC_OPERATOR_L2	• Request route • Start route • Stop route (corresponds to reset request and reset start) • Restart route (after stop) • To acknowledge (positive edge)
RC_OPERATOR_L3	• Specifying locations for a path (source, via1...10 and destination) • Specifying the mode table of a route • Specifying the function ID of a route • Specifying the material of a route • To activate/deactivate ignoring of errors • To adjust the option dialog • in case of redundancy: switch to a different Route Control server
RC_MAINTENANCE	• Complete access to all actions/operations

If you wish to apply these user rights within the scope of *SIMATIC Logon* also for the Route Control faceplate in the PCS 7 OS, then, with the "User Administrator" of the PCS 7 OS, set up the user groups RC_OPERATOR_L1 and / or RC_OPERATOR_L2.

Assign these user groups the following permission levels:

User group	Rights	Permission levels of the PCS 7 OS
RC_OPERATOR_L1	see table above	2, 4 and 5
RC_OPERATOR_L2	see table above	2, 4, 5 and 6

If you also want to enable the members of other Route Control user groups to operate with the Route Control faceplate, then via the "User Administration" set up these user groups too and assign them the necessary permission levels of the PCS 7 OS.

Note

The rights of the user group RC_OPERATOR_L3 cannot be used with the Route Control faceplate.

4.7.3 Defining user rights

Requirements

SIMATIC Logon comprises two components and is installed on every computer with a Route Control application:

- SIMATIC Logon administration tool
- SIMATIC Logon service (runtime component)

The following requirement applies when working with *SIMATIC Logon*:

- The "Logon_Administrator“ Windows group must be created. This group is used in all SIMATIC components such as BATCH or Route Control.
  Only the members of one of these two user groups may open the SIMATIC Access Control application and define user roles.

  Note

  As Route Control works with five fixed user groups, no other groups have to be set up using SIMATIC Access Control for Route Control.

Basic Procedure

Step	Action
1	Create all users with passwords.
2	Assign users to to the specific groups.

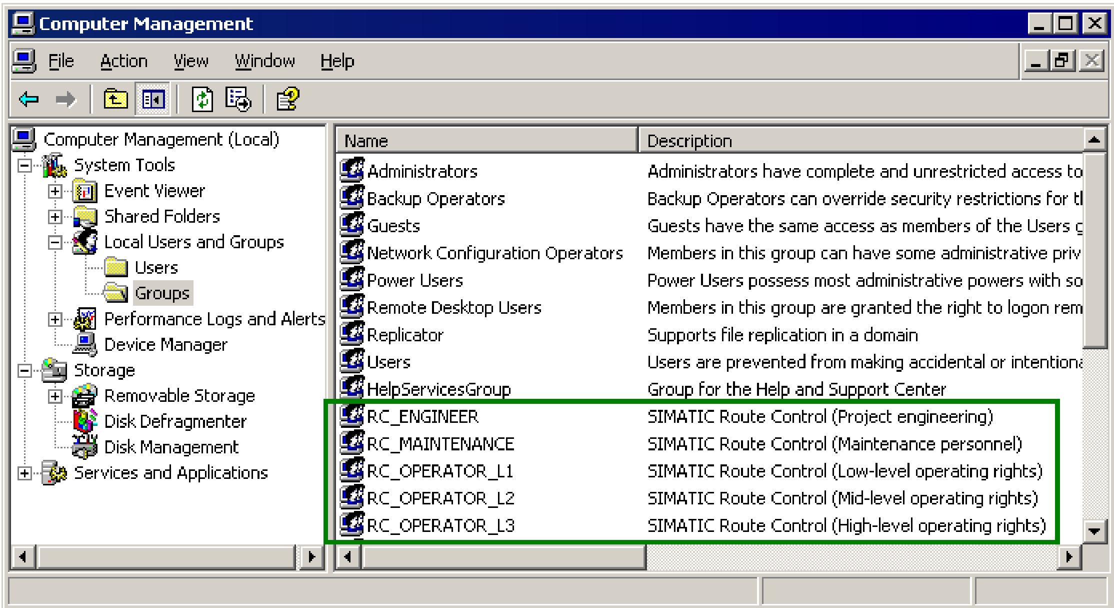
Note

You will need Administrator rights and expertise in order to work in Windows user administration.

The Route Control setup creates the required groups during installation.

If a domain controller is available, you can manage the users and groups there centrally.

If you use a *SIMATIC Logon* logon server or a domain controller, you must create the user groups manually.



Assigning Windows User Groups and RC User Roles

The names of the Windows user groups must match those of the Route Control user roles.

Changing User Rights

The user rights for SIMATIC Route Control cannot be changed.
These rights are permanently assigned to the user roles or user groups.

Update from V8.1 to V8.2

5

Overview

To upgrade the SIMATIC Route Control software from V8.1 to V8.2, select "Update" in the setup.

You can find information about the new functions in the

section "What's New in SIMATIC Route Control V8.2? (Page 23)"

Note the following when updating a Route Control project from V8.1 to V8.2:

- The update of the AS blocks in your projects **does not require a CPU stop**.
- Conversion of the SIMATIC Route Control database is not required.

Update the AS blocks in your projects that use RC functions. To do so, copy the new AS blocks from the installed RC library into the S7 projects in which you are using RC functionality.

Update their CFCs with a block-type import. The requires a Compile OS operation. Download the charts to the automation systems involved.

Block update

We recommend that you update the blocks.

Note

If you still want to continue working with AS blocks prior to V8.2, this is possible. You forgo the corrections and innovations of the new library in this case, however.

See also section "Software update of earlier versions (Page 585)".

You can also find additional Information on the previous versions here.

General 6

6.1 S88 terms

S88 terms

The S88 terms used in the documentation have the following meanings:

S88 terms	Meaning
ENTERPRISE	Company
SITE	(Production) location
AREA	Area within a site
PCELL	Process cell (plant)
UNIT	Unit
EMOD	Equipment module
UNIT LOCATION	Location in a unit, such as an inlet valve or a discharge valve

6.2 Abbreviations

Abbreviations

The abbreviations used in the documentation have the following meanings:

Abbreviation	Meaning
AS	Automation system
BSEND	Communication service for transferring data blocks (as opposed to individual variables) Route Control uses the BSEND/BRCV mechanism for communication between the AS and the Route Control server.
CE	Control element
CFC	Continuous flow chart Element blocks and route blocks are inserted in CFCs and interconnected to blocks of other libraries or user blocks.
CFR	Code for Federal Regulations Used here in the context of FDA 21 CFR Part 11
CSV	Comma separated values ASCII text file in which values are separated by commas or other characters. This file format can be read into Microsoft Excel, for example. Route Control offers an export and import interface in CSV format for partial routes and elements.
DB	Data block
EKB	File extension for license files

Abbreviation	Meaning
EQM	Equipment In this case, EQM is the extension for a SIMATIC BATCH file that contains process-cell data (e.g., process cell, unit). BATCH creates this file based on the plant hierarchy in the S7 project. It serves as the basis (physical model) for configuring the recipes.
EPH	Equipment phase This is a phase module (CFC) that can be used to control a material transport (route).
ERP	Enterprise resource planning Planning level
ES	Engineering station, engineering system
FDA	Food and Drug Administration U.S. regulatory agency
FP	Faceplate In Route Control, a faceplate for a route. This faceplate is interconnected to a route (RC_IF_ROUTE) and can be opened from the block icon in a PCS 7 OS picture.
FUNC_ID	Function ID
F-system	Fail-safe system
H-system	Fault-tolerant system
IF	Interface
LE	Link element
LIB	Library
LOC	Location (location in route network)
MAC	Medium access control In the case, medium access control is the interface address on Layer 2 of the ISO/OSI communication model. The MAC address is used to identify communication peers, for example, the AS-MAC address or Route Control Server-MAC address (of the network adapter).
MDAC	Microsoft® data access components
MDB	File extension for a Microsoft Access database
MES	Manufacturing execution system Layer between the ERP and process control level
MLFB	Machine-readable product designation The MLFB is the article number of a product; it is intended to serve as both the type and system designation.
MP	Multiproject
MSXML	Microsoft XML
MT	Mode table
OB	Operation block
OE	Object engine Runtime container for Route Control, BATCH and PCS 7 OS in PCS 7 V5. The object engine is not included in V6.
OES	Order entry system System for planning batch orders and specifying and evaluating process parameters in PCS 7 V5.
OS	Operating station
PCELL	Process cell, plant
PCS 7	Process control system (a SIEMENS AG product)
PE	Parameter element

Abbreviation	Meaning
PLC	Programmable logic controller (automation system)
PR	Partial route
PT	Process technology
PTE	Process technology elements In this case, process technology elements are represented by a library with blocks for activating process elements such as motors and valves. Comparable to the standard library of PCS 7
QS	Quality assurance
RC	Route Control
RCC	Route Control Center User interfaces for routes with detailed display of route elements and their status
RC_IF	All Route Control interface blocks begin with this name element, IF = Interface
RCE	Route control element A control element interconnected in a partial route
RCS	Route Control system RCS was the product abbreviation up to version 5; as of V7 the product abbreviation is SRC.
RLE	Route link element A link element interconnected in a partial route
RPE	Route parameter element A parameter element interconnected in a partial route
RSE	Route sensor element A sensor element interconnected in a partial route
SB	SIMATIC BATCH
SC	SC block library Comparable to the standard library of PCS 7 or the PTE library
SCS	SIEMENS Communication System Communication layer between different applications
SE	Sensor element
SFC	Sequential function chart Route Control offers a SFC typical that can be further developed for use in creating your own SFC block.
SL	SIMATIC Logon SIEMENS software component for checking access control/user authorization used by PCS 7 OS, BATCH, Route Control, and other products for authentication.
SRC	SIMATIC Route Control Product
SSC	Siemens Security Component Used by Setup so configure the firewall.
TCP/IP	Transport Control Protocol/Internet Protocol Level 3 or Level 4 data communication protocol of the ISO/OSI communication model
PH	Plant hierarchy Structure (process cells, units, etc.) created in SIMATIC Manager. The plant hierarchy can be transferred from an S7 project to the Route Control project using the wizard.

Abbreviation	Meaning
TQM	Partial EQM, see EQM When project engineering is distributed, EQM file data are stored in so-called TQM files.
TSAP	Transport Service Access Point Access point of a communication level of the ISO/OSI model
UC	Use case Typical use case
UDA	User-defined attribute Route Control uses three UDAs; they enable the Route Control Wizard to recognize the element type concerned: RC_TYPE: Element type, such as CE, SE, PE, LE RC_SUBTYPE: Element subtype, such as, MOTOR, VALVE, etc. RC_ID_PARAM: Name of input containing the ID for example, ID or, for remote elements, LOC_ID
UDT	User-defined data type User-definable data type for programming in the S7 project
WinCC	Windows Control Center
XC	Cross-coupling In this case, cross-coupling refers to the lateral communication links between the Route Control automation systems.
XML	Extended markup language Structured language for describing data
XSLT	Extended style sheet template File containing the layout for displaying data from an XML file.

6.3 Menu commands

Route Control Engineering

- Section "Engineering Menu (Page 385)"

Route Control Center

- Section "Route Control Center Menu (Page 497)"

Note

If you want to open the shortcut menu of an object then right-click on the object.

6.4 Dialog boxes

Dialog boxes

The following table contains the sections in which the SIMATIC Route Control dialog boxes are described:

Configuration

Preparation

Function	Dialog box descriptions
Engineering tool	Guide to the Introduction (Page 225)
User rights	Introduction to Authorization Management (Page 46)
Conversion tool	Converting a Route Control Project (Page 388)

S7 project

Function	Dialog box descriptions
Route Control Wizard	Selecting Actions (Page 348)
Selection of message server	Selection of the PCS 7 OS Message Server (Page 349)
Export objects	Selecting Objects to be Exported (Page 350)
Summary	Route Control Wizard: Summary (Page 353)
ID correction	Route Control Wizard: Adapting IDs (Page 351)
Result	Route Control Wizard: Result (Page 355)

Engineering tool

Function	Dialog box descriptions
Process cell	Process cells, units and locations (Page 379)
Unit	Process cells, units and locations (Page 379)
Locations	Process cells, units and locations (Page 379)
General locations	Process cells, units and locations (Page 379)
Material, material group	Configuration of Materials and Material Groups (Page 460)
Material sequences	Configuration of Material Sequences (Page 461)
CSV interface	Guide: CSV interface (Page 299) CSV Interface Overview (Page 357)
Control element	Control element (properties) (Page 426) Control element (activation) (Page 427) Control element (cross-reference list) (Page 428) Route control element (properties) (Page 430)
Sensor element	Sensor element (activation) (Page 432) Route sensor element (properties) (Page 433)

Function	Dialog box descriptions
Parameter element	Parameter element (properties) (Page 435) Parameter element (activation) (Page 436) Route parameter element (properties) (Page 437)
Function ID	Mode Table (Properties) (Page 408)
Runtime parameters	Runtime Parameters (Properties) (Page 392)
Mode table	Mode Table Properties (Page 408)
Partial route	Partial Route (Properties) (Page 414)
Project Settings	Project Settings (Properties) (Page 391)
Download the project to the server	Downloading to the Route Control Server (Page 474)

PCS 7 OS picture

Function	Dialog box descriptions
Block icon	Block Icon for a Route (Page 481)
Interconnection	Interconnecting a Block Icon (Page 335)

Runtime

Client

Function	Dialog box descriptions
Block icon	Block Icon for a Route (Page 481)
Faceplate	Faceplate, Classic style (Page 483) Faceplate, APL style (Page 486)

Route Control Center

Function	Dialog box descriptions
Logon	Logon (Page 489)
Center	General Operator Control Elements (Page 500)
Server selection	Selecting a Route Control Server (Page 490)
Add a server	Add a server (Page 492)
Find a server	Find a server (Page 491)
Server status	Server status (Page 492)
Settings	Options > Settings Menu (Page 501)
Route properties	Route Properties (Page 511)
Locations	Locations (Page 379)
Error display	Error During Route Request (Page 494)
Sort the display	Route Control Center Sorting (Page 510)

Function	Dialog box descriptions
Activation keys	Keys for the Type of Activation (Page 502)
Update project	Server status (Page 492) Updating the Server (Page 494)

Server

Function	Dialog box descriptions
Status	Route Control server start options (Page 534)
User interface	Route Control Server User Interface (Page 531)
AS list	Expanded Diagnostic Information (AS List) (Page 536)
Route list	Expanded Diagnostic Information (Route List) (Page 538)
AS-server connections	Expanded Diagnostic Information (AS Connections) (Page 539)
Clients/Route Control Center	Expanded Diagnostic Information (Client Connections) (Page 540)

6.5 Keyboard commands

Overview

Keyboard command	Action
	Route Control Engineering
Ctrl + O	Open a Route Control project
Ctrl + X	Cut
Ctrl + C	Copy
Ctrl + V	Paste
Del	Delete
F2	Rename
Ctrl + E	Export/import via a CSV file
Shift + F5	Arrange windows to overlap (cascade)
Shift + F2	Arrange windows horizontally (tile horizontally)
Shift + F3	Arrange windows vertically (tile vertically)
F1	Open Context-Sensitive Help
ALT + P	Open the "Properties" dialog box
Ctrl + A	Select all elements in the current view
Ctrl + N	Add a new element to the current view
ESC	Cancel/close dialog box without performing any changes
	Route Control Center
ALT + F4	Exit the application
Ctrl + S	Display the Route Control server status
F5	Update the display

Keyboard com-mand	Action
Ctrl + ALT + E	Display the dialog box with the settings
F1	Open Context-Sensitive Help

6.6 User Interfaces

Introduction

Route Control offers three user interfaces for the operator control and monitoring of a route and its elements:

Route Control block icon

The block icon is interconnected to a route block using the Route Control Dynamic Wizard for PCS 7 OS faceplates. The block icon displays the main properties of a route during runtime.

You can find additional information in the section
"Route Control Block Icon for a Route (Page 481)"

Route Control faceplate

For a more detailed route diagnosis, click the block icon to open the faceplate. It displays, for example, the source and destination of a route.

You can find additional information in the section
"Route Control Faceplate (Page 483)"

Route Control Center

You can open the Route Control Center from the faceplate to display the elements of the route and their statuses.

You can find additional information in the section
"Route Control Center (Page 488)"

6.7 Control commands

Control commands

Control commands are names for activation or deactivation of elements, for example, "On" for starting a motor. The texts for these commands are language-dependent. As of Route Control V8.0, default text will be supplied for these texts for all languages.

In the "Control texts" dialog, you can change this text for the selected language. The changes are valid for the current AS.

If you add a control to a custom element type, the control text appears in this interface and can also be edited here.

If you remove a control, the corresponding text disappears here as well.

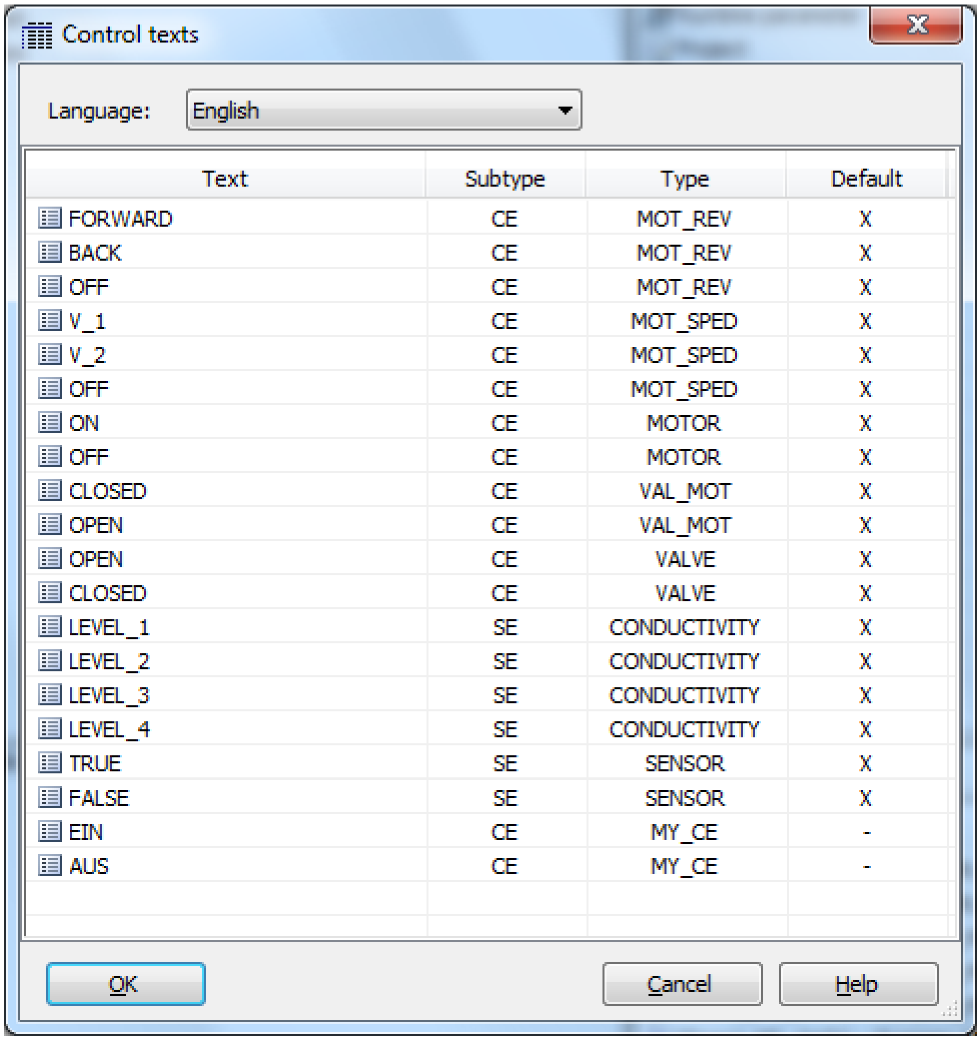


Image 6-1 Control texts

Important notes 7

7.1 Order of Tasks

Sequence

By performing the steps shown in the following table in the recommended sequence, you will quickly become familiar with the product.

Step	Action	Additional information
1	Install PCS 7 (PCS 7 system setup).	"Hardware and Software" (Page 40)
2	Install SIMATIC Route Control components (ES, server, client).	"Route Control Scope of Supply" (Page 38)
3	Create user groups in Windows (automatically performed by the Route Control setup).	"User Roles for Route Control" (Page 46)
4	Create a SIMATIC S7 project with at least one automation device (CPU) and one PCS 7 OS.	"Configuration Overview" (Page 303)
5	Enter Route Control applications in HW Config.	"Route Control Applications" (Page 244)
6	Copy the Route Control blocks from the Route Control library to the master-data library of your S7 project.	"Creating a New Project" (Page 73)
7	CFC chart with one RC_IF_CFG and one RC_IF_XC_DIAG block (for more than one automation system).	"Overview of Cross-Coupling Blocks" (Page 172)
8	CFC charts for elements; insert RC_IF_xxx blocks.	"Overview of Elements" (Page 100)
9	Pro route: CFC chart with an RC_IF_ROUTE block This block is sufficient for the manual operation of a route: For automatic operation, RC_IF_ROUTE has to be interconnected to the user program: You can make this adjustment at a later date.	"RC_IF_ROUTE (FB 800)" (Page 101)
10	Configuring the locations	"Configuring the locations" (Page 328)
11	Start the Route Control Wizard with all options (export).	"Route Control Wizard: Actions" (Page 346)
12	Compile CFC and download to an automation system (AS).	PCS 7 Manual
13	Compile NetPro and download to an automation system (AS).	"Exporting the Connection Configuration (NetPro)" (Page 289)
14	Download the PC station	PCS 7 Manual
15	Configuration of the Route Control objects (project settings, mode tables, partial routes, interconnection of elements in partial routes)	"Starting Route Control Engineering" (Page 379)
16	Configure the materials, material groups and successor relationships (optional)	"Material (Overview)" (Page 458)

Step	Action	Additional information
17	SIMATIC Manager: Compile PCS 7 OS	PCS 7 Manual
18	Expand the PCS 7 OS project: Create pictures, interconnect block icon with route instance (RC_IF_ROUTE)	"Route Control Dynamic Wizard" (Page 335)
19	Start PCS 7 OS process mode.	PCS 7 OS manual
20	Download Route Control server	"Downloading the Route Control Server" (Page 472)
21	From the PCS 7 OS picture, start the Route Control faceplate and the Route Control Center by means of the block icon and control routes manually (manual test mode).	"Block Icon for a Route" (Page 481) "Route Control faceplate" (Page 483) "Route Control Center: General Operator-Control Elements" (Page 500)

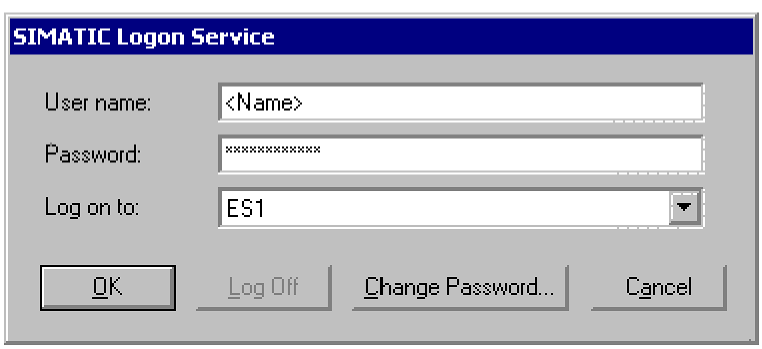
7.2 General Information

7.2.1 Logon Dialog Box

Description

If the *SIMATIC Logon* component is installed, you have to log on and off in order to work with SIMATIC Route Control. *SIMATIC Logon* accesses Windows users and user groups.

Dialog box



Meanings of Operator-Control Elements

Operator-control element	Meaning
User name	Edit box for the name of the user
Password	For security reasons, the password will not be visible.
Log on to	Edit box for the computer or domain to which you are logging on

Operator-control element	Meaning
OK	Checks whether you possess the required authorization. If the answer is yes, the dialog box closes and you are logged on. This can be seen in the application's status bar, which displays the full user name. If access authorization is not granted, a notice is displayed and you can correct the data.
Log off	Logs the user off.
Change password	Opens the dialog box for changing the password.
Cancel	Cancels the logon or logoff procedure; the original status is retained.

7.2.2 Restriction of the quantity framework

Description

There are restrictions on the quantity framework for Route Control sensor and control elements.

Cause of Messages

Route Control element blocks issue messages:

- If a fault occurs
- If an error occurs
- If the element transitions to manual mode

The element blocks call the AlarmS block (SFC18) for this purpose.

Number of Calls

The number of calls is limited to 4,096 in PCS 7 if the new message concept is used.

The total number of elements multiplied by the number of messages issued by these elements must not exceed 4,096. The different elements generate a different number of messages:

- Control elements of SIMATIC Route Control call the block for three different messages.
- Sensor elements call the block for two different messages.
- Parameter elements and link elements do not generate any messages.

Note

Please note that all program sections in an automation system share these resources. Therefore, the total number of all program sections must not exceed the limit of 4,096 calls.

Calculation Formula

The number of SIMATIC Route Control calls is calculated as follows:

Number of calls for Route Control = Number of control elements * 3 + Number of sensor elements * 2

Examples

Number of control elements	Number of sensor elements	Total number
1024	512	4096
512	1024	2560
680	1024	4088

From our experience, this number of control elements has never been reached in *one* automation system. Because other programs besides SIMATIC Route Control are also being executed, as a rule such quantities are already distributed among more than one automation system for performance reasons.

Additional information

You can find an overview of the Route Control quantity framework in "Quantity Framework for Route Control" (Page 607).

7.2.3 Invalid characters

PCS 7

For the names of hierarchy folders, blocks and CFC charts, the special characters
[\ ] [/] [.] ["] [%] are not permitted.

Route Control

In Route Control, the ['] (apostrophe) special character is not permitted either.
Neither can it be used in comments.

If the Route Control Wizard finds this character when exporting from PCS 7, it will write an error message to the log.

For CSV exports/imports to Route Control Engineering, one of the following characters can be selected as a separator: [;] [,] [*].
These characters must not be used in configuration.

Note

Please also note the comprehensive information provided in the PCS 7 OS online help. Search the help for "invalid characters".

We recommend that you completely avoid special characters during configuration. Sole exception: [_] (underscore).

7.2.4 Route Request via any Mode Table

Special consideration for mode table = 0

If you request a route with mode table = 0, the route found may contain partial routes to which different mode tables have been assigned.
In such cases, the Route Control Center will not be able to display the mode level unequivocally.

If you must work with mode table = 0, we recommend that you give the mode levels in the mode table concerned the same names.

7.2.5 Reinstallation of the Route Control Faceplate

Initial Situation

- You have a PCS 7 OS project containing Route Control faceplates.
- You want to install a new version of the Route Control faceplate.

Procedure

Step	Procedure
1	Opening the C editor in your PCS 7 OS project
2	Executing the menu command **Regenerate Header**

Result

The standard functions, including the Route Control scripts, are recompiled and communicated to the PCS 7 OS project. This procedure is necessary to ensure that the newly installed Route Control faceplate can be operated with the old scripts.

7.2.6 Route Control faceplate without Route Control server

Route Control faceplate without Route Control server

Your computer has the following constellation:

- PCS 7 OS is installed.
- Route Control server is not installed.

If you want the Route Control faceplate to be available, you must execute the Route Control faceplate setup, including Route Control Base.

The Route Control faceplate setup installs script files and global functions in the PCS 7 OS directory, which are required for the Route Control faceplate to function properly.

7.2.7 PCS 7 OS memory reset

PCS 7 OS memory reset

Note

Of a PCS 7 OS with a memory reset is recompile, the Route Control Wizard must be run again with the menu command **Select the Message Server** and the "Generated messages" check box must be activated.

Additional information

- Section "Actions" (Page 346)
- Section "Selecting the PCS 7 OS Message Server" (Page 349)

7.2.8 Enabling changes to configuration

Enabling Changes

Note

If you make changes to the Route Control configuration and download the changes to the Route Control server, the changes do not become active until the next route request.

Example: You have incorporated additional elements in partial routes or modified properties.

7.2.9 Downloading to the Server During an Active Route

Problem

The Route Control Center displays the elements of an active material transport. If the configuration is changed, downloaded to the Route Control server and activated while a transport is active, discrepancies can arise between the configuration and the route.

Example:
A new element is assigned to a partial route. This new configuration is downloaded to the Route Control server and activated. The Route Control Center now displays the new element in the list, although it has not been activated in the automation system. The automation system is still working with an element list that is based on the previous configuration.

Solution

The new element is included as soon as the route is completed and started again. At this point, a new element list is downloaded to the automation system.

7.2.10 Online help in the Route Control Center

Online help in the Route Control Center

The user can open the Windows Explorer from the online help, thus giving access to the file system. This is not possible on operator stations.

Due to reasons of security, the online help cannot be accessed in the Route Control Center if this application has been opened through a PCS 7 OS picture. The online help in the Route Control faceplate has also been deactivated.

If you call up the Route Control Center from the start bar, on the other hand, the online help is available since the Windows Explorer can also be called up from the start bar.

7.2.11 MES Interface

MES Interface

Although SIMATIC Route Control does not feature a direct interface to SIMATIC IT, certain data can be exchanged nonetheless by means of standard interfaces (Runtime and OPC coupling) via PCS 7 OS-Server / OpenPCS 7 including, for example, data of the "RC_IF_ROUTE" route block such as the input parameters of the Source, Via and Destination locations of a route, material data, or output parameters such as the route status, and the values of parameter elements.

7.2.12 SIMATIC Route Control and PLCSim

SIMATIC Route Control and PLCSim

SIMATIC Route Control does not support PLCSim, as PLCSim is unable to process BSEND/ BRCV orders, which are required for communication between the Route Control automation systems and the Route Control servers. Communication between the Route Control server and the automation systems is carried out over "named connections" and BSEND/BRCV.

We do not recommend connection via MPI.

7.3 Notes on Libraries and Blocks

7.3.1 Installing a new Route Control library

Requirement

You want to install a more recent version of the Route Control library and update your project with the latest blocks.

Requirement

The configuration environment for an S7 project and the Route Control project are installed on your computer.

Basic Procedure

Step	Procedure
1	Open the new Route Control library.
2	Copy the changed blocks (FB, FC, DB and UDT) from the block folder of the Route Control library into the block folders of each individual project to be changed.
3	Perform a block type import for Route Control blocks in CFC.
4	Compile and download the charts.

7.3.2 Downloading instance data blocks to the AS

Problem

Blocks from a later version of SIMATIC Route Control will be compiled and downloaded to the AS, to remedy an error, for example. The block interface has changed.
A new number can result from the interface change and the automatic assignment of instance-data-block numbers.

If the new function block and data block are imported into one automation system (AS), the peer automation systems of a route can still run. These peer automation systems have received the instance-data-block number of their master route or master FB at the beginning of the route. Once a route is started, they constantly send up-to-date data (PUT jobs) to this instance DB.

If another instance data block is now downloaded to the master AS, the previous data block simultaneously becomes invalid or is even reassigned to an entirely different function block. There is a risk that data will be overwritten.

Remedy

You must first close all routes involved in the AS to be reloaded. This applies both to master routes in this AS as well as to routes for which the AS is involved as a slave.

How to Identify the Routes Involved in this AS

1. Start the Route Control Center from the Windows start menu.
   All routes are displayed.
2. At the top of the list, sort the routes according to the "AS" column.
   As well as the AS involved, all route IDs will appear in the first column.
3. Terminate all the routes in this AS manually.
4. Once the blocks are downloaded to the AS, reset these routes to automatic mode.

Note

As an AS can also be involved as a slave to another AS in a material transport, the routes in any other AS also have to be terminated manually.

In the Route Control Center, you can select "View Maintenance Tasks", which lists all automation systems and their statuses.

7.3.3 Downloading user blocks to the AS

Downloading user blocks to the AS

Important notes for importing blocks into the AS:

CAUTION

If you want to import a new version of Route Control blocks into the AS, you must follow the steps below:

- Deactivate the routes in which the target AS is involved.
  Do this by setting the routes to manual and deactivating them. This pertains to all routes for which this AS is the master or a slave.
- Compile the blocks
  If the block interface has changed (also pertains to parameter properties such as "S7_m_c=true"), the instance-data-block number can also change during compilation.
- Import the blocks.
- Restart the Route Control server
  This ensures that all of the AS data are reestablished in the server by means of a general request. This affects the instance DB number in particular.

CAUTION

The SIMATIC Route Control data blocks must not be read back from the automation system to the project's offline container on the engineering station (ES).
The offline container must contain the original blocks from the Route Control library!

This affects the following blocks:

- Route blocks DB 101 to DB 400
- The blocks for cross coupling DB 450 to DB 481
  and DB 751 to DB 781

Reason:
If data blocks are read back from the automation system to the engineering station, the current image (status of a portion of the elements of this route) is uploaded. If these data blocks are subsequently downloaded to the automation system again and the route has already been deactivated on this AS, elements are activated according to the latest image.

7.3.4 LOCK input on element blocks

LOCK Input

The LOCK input at the element blocks designed for interlocking elements currently has no function and is reserved for use in future versions.

7.4 Notes on Configuration

7.4.1 Creating a new S7 project for Route Control

Basic Procedure

Step	Procedure
1	Create a new S7 project in a multiproject.
2	Copy the Route Control blocks from the Route Control library to the master data library of your S7 project (including the DBs and UDTs).
3	Copy the Route Control blocks from the master data library into the block containers of the individual projects (including the DBs and UDTs) of your S7 project.
4	Perform a block type import in the CFCs of individual projects.

Note

A master data library can only exist in one multiproject.
You should therefore also create a single project in a multiproject.

For a single project, you need to manually copy the required DBs and all UDTs manually to the block folders of the automation systems.

7.4.2 Adapting the block ranges

Adapting the block ranges

The blocks in SIMATIC Route Control are considered user blocks in terms of an S7 project. The block range settings therefore have to be adapted in the CFC Editor.

This also applies if you want to use the STEP 7 Import/Export Wizard to create models in the project library, which does not yet contain any CFC charts.

Set the upper limits as follows:

- DB to 899
- FC to 899

Additional information

- Section: "Adapting the Block Ranges in CFC" (Page 309)

7.4.3 Optimizing memory requirements in the AS

Deleting Blocks Not Required

Better use can be made of the memory in an automation system if you delete unneeded blocks.

Route blocks

The blocks for the element list of a route have fixed block numbers which are assigned to route IDs according to the following rule:

Block number = route ID + 100

Route ID	DB no.
1	101
2	102
...	...
300	400

You can delete data blocks for route IDs that are not used in any of the automation systems.

One of the following conditions must be true:

- All route blocks use a fixed route ID;
- Only certain areas are permitted for dynamic IDs.

Example

Route ID	DB no.	Note	AS1	AS2	AS...	AS n
1	101	Fixed ID	X	X	X	X
2	102	Fixed ID	X	X	X	X
3	103	Fixed ID	X	X	X	X
4	104	Fixed ID	X	X	X	X
5	105	Fixed ID	X	X	X	X
6	106	Fixed ID	X	X	X	X
7	107	Dynamic ID	X	X	X	X
8	108	Dynamic ID	X	X	X	X
9	109	Dynamic ID	X	X	X	X
10	110	Dynamic ID	X	X	X	X
11	111	Not used	-	-	-	-
...	...	Not used	-	-	-	-
300	400	Not used	-	-	-	-

In this example, DB 101 to DB 110 must be available in all automation systems. You may delete DB 111 to DB 400.

If you install additional "RC_IF_ROUTE" route blocks in the CFC which do not operate with already available route IDs, download the DBs for all new IDs to all automation systems.

Blocks for REMOTE elements

If your project does not communicate with any elements of another project you can delete the corresponding REMOTE blocks:

Symbolic name	DB no.	Bytes	Name
RC_REMOTE_1	91	20630	Send/Rcv buffer for remote CE/SE/PE
RC_REMOTE_2	92	20630	Send/Rcv buffer for remote CE/SE/PE
RC_REMOTE_3	93	20630	Send/Rcv buffer for remote CE/SE/PE
RC_REMOTE_4	94	20630	Send/Rcv buffer for remote CE/SE/PE
RC_REMOTE_5	95	20630	Send/Rcv buffer for remote CE/SE/PE
		103150	Savings

Download the DBs of any REMOTE elements you install in the CFC at a later time to all automation systems.

Cross-coupling blocks

If your project only contains a single AS you can delete the DBs required for cross-coupling of several AS.

Symbolic name	DB no.	Bytes	Name
RC_XC_JOB_START	450	456	Cross Coupling Start
RC_XC_PUTX_1	451	936	Cross Coupling Send/Rcv-DB 1
RC_XC_PUTX_......	......	......	......
RC_XC_PUTX_31	481	936	Cross Coupling Send/Rcv-DB 31
RC_XC_PCU	704	960	Data block for cross coupling connections
RC_XC_JOB	705	31800	Data block for cross coupling jobs
RC_XC_1	751	844	Cross Coupling Instance DB 1
RC_XC_......	......	......	......
RC_XC_31	781	844	Cross Coupling Instance DB 31
		86396	Savings

Download the DBs of any additional AS you put into operation to all automation systems.

7.4.4 Optimizing the number of PCS 7 OS tags

PCS 7 OS Tags

The "s7_m_c" attribute is set to "TRUE" for a few input and/or output parameters for element interface blocks such as RC_IF_MOTOR in the Route Control library. This means that these parameters are created as PCS 7 OS tags during PCS 7 OS compilation.

If you do not wish to use these tags, for example, in PCS 7 OS pictures or for logging values, you can significantly reduce the number of PCS 7 OS tags.

A variety of options is available to reduce the number of OS tags:

- Do not create OS tags for individual input and/or output parameters
  Set the "S7_m_c" attribute to "FALSE" for the required parameter
- Do not create OS tags for the block
  Set the "S7_m_c" attribute to "FALSE" for the required block

---

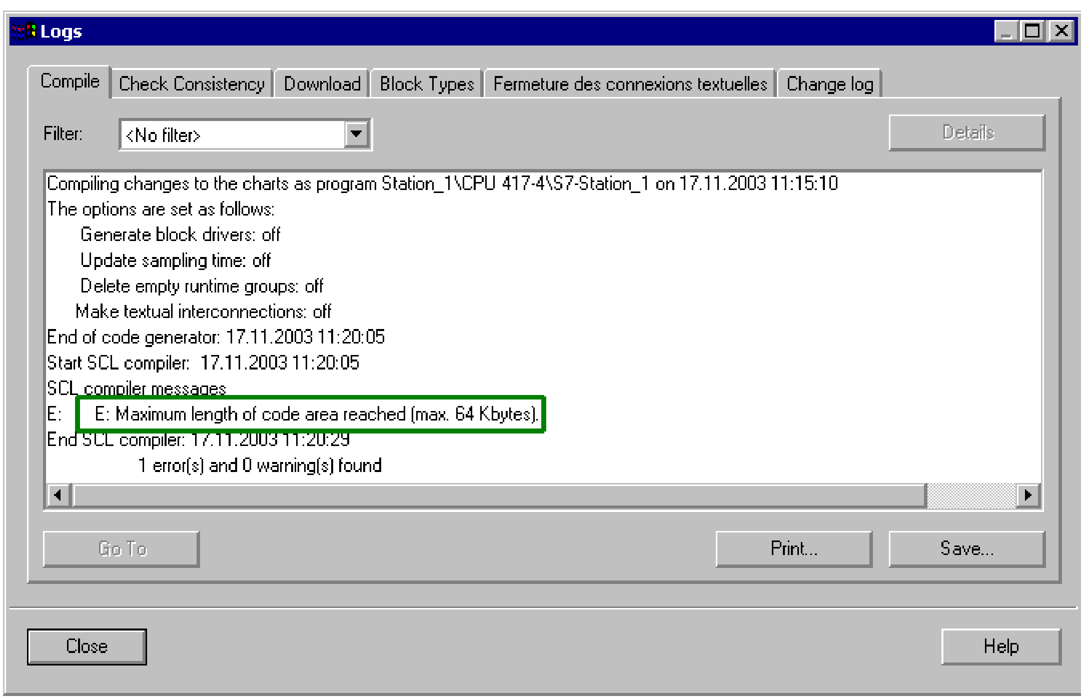
Note

As of version 7.0, the "s7_m_c" attribute in the interface blocks of the Route Control library is set to the value "FALSE".

7.4.5 SCL compiler error message

Problem

Compilation of CFC charts is acknowledged with the following message:

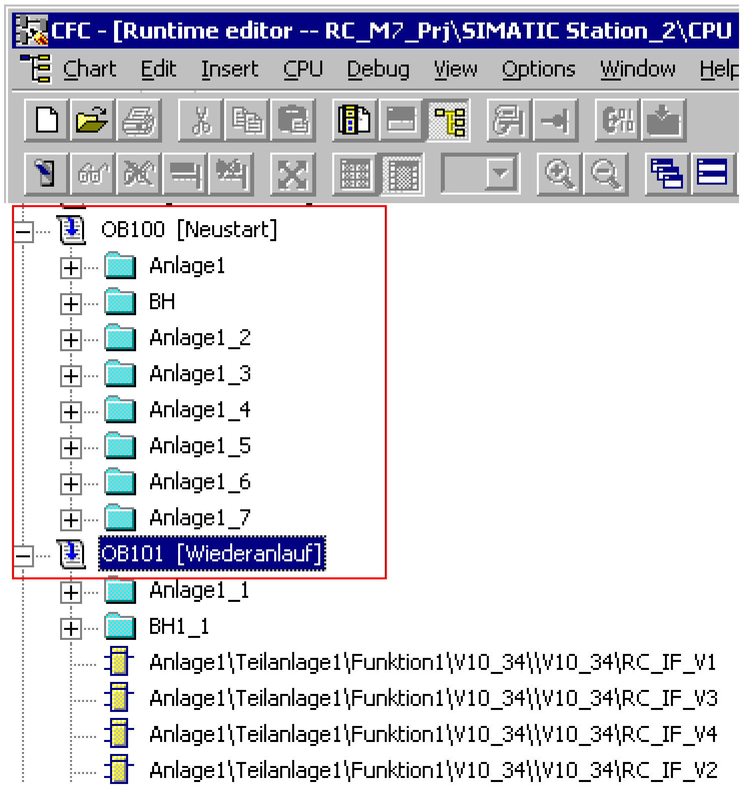


Reason:
Too many blocks were inserted directly at the highest level of an organization block.
Example: Interface blocks of elements in the startup organization blocks

Solution

In such a case, proceed as follows:

1. Create different runtime groups.
2. Distribute the block calls to these groups.



7.4.6 Calling RC_IF_SFC (FB 849) - Online Help

Direct Jump to Online Help

In the case of user blocks derived from FB 849 (RC_IF_SFC), a direct jump to the online Help system is now possible because the "Block family (S7_Family)" parameter was transferred correctly when the block was compiled by the CFC/SFC Editor.

7.4.7 Copying RC_IF_ROUTE route blocks

Copying RC_IF_ROUTE route blocks

If you copy charts in CFC containing RC_IF_ROUTE (FB800) type blocks to which a route ID has already been assigned, you must set the block input ID to 0 manually in the copied chart. The Route Control Wizard will otherwise detect several identical route IDs and automatically correct the ID in the original block. Thus, it would end up changing a correctly assigned route ID.

7.4.8 BSEND/BRCV and PUT

PUT/BRCV Calls

As regards communication between automation systems, there are two different types of data exchange:

- If communication between the automation systems takes place **within** the same Route Control project, Route Control uses **PUT** calls. with this type, the connections are specified, because the peer AS is known.
- If data are being exchanged with automation systems from **another** Route Control project, Route Control uses **BSEND/BRCV** calls. The connections are **unspecified**, because the peer AS is not known.

Note

In the second case, elements of the other Route Control project are mapped in the first Route Control project using "proxy blocks," such as RC_IF_REMOTE_CE.

This function has been designed to support the parallel control of **individual** elements from another area.
It has **not** been designed to enable a route to run on multiple automation systems in different Route Control projects.

Additional information

- Section "AS-AS and AS-Server Connection Configuration" (Page 245)
- Section "CFC Charts with REMOTE Elements" (Page 270)
- Section "Configuring REMOTE Elements" (Page 274)

7.4.9 Run Sequence of Blocks

Run Sequence of Blocks

When configuring Route Control, ensure that the blocks run in the sequence specified.

Additional information

- Section "Run Sequence of Route Control Blocks" (Page 307)

7.4.10 Location as a variant

Location as a variant

As of V7.0, do not configure locations in Route Control Engineering any more, configure them directly in SIMATIC Manager instead. The "Source", "Via" and "Destination" properties can be configured there.

The "Variant" property cannot be configured in SIMATIC Manager. However, this property can still be activated in Route Control Engineering.

7.4.11 Chart-in-chart technology

Object name

If you are using chart-in-chart technology with CFC and you insert element (RC_IF_MOTOR, etc.) or route (RC_IF_ROUTE) blocks, you must take the maximum length of the object name into consideration.

The Route Control Wizard will transfer up to 250 characters to the Route Control configuration. If this maximum length is exceeded, the Route Control Wizard issues a warning message and also generates an entry in the log file.

If character strings are too long, the Wizard only uses the characters at the end of the text and truncates the characters at the beginning of the name.

7.4.12 "LOAD" directory on the Route Control Server

The "LOAD" directory

The "LOAD" directory on the Route Control Server is used for loading the Route Control configuration.

Memory Expansion

The drive on which the Route Control configuration is located does not have enough available memory. Check the available memory on the relevant partition; at least 100 MB must be available.

7.4.13 Drop-down list box for selecting locations in plant pictures

Introduction

Refer to the "@pcs7typiclasrc.pdl" picture for three examples of the "rcCBox Class" control in Graphics Designer. You can insert these examples in your plant pictures so that locations can be selected from a drop-down list box there during process mode. The locations available in the project are offered for selection in this drop-down list box according to their type, with their PH names displayed. The location types offered in this drop-down list box, that is, "Source", "Via", "Destination", or "All Types", are defined when you program the control properties. The control determines the ID of the selected location and supplies it to the block input interconnected to "Loc ID".

Project Engineering

Program the following control properties:

Parameter	Data type	Meaning
RCServer IP	DWORD	Expects the IP address of the current Route Control server. You must interconnect this parameter to the "QSERV_IP" output of a route block (FB 800/ RC_IF_ROUTE), as this output supplies the IP address in the required format. (Example: 142.120.30.10 as 0A 1E 78 8Eh)
Loc Typ	BYTE	Selects the types of locations which are to be offered in the drop-down list box. You can select the following values: "eLoc_Type_Src - 1" for locations of the type "Source" "eLoc_Type_Via - 2" for locations of the type "Via" "eLoc_Type_Dst - 4" for locations of the type "Destination" "eLoc_Type_All - 7" for locations of all types Only the values listed in the table below can be used when programming the Loc Typ parameter manually. However, certain combinations are possible using scripts or variable interconnections, for example, the value "5" for selecting "Source" and "Destination" locations.
Loc ID	DWORD	Supplies the ID of the location selected from the drop-down list box. Interconnect this output to the appropriate location input of an RC_IF_SFC or a different automatic program, for example.
Enable	BOOL	Enables the control element for operation. Set this input to TRUE or interconnect it to a corresponding variable.

Example

Refer to the "@pcs7typiclasrc.pdl" picture for examples of the control in Graphics Designer.

Note

A script is linked to the "LocIDChanged" object event, and this is required in order for the control to function.

Use

The control is meant to be interconnected to an **automatic** program (e.g. the adapted RC_IF_SFC or a different user program).

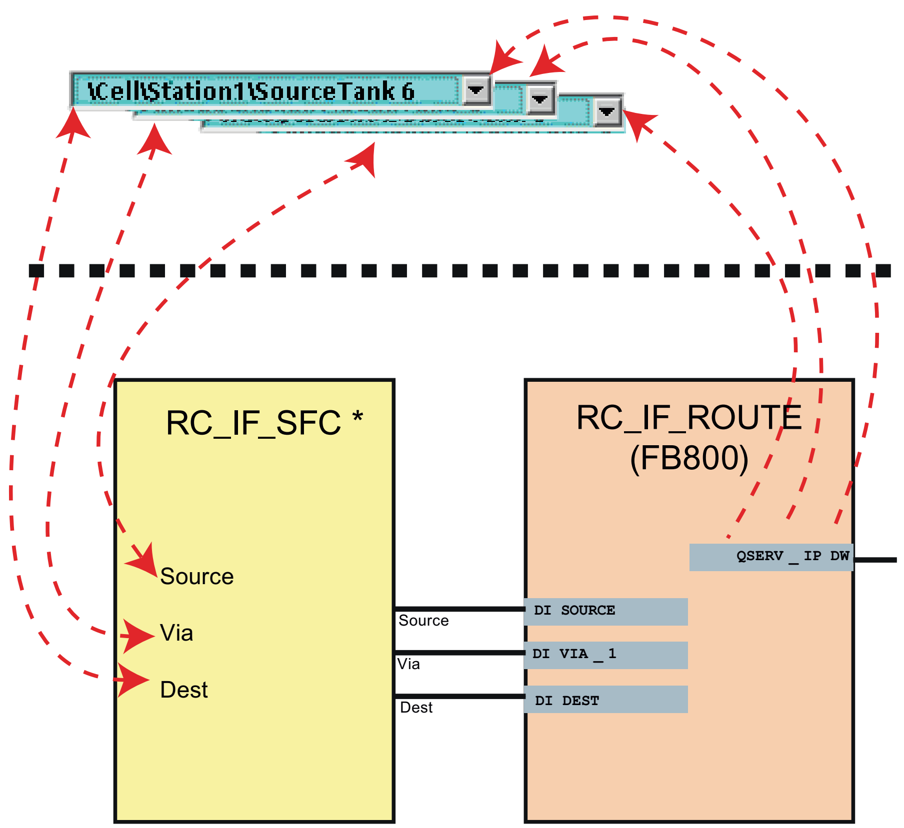


Image 7-1 Legend

* A different automatic program can be used

The dashed lines with arrows on either end indicate the direct interconnection (by entering a variable name) of the control properties.

The dashed lines with arrows on just one end indicate the flow of data from and to the drop-down-list-box control.

Inadvisable Use

It is not advisable to interconnect to an FB 800/RC_IF_ROUTE; see the information below:

- In route manual mode, the FB 800/RC_IF_ROUTE does not evaluate its location inputs. Therefore, it is not possible to use the control in this operating mode.
- The control could technically be used in route automatic mode, as the FB 800/ RC_IF_ROUTE does evaluate location inputs in this operating mode. However, there is a serious disadvantage to doing so: The control must be interconnected to the location inputs of the block via the Properties dialog, but in standard operation these inputs are already interconnected to an automatic program via CFC. This gives rise to a conflict, which will always be dominated by the CFC interconnection, as the interconnected values are always used when processing the block. This also means that the IDs selected in the control are not taken into account.

7.4.14 Compiling the script file for the Route Control Dynamic Wizard

Introduction

A Route Control faceplate is available for the operator control and monitoring of material transports in PCS 7 OS process pictures in the "@PCS7TypicalsRC.pdl" and "@Template_RC.pdl" templates. The Route Control Dynamic Wizard assists you in interconnecting this faceplate to the associated route block.

Note

The block icons are available in the "@PCS7TypicalsRC.pdl" and "@Template_RC.pdl" files.

The "@Template_RC.pdl" file basically includes the same block icons as the "@PCS7TypicalsRC.pdl" file with one important difference:

The block icons of the "@ PCS7TypicalsRC.pdl" file are used for automatic placement of the block icons in process pictures in the "Create/update block icons" function (in SIMATIC Manager).

The block icons of the "@Template_RC.pdl" file are used to manually add block icons.

Procedure

If the Route Control Dynamic Wizard is not yet available, compile it as follows:

1. In Windows, select the menu command
   Start > SIMATIC > WinCC > Tools > Dynamic Wizard Editor
   The Dynamic Wizard Editor appears.
2. Select the language as "English", "French" or "German" from the drop-down list in the toolbar.
3. Activate the language in the PCS 7 OS Explorer using the menu command **Options > Language**.

4. In the Dynamic Wizard Editor, open the script in directory <Drive>\Program Files\SIEMENS \WINCC\wScripts\wscripts.<Language>\\
   The following languages are available:
   deu = German
   enu = English
   fra = French.
   The script file is called rc_if_route_<L>.wnf.
   <L> stands for the language:
   a = German
   b = English
   c = French.
5. Compile the script in the Dynamic Wizard Editor by selecting the menu command **Dynamic Wizard > Create CWD.**
   The script will be compiled.
6. Change to the Graphics Designer. If you now select a Route Control object, a new tab called "RC Faceplates" appears in the "Dynamic Wizard" window.

You can now work with the Route Control Dynamic Wizard.

7.4.15 SIMATIC BATCH and SIMATIC Route Control

Blocks for Linking to SIMATIC BATCH

As of V6.1, you can link SIMATIC Route Control to SIMATIC BATCH using the following interfaces:

- RC_IF_ROUTE blocks
- SFC Typical

These interfaces are included in the Route Control library.

Interaction of SIMATIC BATCH and SIMATIC Route Control

The interaction of SIMATIC BATCH and SIMATIC Route Control has been simplified beginning with version 7.0.

You no longer configure locations in Route Control Engineering, you do this in SIMATIC Manager. The locations are assigned unambiguous IDs within the entire project.
For further information, refer to the section
"Configuring locations" (Page 328)

The locations are imported by both BATCH and Route Control.

An instance of an SFC type that controls a Route Control route block is used as an interface between BATCH and Route Control. The instance can be configured as a recipe function (EPH category) or as a recipe operation (EOP category) and used in a recipe in BATCH.

In the Route Control library located in the "Templates" folder, you will find the example SFC type "RC_IF_SFC_SB", which is defined as an EPH and prepared for use by SIMATIC BATCH and SIMATIC Route Control.

If you use an instance of this type in BATCH, you will see the new "Transfer Parameters" tab in the properties dialog of the block for the recipe. There, you configure the locations for the source and destination and the vias, as required. These transfer parameters are configured in the SFC type in the characteristics editor as setpoints. These setpoints are outputs of the SFC instance that must be interconnected to the route block of Route Control.

As an example for the interconnection of this type of instance to a Route Control route block, you will find the CFC chart "ROUTE_SFC_SB" in the "Templates" folder of the Route Control library.

Reaction of BATCH to failure of the Route Control Server

The Route Control block "RC_IF_CFG" (FB 850) generates a message in order to report any failure of the Route Control Server.

BATCH does not detect this failure. A Batch with active transfer phase remains in wait state.

You can change this reaction by interconnecting the inverted output "Comserv1" of the "RC_IF_CFG" block with input "BA_EN" of the EPH block.

If the Route Control Server now fails within a transfer phase the phase and the unit enter the fault state on expiration of a waiting time of 10 seconds.

You can resume the Batch operation after recovery of the Route Control Server.

BATCH View in the Route Control Faceplate

In order for the BATCH data to be displayed in the Route Control faceplate, the following inputs of the RC_IF_ROUTE must be interconnected with the appropriate outputs of the SFC type:

Input	Meaning
BA_EN	Released by BATCH
OCCUPIED	Allocated by BATCH
BA_NA	Name of batch
STEP_NO	Step number
BA_ID	Batch ID

7.5 Notes about the Route Control Wizard

7.5.1 Transferring from an S7 project

Data to be Transferred

The Route Control Wizard can be used to transfer data configured in SIMATIC Manager to Route Control Engineering.
You can transfer the following data from an S7 project or the projects associated with an S7 multiproject:

- Plant hierarchy
- Elements
- Routes
- Locations
- Automation systems

Note

You do not have to assign route IDs at the RC_IF_ROUTE blocks manually. If your project has a maximum of 300 route blocks, you can leave the FIXED_ID input with a value of 1 and the ROUTE_ID input with a value of 0 at all route blocks. The Wizard then assigns unique fixed route IDs.
If there are more than 300 route blocks, use the dynamic ID assignment procedure. You can find information about this in
"Guide to Dynamic ID Assignment" (Page 284).

Leave the assignment of the RC_IF_xxx interface block IDs to the wizard too.

The Route Control Wizard recognizes the automation systems that are relevant for Route Control at the inserted block RC_IF_CFG and creates all NetPro connections for the cross-couplings.

The Route Control Wizard recognizes the PC stations that are relevant for Route Control at the inserted RC applications and creates the AS-server connections too.

Additional information

- Section "Transferring Data From an S7 Project" (Page 343)

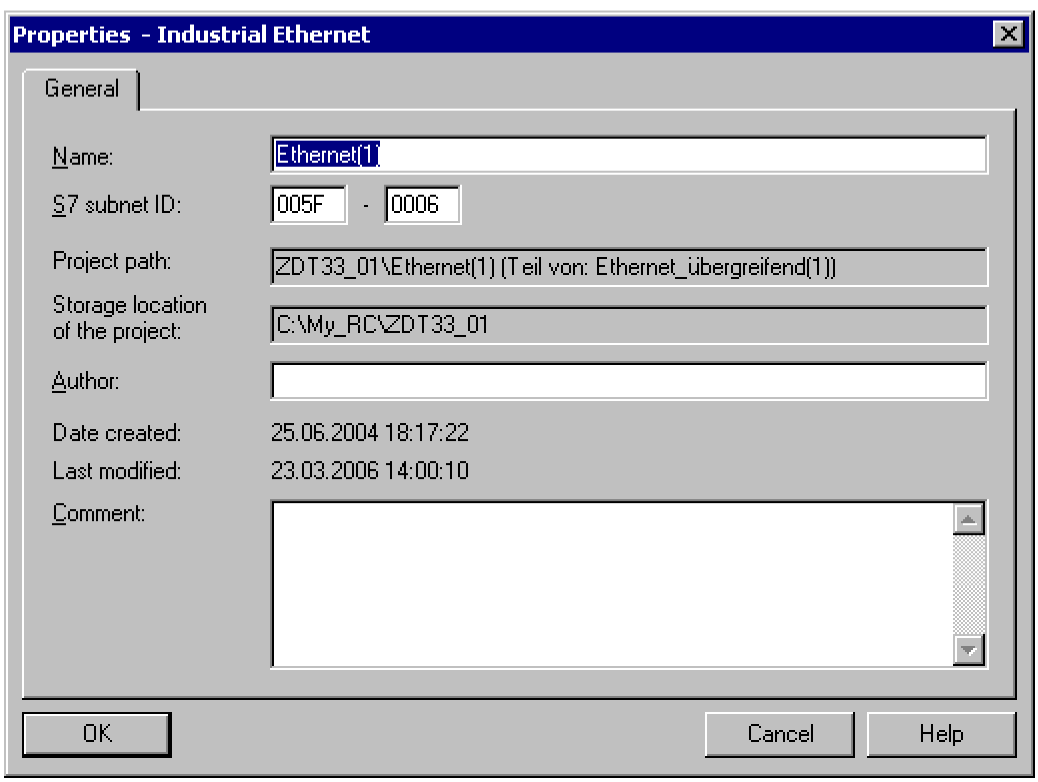
7.5.2 Route Control Wizard Start Requirements

Requirements

The following requirements must be met in order for you to start the Route Control Wizard and create S7 connections:

- All automation systems relevant for SIMATIC Route Control use either an IP address or a MAC address; a combination of the two is not permitted.
- If all automation systems relevant for SIMATIC Route Control use an IP address:
  The network parameters have been parameterized correctly.
- If a number of automation systems have been allocated to a number of individual S7 projects in one multiproject:
  The network properties (network name, S7 subnet ID, see figure below) must be identical in all of the individual S7 projects.
- All applications with write access are closed (e.g., HW Config, NetPro).
  This is necessary because the Route Control Wizard has to access the S7 connection data as well as to change or reenter them.

You can find additional information in
"Industrial Ethernet Properties" (Page 87).



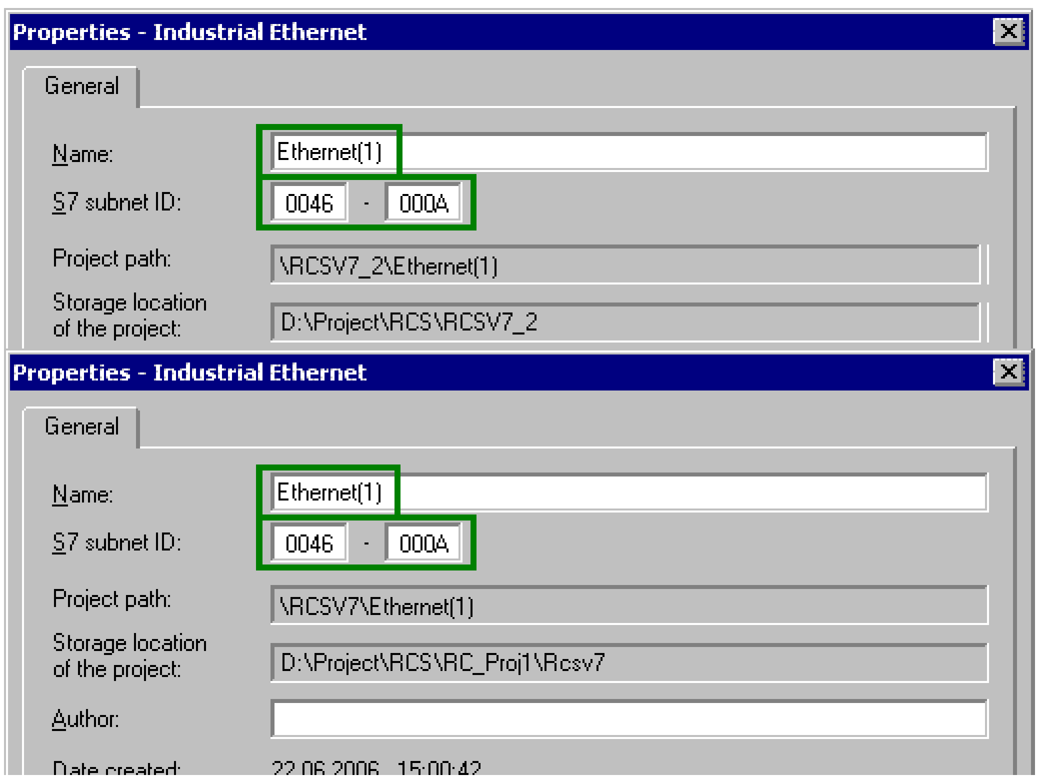
Note

Use the "Project Synchronization" SIMATIC Manager function to automatically adjust these settings for all projects as well as the individual projects of a multiproject.

7.5.3 Industrial Ethernet properties

Industrial Ethernet properties

The figure below shows the Industrial Ethernet properties of two S7 projects:



The name and S7 subnet ID must match in both projects.

You can merge cross-project connections in NetPro.
To do this, select the menu command
Edit > Merge Connections in NetPro.

7.5.4 Computer name and IP address of the Route Control server

SIMATIC Route Control Version 6.1

Up until version 6.1, you needed to enter an IP address for the Route Control server(s) in the Route Control Wizard or configure a computer name. The computer name was required in order to download the RC server from the RC Engineering tool (shared drive). The computer name of the server was also used by the wizard to correctly set the "PCS 7 OS-dependent startup" and "PCS 7 redundancy logon" switches.
You can find additional information in
"Overview of Project Settings" (Page 390).

SIMATIC Route Control Version 6.1 SP1 and Higher

As of V6.1 SP1, "Route Control applications" are configured in HW Config. The Route Control Wizard uses these to automatically detect the stations where Route Control applications are running and the other applications, which are also running on the same stations. As of version 6.1 SP1, you do not have to specify the computer name of the Route Control server or enter its IP address.
The two global settings referred to above are also ascertained automatically.

You can find additional information in
"Hardware Configuration (HW Config)" (Page 313).

7.6 Notes on route configuration

7.6.1 Route search basics

What is the route search?

The route search is used to establish a connection between a starting and destination location by stringing together configured partial routes. This search can be affected by specification of certain parameters, such as VIA points or priorities of partial routes.

7.6.2 Routes

What is a route?

Although routes or material transports are indeed visible in RC Engineering, they are no longer configured. Routes "come into being" at the moment of the route search via the assembly of partial routes.

You define a route by indicating the following parameters:

- Mode table
- Function ID
- Material
- Source and destination location
- Up to 10 VIAs

7.6.3 Partial routes and VIAs

Relationship between partial routes and VIAs

A partial route is the connection between two locations. A route consists of at least one, but generally several partial routes.

VIAs are intermediate destinations that can be used for configuring partial routes.

Note

If VIAs are predefined in the route search, they must be used for the route to be searched. This means that the course of the route can be affected with the use of VIAs.

Create partial route

You create and program partial routes in Route Control Engineering.

A partial route is always an object within a mode table. Partial routes generally contain elements (e.g., control elements such as valves), that are "incorporated" into different mode levels with a different activation. The sum of the partial routes forms the route network of the process cell.

Types of partial routes

Specify how partial routes are used during the route search:

- As unidirectional partial routes
- As bidirectional partial routes

The difference lies in the fact that unidirectional partial routes in the route search are used only in the direction that is established by start and final point.

Bidirectional partial routes, on the other hand, can also be used from the final point to the start point, whereupon the number of combinations for routes is normally greater.

However, there is a danger that circular or undesired routes are found.

Priority of a partial route

You can weight partial routes in the configuration by specifying various values (1 – 9999) for the "priority" parameter. The smaller the numerical value, the higher the priority. In the route search, the priorities of the individual partial routes are added up. The path with the smallest priority sum is selected.

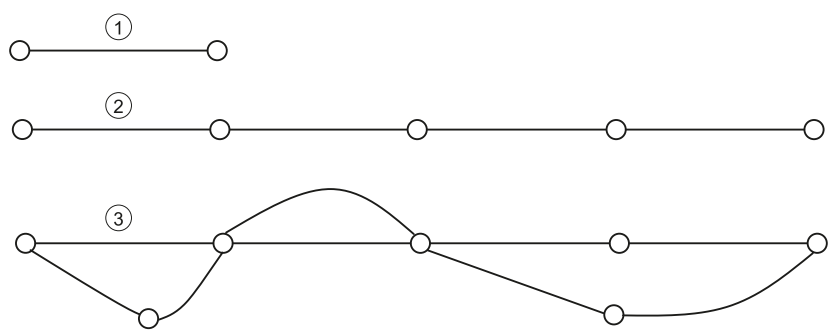
Establish the priority in the configuration and enter the value you have selected as a parameter of the partial route. For example, you can take the following criteria into account to set the priority of a partial route:

- Length of pipeline
- Number of elements in the route
- Particular elements, such as pumps, that have not been used as heavily

7.6.4 Assembly of routes

In RC Engineering, **partial routes** are always defined between two locations (hereinafter referred to as connection points). A **route** is constructed by stringing together partial routes to produce a path which connects source and destination. A special case is a path that consists of exactly one partial route.

As such, multiple possibilities are produced for "putting together" routes:



① A route consists of a single partial route:

The connection points of the partial route are both the start (source) and final point (destination) of the route.

A route consists of several partial routes:

Depending on the configuration of the partial routes, there are two possibilities:

- ② One route is permanently defined, because the sequence of the partial routes permits only one path.
- ③ Alternative partial routes are defined so that multiple paths can lead from the source to the destination.

Particularities

Elements (e.g. valves) can only be used in an active route (except in the case of "friendly routes", see 9.1.11 Guide on friendly routes).

The following exception applies here however:

Elements incorporated in partial routes that serve only as querying, i.e. passive ("?" identifier), elements can be used simultaneously even in multiple routes.

- **Priority**
  There is a possibility that several paths with the same sum of priorities from the partial routes (length) lead to the final point in different ways. The path actually used as the shortest path then is arbitrary.
- **VIA points**
  Dynamically, the course of a route can also be determined by assignment of intermediate locations (VIAs). The route is then determined in several stages by searching for the shortest route between the pre-determined route points. Depending on the configuration, it may be possible that a route cannot be found. This can happen, for example, when the first section of the route contains a partial route already in use that absolutely requires a different, subsequent route section. However, a solution may possibly be found by assigning different partial route priorities.
- **Saved routes**
  If a specific route is always to be used for a combination of source, destination, and VIAs, a route can be determined in the offline search and then saved.
  It is possible to save an active route in the Runtime system.
  These routes can be used via the "Start saved route" function.

Offline and online route search

The Route Control route search offers different variants depending on the processing environment (RC Engineering or RC Runtime System):

The search for the shortest route is conducted in Route Control according to the Dijkstra algorithm:

- In **RC Engineering** (offline route search), you can check the routes that are possible based on the present configuration using the function "Check route".
  For this purpose, the route network is shown in a graphical display. Here you can specify the source, destination, and any VIA points of a route and start a route search by operating according to various criteria:
  - Search for the shortest route
  - Search all routes
  - Search the main routes
- In the **RC Runtime System** (online route search), the shortest route is always searched. The route search is likewise specified by indicating source, destination, and any VIA points (on the RC_IF_ROUTE block), started using an RC_IF_ROUTE entry, and executed by the RC server.

Shortest route

By setting priorities for the partial routes (from 1 to 9999) a length is assigned to a partial route; the sum of the partial route priorities from the starting point yields the length of the route.

In the route search, a search is made from the starting point to the connection point over the partial route having the lowest priority. The starting point is assigned to this connection point as the preceding point, and the sum of the priorities of the partial routes (lengths) is noted up to this connection point. Since this connection point has now been reached, all steps in the search sequence that reach **this** connection point in a **later search step** are classified as unsuitable and rejected. The next search step always starts from the connection point that has the smallest sum of the priorities of all partial routes. These search steps are performed until the goal is achieved.

Online as well as offline route searches can be affected by additional parameters:

- Specifying additional route points (VIAs) that must be included in the route.
- Weighting of the partial routes by assignment of various priorities ("length") to partial routes.

Differences between offline and online search

There are two **essential differences**:

- In the **offline search**, locations can certainly be excluded when running the route search. Otherwise, all configured elements and partial routes are available for the search because only **one** route search or one route is ever active when offline. Routes which are active simultaneously, such as those in the Runtime System, do not exist and, therefore, cannot affect the offline search.
- The **online search**, by contrast, takes the **current system state** into account. As such, elements of a partial route may not be available and could cause this partial route to not be available for the route search. Moreover, in the Runtime System up to 300 routes may also run simultaneously, by which partial routes are already assigned that would also be needed for the route search just started. In this case, a search is made for alternative partial routes.
  See also on this Guidelines on concurrent routes (Page 236).

7.6.5 Variants in the route search

Introduction

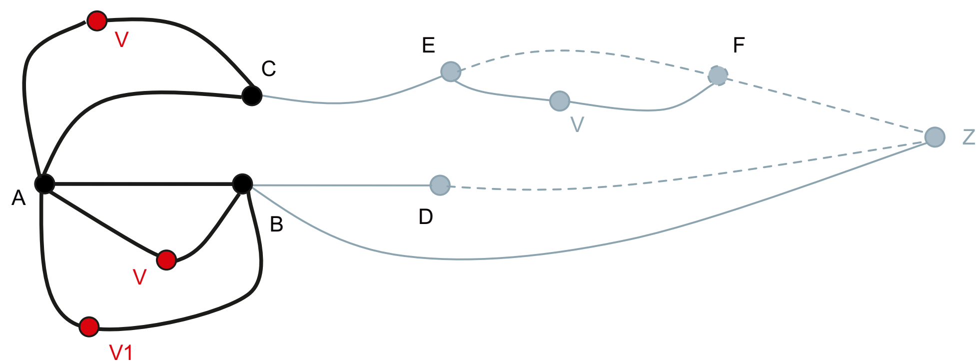
When configuring partial routes, assigning a variant to a partial route is possible.

A variant is a fictitious location within a partial route, which is specified in addition to the start and final point.

With one variant, you can define alternative partial routes with an identical start and final point.

The following picture shows two examples.

In the example, from A to B three - with the variants V and V1 - and from A to C two alternative "paths" - with the variant V - are defined.



Start and final point of a partial route (all prio 1)

Variant of a partial route

Properties

A location that is used as a variant must be of the "VIA" type. The location must be neither source nor destination.

If a partial route was configured with a variant, this gets preference over partial routes without variants, to the extent that in the route search, the variant location was specified as VIA. In this way, with reference to the overall route, the assessment of the priority can be suspended.

Restrictions

If several partial routes are configured with the same variants between the start and final points, the first variant "found" in the route search is used.

If the location V is used in the above example as the variant in a route search from A->Z, it cannot be predicted whether the partial route A->B or A->C is used.

Route search

Note

Variants are only considered in the ONLINE route search.

In the online route search, the desired variant must be "given" as VIA parameters.

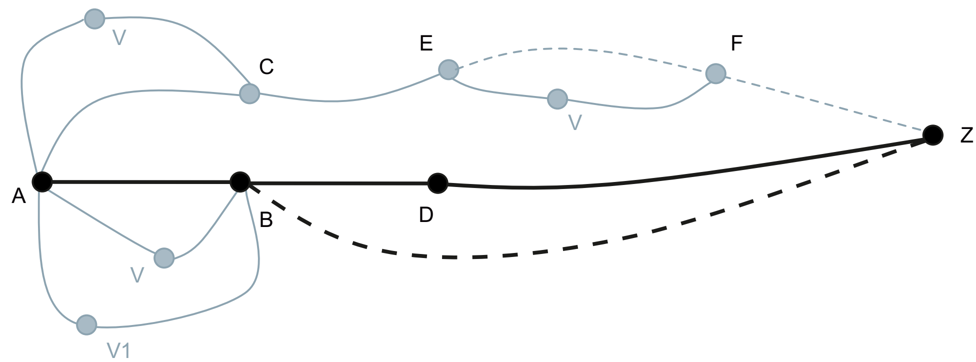
It would be possible to come to the conclusion that the "variant" of a partial route can be replaced by dividing the partial route A->V->C into two partial routes (A->V and V->C).

However, the conclusion is not correct because the route algorithm variants are otherwise assessed as VIAs.

VIA:

A VIA is a fixed start or final point of a **partial route**, that can "run through" an **overall route** only **once**. The search starts with the source and first goes in the direction of VIA1, from there to VIA2 etc., and lastly to the destination.

Specifying point D as VIA for the route A->Z enables the route A->B->D->Z to be found instead of the route A->B->Z.



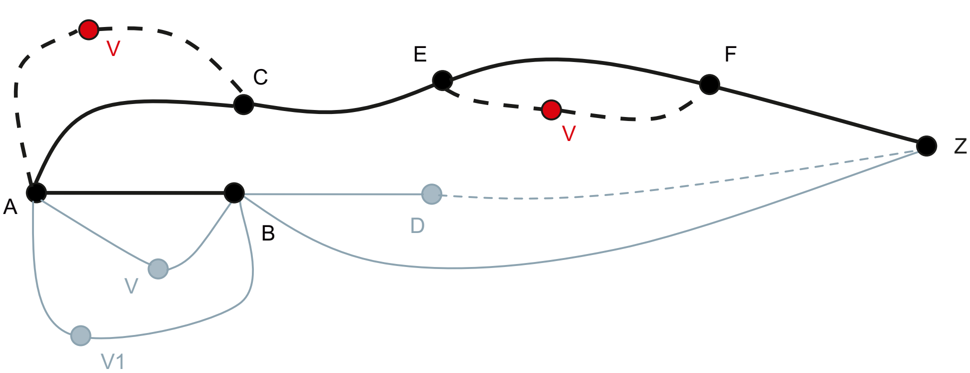
● Start and final point of a partial route (all prio 1)

Variant:

A variant is individually evaluated, as opposed to the VIA, for each **partial route**. It can be "present" in an **overall route** several times.

In simplified terms, the search for an overall route from A->Z (with specification of the variant V) begins from A out into all permissible directions (thus A->C and A->B).

If, for example, A->C was found as the first partial route (that is before A->B) **and** this includes a variant V, the partial route A->C with the specified variant V is selected. As a result, C becomes the starting point for the additional search. *B is no longer considered.* However, if the variant V1 were to be specified in the route search, this compels the partial route A->B via the variant V1 to be taken and the route search is continued from the location B.



● Start and final point of a partial route (all prio 1)

● Variant of a partial route

As such, a lower priority overall route can be selected because a specific "direction" was adopted by using a variant partial route.

However, the advantage of this type of assessment consists in the fact that the specification of **one** variant makes it possible to use the respective alternative route (with the variant) for **several** partial routes of **one** overall route or not:

A->Z without variant V:	Partial routes: A->C	/ C->E	/ E->F	/ F->Z
A->Z with variant V:	Partial routes: A->**V**->C	/ C->E	/ E->**V**->F	/ F->Z

7.6.6 Route search in theory

Depending on the configuration of the partial routes, a route network can become unimaginably large.

This topic can be well illustrated using "taxi geometry". In the case of taxi geometry, the shortest route between two points in a right-angle street system is always sought.

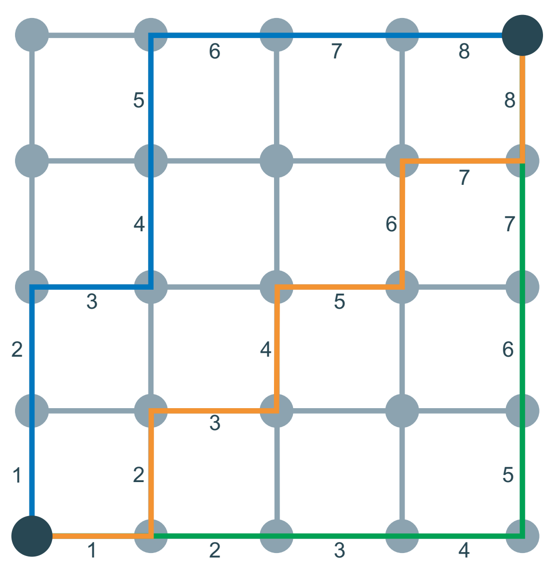
Example "taxi geometry"

In this example, a 2-dimensional right-angle route network with sides of 5 by 5 locations is used.

In this small route network alone, 40 partial routes can be formed as long as you only connect the adjacent connection points by horizontal and vertical partial routes of the same priority.

If you select diagonally opposite corner points as the start and final point of a route, then in this example, 70 different equally short routes are created, also known as a "Pascal’s triangle". These routes all use only a maximum of 8 partial routes.

The following illustration shows, for example, 3 to 70 possible paths:



However, if you permit solutions with more than 8 partial routes, the number of possible routes increases by leaps and bounds. In this case, detours are also determined.

The route search for the "shortest route" in this example determines only one of the 70 shortest possible routes, which is formed from 8 partial routes. The route selected is random.

Searching for the "main routes" supplies all 70 shortest possible routes.

In this example, the search effort for "all routes" is already substantial and takes too long.

Block library

8

8.1 Classification of Route Control Blocks

Classification of Route Control Blocks

SIMATIC Route Control blocks can be classified according to function and architecture. Blocks to be inserted into CFC charts begin with "RC_IF".

	User interface	Configuration blocks
Configuration	-	RC_IF_CFG (FB850) (Page 172)
Diagnostics for cross-coupling	-	RC_IF_XC_DIAG (FB884) (Page 178) RC_IF_XC_LIFE (FC884) (Page 182)
Routes	RC_IF_ENCODER (FC800) (Page 128) RC_IF_ROUTE (FB800) (Page 101) RC_IF_DECODER (FC801) (Page 129)	-
Local elements	RC_IF_MOTOR (FB822) (Page 138) RC_IF_MOT_REV (FB823) (Page 142) RC_IF_MOT_SPED (FB824) (Page 146) RC_IF_VAL_MOT (FB825) (Page 134) RC_IF_VALVE (FB826) (Page 131) RC_IF_LE (FB828) (Page 166) RC_IF_SENSOR (FB845) (Page 154) RC_IF_CONDUCT (FB846) (Page 156) RC_IF_VOLUME (FC808) (Page 163) RC_IF_TIMER (FC809) (Page 164) RC_IF_USER_CE (FB829) (Page 150) RC_IF_USER_PE (FC807) (Page 165) RC_IF_USER_SE (FB848) (Page 159)	-
Remote elements	RC_IF_REMOTE_CE (FB821) (Page 185) RC_IF_REMOTE_SE (FB842) (Page 187) RC_IF_REMOTE_PE (FB843) (Page 190)	RC_IF_REMOTE_SEND (FB831) (Page 193) RC_IF_REMOTE_RECV (FB833) (Page 196)
Special blocks	RC_IF_ROUTE_SFC (FB849) SFC Overview (Page 279)	-

You can find information about the kernel blocks in "Overview of Kernel Blocks" (Page 198).

Note

During configuration, please note theRun Sequence of Route Control Blocks (Page 307).

Additional information

- Section "General Information About Block Descriptions" (Page 98)

8.2 General information about block descriptions

Block Description

The blocks are always described according to the following structure:

- Heading
- Description
- Inputs and Outputs
- Return Value
- Configuration

Block Description Heading

The block name consists of the following elements:

- Type name
- In parentheses after the type name
  - Type (FB, FC, DB, UDT)
  - Number

Description

Here the block function is briefly described.

Inputs and Outputs

The connections provide the data interface of the block. You can use this interface to transfer data to the block and obtain results from the block.

In each block description, the tables present all the connections (input and output parameters) that you can access with your configuration tools. Connections that can only be accessed from the block algorithm ("internal tags") are not shown.
The meanings of the columns are as follows:

Column	Meaning/Range of values
Parameter	Name of I/O derived from the English designation. Outputs start with Q...
Meaning	Function, brief description
Type	S7 parameter data type (e.g., BOOL, REAL, DINT, INT)
Default	Value of parameter prior to the initial block run (unless changed during configuration)

Column	Meaning/Range of values
Input or Output	Type of block-algorithm access to the parameter: • Inputs (I) Input parameter, parameter assignment for block, shown left of the block in CFC • Non-interacting inputs (IO) Input and output parameter, non-interacting input that can be written by the PCS 7 OS and written back from the block, shown left of the block in CFC • Outputs (O) Output parameter, output value, shown right of the block in CFC
Attr.(Attribute)	Additional parameter features for use in CFC. Non-interconnected input parameters and input/output parameters can be assigned parameters (input/output parameters only in the case of FCs online). Output parameters can not be assigned parameters and can be transferred in the CFC by interconnection to an input of the same data type. Additional or alternative parameter properties are specified as follows: • Q: Interconnectable The connection can be interconnected to another connection of the same type. • U: This parameter is invisible in the CFC. The connection is not shown in the CFC (for example, message ID/event ID) because it is supplied by this block. This setting can be changed in the CFC. • V: This parameter is visible in the CFC.
OCM	The connections labeled with a plus sign (+) have received the attribute for operator control and monitoring (s7_m_c = true). These enable operator control and monitoring by means of suitable PCS 7 OS blocks. Operator control and monitoring is not possible for connections labeled with a minus sign (-).
Permitted values	Additional limitation about the range of values for the data type. If a limitation is not specified, the full range of data-type values applies.

QRET_VAL Return Value

Some blocks have an extensive range of return values. A separate table lists the values and their meanings here.

Configuration

Finally, the most important steps required to use this block are given. If necessary, supplementary notes are also provided here.

8.3 Interface Blocks

8.3.1 Interface Block Overview

Block Overview

The Route Control interface blocks with names beginning RC_IF_... include the following blocks:

Block type	Blocks
Blocks for activating a route	RC_IF_ENCODER (Page 128) RC_IF_ROUTE (Page 101) RC_IF_DECODER (Page 129)
Blocks for interfacing of control elements (CE)	RC_IF_VAL_MOT (Page 134) RC_IF_VALVE (Page 131) RC_IF_MOTOR (Page 138) RC_IF_MOT_REV (Page 142) RC_IF_MOT_SPED (Page 146) RC_IF_USER_CE (Page 150)
Blocks for interfacing of sensor elements (SE)	RC_IF_CONDUCT (Page 156) RC_IF_SENSOR (Page 154) RC_IF_USER_SE (Page 159)
Blocks for interfacing of parameter elements (PE)	RC_IF_VOLUME (Page 163) RC_IF_TIMER (Page 164) RC_IF_USER_PE (Page 165)
Blocks for interfacing of link elements (LE)	RC_IF_LE (Page 166)
Blocks for configuration and cross-coupling	RC_IF_CFG (Page 172) RC_IF_XC_DIAG (Page 178) RC_IF_XC_LIFE (Page 182)
REMOTE blocks	RC_IF_REMOTE_CE (Page 185) RC_IF_REMOTE_SE (Page 187) RC_IF_REMOTE_PE (Page 190) RC_IF_REMOTE_SEND (Page 193) RC_IF_REMOTE_RECV (Page 196)

Additional information

- During configuration, please note theRun Sequence of Route Control Blocks (Page 307).
- with regard to the element names adopted from the S7 project, note also the information in "Chart-In-Chart Technology" (Page 79).
- You can use the RC_IF_USER_CE, PE and SE blocks to develop custom block types. You can find additional information on this in the section "Example for User-Defined Type" (Page 168)

8.3.2 Routes

8.3.2.1 RC_IF_ROUTE (FB 800)

Description

This block is the **central interface of a route** to the user program and the counterpart to the Route Control faceplate in the PCS 7 OS picture. The following tasks are performed on this block:

- Definition of route parameters (source, destination, via, mode, and material, for example)
- Starting, holding, and ending material transports
- Defining setpoints for monitoring times (status-monitoring time, error tolerance time)
- Specifying dynamic setpoints for external parameter elements
- Transferring batch ID, batch name, and step number from a BATCH system

The block controls exactly one route, i.e. one material transport. It provides additional information about the status of the route and its elements to the user program by means of output parameters.

Typically, one user-defined SFC derived from RC_IF_ROUTE_SFC and one RC_IF_ENCODER (FC 800) (Page 128) is connected upstream of RC_IF_ROUTE and one RC_IF_DECODER (FC 801) (Page 129) is connected downstream of RC_IF_ROUTE.

An overview of the relationship between SFC, route and operator dialogs is provided in the section
"Relationship of SFC and Route with Operator Dialogs". (Page 280)

Dynamic or Fixed Route ID

A route can be operated with a fixed route ID.
For additional information see the section
"Valid Route IDs" (Page 603).

Dynamic route IDs are primarily used when a project contains more than 300 routes. This procedure ensures that no more than 300 material transports take place simultaneously.

Even if a project contains fewer than 300 route blocks, dynamic ID assignment can still make project engineering easier and prevent duplicate assignment of IDs.

For additional information on this see section
"Guide to Dynamic ID Assignment (Page 284)".

Organization Blocks (OB)

In general, the RC_IF_ROUTE block can be inserted in any OB. However, the only useful OBs are the time blocks OB 30 to OB 35, or OB 1.

Note

For process cells with up to 30 material transports, the RC_IF_ROUTE can be inserted in the free cycle OB 1.

Generally, the following applies: The processing speed of RC_IF_ROUTE should not exceed that of the kernel blocks of Route Control.

The kernel blocks of Route Control are processed in OB1, which means the processing time of the RC kernel blocks can be read at the OB 1 cycle.

Due to the required communication between AS and RC server during "operation" of routes (requesting, starting, etc.), we recommend that you do not call the RC_IF_ROUTE any faster than in a one-second cycle.

Inputs and outputs

Note

You can find detailed information on setting the parameters of the ROUTE_ID and FIXED_ID inputs in the section "Guide to Dynamic ID Assignment" (Page 284).

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
ROUTE_ID	Route ID that is unique across all ASs in a Route Control project	INT	0	I	V	-	0 ... 300 The meaning depends on the FIXED_ID input.
FIXED_ID	Indicates whether the route ID is to be assigned dynamically or fixed.	BOOL	FALSE	I	VQ	+	0: Dynamic ID assignment 1: Fixed ID assignment
RES_MAN	When the route is controlled manually, i.e. via the Route Control Center, the user program can use this signal to return the route to automatic mode.	BOOL	FALSE	I	VQ	+	0 -> 1: Positive edge resets to automatic mode. 1 -> 0: No evaluation takes place.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
FUNC_ID	Function ID of route, important for the route request	INT	-	I	VQ	+	0: System assigns route ID as function ID FUNC_ID = QID 1...300: Assigned by the system 301...32,000: User-defined You can find additional information in the section "Valid Function ID" (Page 604).
MON_TM	Substitute value of the status-monitoring time in seconds: Maximum time that may elapse before all elements have reached the position setpoint after a mode level has been activated. For additional information, refer to the inputs MON_TM1..32.	INT	30	I	VQ	+	1 ... 32767 The monitoring time goes into an endless loop if the value 32,767 is set.
FLT_TM	Substitute value of the fault tolerance time in seconds: Maximum time that may elapse before an element returns to the position setpoint after having left the already reached position setpoint. For additional information, refer to the inputs FLT_TM1..32.	INT	10	I	VQ	+	1 ... 32767 The monitoring time goes into an endless loop if the value 32,767 is set.
MON_TM1 ... MON_TM32	Status-monitoring time for mode level #1 ... Status-monitoring time for mode level #32	INT ... INT	-1 ... -1	I ... I	UQ ... UQ	- ... -	-1 Substitute value MON_TM will be used. >0: Time in seconds =32767: Deactivated
FLT_TM1 ... FLT_TM32	Fault tolerance time for mode level #1 ... Fault tolerance time for mode level #32	INT ... INT	-1 ... -1	I ... I	UQ ... UQ	- ... -	-1 Substitute value FLT_TM will be used. >0: Time in seconds =32767: Deactivated
MODE	Mode levels to be activated; this 32-bit value is an OR operation of 32 binary signals, whereby each binary signal stands for one mode level.	DWORD	-	I	VQ	+	1 ... 2 to the power of 32 -1
SOURCE	Starting point for a route (source of material transport)	DINT	L#0	I	VQ	+	0: Not permitted >0: ID of the location from Route Control Project Engineering

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
VIA_1 ... VIA_10	Via location #1 for a route ... Via location #10 for a route	DINT ... DINT	L#0 ... L#0	I ... I	VQ ... VQ	+ ... +	0: Permitted, but location will be ignored >0: ID of the location from Route Control Project Engineering
DEST	Destination for a route (destination of material transport)	DINT	L#0	I	VQ	+	0: Not permitted >0: ID of the location from Route Control Project Engineering
MODE_TBL	Parameters for route request mode table	DINT	-	I	VQ	+	0: All partial routes in all mode tables are searched. >0: Only partial routes that are assigned to this mode table in Route Control Project Engineering are taken into consideration.
MATERIAL	Material to be transported; this parameter only has to be specified under the following conditions: • Link elements can be used for visualization. • During the route search, material compatibility relative to the previously transported material will be assessed. Otherwise, 0 is applied here.	DINT	-	I	VQ	+	0 or 1 ... 1024
MATSTAUT	"Material Set Automatically" You can find a sequence diagram and a description in the section "Material Sequence Diagram for RC_IF_ROUTE" (Page 459).	BOOL	TRUE	I	VQ	-	0: Material is not applied automatically. 1: Each time a route switches to the "Active" status, the material in the link elements is applied.
SET_MAT	The MATERIAL parameter is applied to all link elements involved in the route; A positive edge sets the material. This function cannot be executed unless the route has a valid route list in all of the automation systems involved. The status of the route must be at least "Ready to start".	BOOL	FALSE	I	VQ	-	0 -> 1: Material is applied. 1 -> 0: No evaluation takes place.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
IGN_ERR	This parameter indicates the route response in the event of a fault.	BOOL	FALSE	I	VQ	+	0: NO = In the event of an error, the route is held and the active elements are switched off. 1: YES = Error is ignored and route operation continues. Notice: The active elements are not switched off.
SOLID	Indicates whether this route involves the transport of solid materials: This parameter affects the route search and the interlocking of route elements. In addition, the order of elements in a partial route plays an important role (enabling from destination to source). **This function is reserved for future use!**	BOOL	FALSE	I	UQ	+	0: Liquid material transport 1: Solid material transport
EN_OS_QU	This parameter indicates the behavior of the route once an error message has been manually acknowledged: The "Resume" action must be executed in order to start the route. For additional information, refer to parameter ACK_MAN.	BOOL	-	I	VQ	+	1: Route is restarted when message is acknowledged. 0: Route remains in error status after message is acknowledged.
EN_DIA_M	Diagnostic-message output in PCS 7 OS can be controlled with this parameter.	BOOL	TRUE*	I	VQ	+	1: A message is issued for each RUN/HOLD/TERMINATE of the route. 0: No messages are issued.
MSG_LOCK	This can be used to generally suppress the sending of alarms/messages for a route.	BOOL	-	I	UQ	+	1: Alarm messages are suppressed. 0: Alarm messages are not suppressed.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
EXT_1_I ... EXT_24_I	External setpoint #1 for an external route parameter element; this index will be entered in the PE as a value during project engineering. ... External setpoint #24 for an external route parameter element. This index will be entered in the PE as a value during project engineering.	REAL ... REAL	- ... -	I ... I	VQ ... VQ	- ... -	
GETXPE	Forces the external setpoints for parameter elements to be transferred again.	BOOL	-	I	UQ	-	Additional information is available in the section Updating external parameter elements (Page 123)
SWONINV	Inverse sequence of elements when activating a mode/a mode level	BOOL	FALSE	I	U	+	1: Sequence of elements is inverted 0: No inversion
SWOFINV	Inverse sequence of elements when deactivating a mode/a mode level	BOOL	FALSE	I	U	+	1: Sequence of elements is inverted 0: No inversion
BA_EN	Input for SIMATIC BATCH This parameter will be transferred to the route block and forwarded by Route Control to the activated elements of a route.	BOOL	-	I	VQ	+	1: Batch processed by a batch system 0: Batch not processed by a batch system
OCCUPIED	Input for SIMATIC BATCH This parameter will be transferred to the route block and forwarded by Route Control to the activated elements of a route.	BOOL	-	I	VQ	+	1: Route occupied by BATCH 0: Route not occupied by BATCH
BA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred to the route block and forwarded by Route Control to the activated elements of a route.	DWORD	-	I	VQ	+	
BA_NA	Element is occupied by a batch with this name from BATCH. This name will be transferred to the route block and forwarded by Route Control to the activated elements of a route.	STRING [32]	-	I	VQ	+	

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
STEP_NO	Element is occupied by a step of BATCH with this number. This number will be transferred to the route block and forwarded by Route Control to the activated elements of a route.	DWORD	-	I	VQ	+	
EV_ID1 ... EV_ID3	Event ID for alarm instance #1 ... Event ID for alarm instance #3	DWORD ... DWORD	- ... -	I ... I	UQ ... UQ	- ... -	
I_ID	Instance ID used by the RC server (do not interconnect!)	DWORD	-	I	UQ	-	
REQ_TIME	Maximum waiting period for a route request on the RC server; after the waiting period expires, the route assumes error status. You can find additional information in the section "Valid Maximum Route-Request Time" (Page 604).	INT	60	I	UQ	-	
MAT_UNDO	Undo the application of the material ID to the link elements.	BOOL	FALSE	I	UQ	-	0 -> 1: Positive edge will be evaluated. 1 -> 0: will not be evaluated
MT_CK_EN	Check material compatibility.	BOOL	TRUE	I	UQ	-	1: New material ID is transferred to the link elements only after verification has been obtained with regard to the predecessor material. 0: New material ID is transferred to the link elements without verification with regard to the predecessor material.
ON_MAT_ERR	Behavior of the route when the material is not permitted	BOOL	TRUE	I	UQ	-	0: Material error is ignored, route continues. 1: Route goes to error when material error is detected.
MAT_TIME	Time limiting of material acceptance (timeout)	INT	15	I	VQ	-	1 ... n: seconds
OOSREQUP	Reserved for future expansions	BOOL	0	I	UQ	--	
OOSREQOS	Reserved for future expansions	BOOL	0	I	UQ	-	

Parameter	Meaning	Type	Default	In-put or out-put	Attr.	OCM	Permitted values
NA_MAT	Material name	STRING [32]	-	O	VQ	+	Name of the current material
QROUT_DB	Route-data-block number used by this route	INT	-	O	UQ	-	
QID	ID assigned by the Route Control Wizard and used by this route	INT	-	O	VQ	+	
QACC_DB	Route data block can be accessed.	BOOL	-	O	VQ	-	1: Route data block can be accessed. 0: Route data block cannot be accessed; Note: Route is still occupied by another instance of RC_IF_ROUTE.
QONSR	Indicates whether or not the active route was started as saved route	BOOL	-	O	U	+	1: Active route is a saved route 0: Active route is not a saved route
QSVRT	Indicates whether the active route was saved	BOOL	-	O	U	+	1: Active route was saved 0: Active route was not saved
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	+	
QRET_VAL	Route return value	WORD	-	O	VQ	+	You can find additional information in the section "RC_IF_ROUTE.QRET_VAL" (Page 119).
QDIAG	Route diagnostic information RC_IF_ROUTE_QRET_VAL	WORD	-	O	VQ	+	You can find additional information in the section "RC_IF_ROUTE.QDIAG" (Page 124).
QREQ_STA	Route-request status	WORD	-	O	VQ	+	0: Not active 2: Request in progress 4: Route request was successful; all element lists of a route have been downloaded to all relevant ASs. 8xxx:: Errors are listed in the section "RC_IF_ROUTE.QREC_RC" (Page 118).
QMAT_DIAG	Return value for check and application of material	WORD	-	O	VQ	+	You can find additional information in the section "RC_IF_ROUTE.QMAT_DIAG". (Page 122)
QREQ_ERR	Route-request return value	BOOL	-	O	VQ	+	1: Error during route request 0: Route request was successful.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QACTIVE	Route status	BOOL	-	O	VQ	+	0: Route is not running. 1: Route is running or route request is active.
QAUTO	Route control mode: Automatic	BOOL	-	O	VQ	+	0: Route is controlled manually via the Route Control Center or the PCS 7 OS faceplate. 1: Route is controlled via the AS user program (automatic mode).
QMAN	Route control mode: Manual	BOOL	-	O	VQ	+	0: Route is controlled via the AS user program (automatic mode). 1: Route is controlled manually via the Route Control Center or the PCS 7 OS faceplate.
QREQ	Route-request diagnostic information	BOOL	-	O	VQ	+	0: Route list is not (yet) valid. 1: Route request was successful; all element lists of a route have been downloaded to all relevant ASs. Corresponds to a value of 4 in the QREQ_STA parameter.
QON	Specifies whether or not the status of the route is "Active".	BOOL	-	O	VQ	+	0: Route is still in "Active" status; mode levels have not yet been transferred; the elements have not been activated. 1: Route is in "Active" status; mode levels have been transferred; the elements are activated.
QHOLD	Indicates whether or not the route has been held.	BOOL	-	O	VQ	+	0: Route has not been held. 1: Route has been held. For the route to continue running, the HOLD input must be reset to 0 or RESUME must be clicked on the faceplate/ RCC.
QSTOP	Indicates whether or not the route will be stopped.	BOOL	-	O	VQ	+	0: Route stopping is not active. 1: STOP input (STOP_AU or STOP_MAN) has been activated; route will be stopped.
QACK	Indicates whether or not error reset is active.	BOOL	-	O	VQ	+	0: Error reset is not active. 1: Error reset is active.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QERR	Specifies whether an error has occurred in the route block.	BOOL	-	O	VQ	+	0: No error 1: Group error in the route block; For additional information, refer to the return value QRET_VAL.
QMON_TOU	Specifies whether the status-monitoring time has expired, resulting in an error.	BOOL	-	O	VQ	+	0: No error, time has not yet expired. 1: Time has expired.
QFLT_TOU	Specifies whether the fault tolerance time has expired, resulting in an error.	BOOL	-	O	VQ	+	0: No error, time has not yet expired. 1: Time has expired.
QMAT_ERR	Specifies whether there is a material error, for example, from a route request.	BOOL	-	O	VQ	+	0: No error 1: Material error, material is incompatible with predecessor material; for additional information, refer to the return value QMAT_DIA.
QMAT_OK	If outputs QMAT_ERR and QMAT_OK both have a value of 0 (false) at the same time, then a material verification has not yet been initiated or the material verification is currently active.	BOOL	-	O	VQ	+	Negative logic of QMAT_ERR
QVALID	Specifies whether or not the static route data such as source and destination locations and function ID are OK.	BOOL	-	O	VQ	+	1: Values are OK and the list of elements is available. 0: Error in static values; route was requested with changed route data in manual mode and was then reset to automatic mode while it was active.
QRCC	Diagnostic information: Route will be displayed in the Route Control Center.	BOOL	-	O	VQ	+	0: Route Control Center will not display this route. 1: Route Control Center will display this route.
QMODE_AC	The current actual values of the function IDs are returned as a 32-bit value.	BOOL	-	O	VQ	+	Bit x = 1; mode level has been reached/achieved. Bit x = 0; mode level has not been reached/achieved.
QRESTPOS	Specifies whether or not *all* of the actively used control elements of a mode level are in the idle state position. (See also the note at the end of the table)	DWORD	-	O	VQ	-	Bit x = 1 Idle-state position has been reached. Bit x = 0 Idle-state position has not been reached.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QRPOSERR	Idle-state error for mode level Failure to stay in the idle state causes an error to be signaled if at least one active element is activated from another route or in manual mode. When elements are activated by another route (for example, in another mode level) or by a "concurrent" route (that is, a route with the same FUNC_ID), no error is signaled. Meaning: The block being activated is "aware" that no error has actually occurred.	DWORD	-	O	UQ	-	Bit x = 1 Idle-state error is satisfied (error is pending) Bit x = 0 No idle state error
QMON_ERR	Specifies whether all elements of a mode level have reached their position setpoint within the fault tolerance time.	DWORD	-	O	UQ	-	Bit x = 1 Position setpoint not reached on time. Bit x = 0 All elements have assumed their position setpoint on time.
QFLT_ERR	Indicates whether elements of a mode level have failed to stay at their previously reached position setpoint for longer than the status-monitoring time.	DWORD	-	O	UQ	-	Bit x = 1 Failure to stay in the final position. Bit x = 0 All elements are still at the position setpoint (activated status).
QGRP_ERR	OR operation from the three signals given above: - QMON_ERR - QFLT_ERR - QRPOSERR In this way, the user program can determine on the basis of a single signal whether there is an error in the mode level.	DWORD	-	O	UQ	+	

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QMN_TM1 ... QMN_TM32	Current value of the status-monitoring time for mode level #1 ... Current value of the status-monitoring time for mode level #32	INT ... INT	- ... -	O ... O	UQ ... UQ	- ... -	QMN_TM1 = MON_TM1 or substitute value MON_TM: Status-monitoring time is inactive. QMN_TM1 = 0: Timeout of the status-monitoring time; mode level #1 reports an error monitoring timeout. All other values Status-monitoring time is active or the position setpoint was reached in time.
QFL_TM1 ... QFL_TM32	Current value of the fault tolerance time for mode level #1 ... Current value of the fault tolerance time for mode level #32	INT ... INT	. ... .	O ... O	VQ ... VQ	- ... -	QFL_TM1 = FLT_TM1, or substitute value FLT_TM: Fault tolerance time is inactive. QMN_TM1 = 0: Timeout of the fault tolerance time; mode level #1 reports a fault tolerance time. All other values Fault tolerance time is active or the position setpoint was again reached in time.
QSTATE Permitted values -1 to 9	Diagnostics: Route status (FB 801) (status in the data block containing the element list for a route)	INT	-	O	VQ	+	-1 Route is available and inactive. 0: Idle, route waiting for REQ signal. 9: Cyclic wait
QSTATE Permitted values 10 to 15	Diagnostics: Route status (FB 801) (status in the data block containing the element list for a route)	INT	-	O	VQ	+	**10**: Sending frame for route request. **11**: Waiting for route list from RC server **12**: Route list received; initializations in progress. **13**: Master AS: Wait until all job data have been sent to peer AS. **14**: Route can be executed; route is ready to start. **15**: Route has been started; sending start frame to server.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QSTATE Permitted values 20 to 21	Diagnostics: Route status (FB 801) (status in the data block containing the element list for a route)	INT	-	O	VQ	+	**20**: Waiting until all remote elements have signaled availability within the timeout. Route error if timeout occurs or if an element is not available. **21**: Route must be stopped because at least one element was not available. Is achieved by timeout or the first element that is not available.
QSTATE Permitted values 101 to 103	Diagnostics: Route status (FB 801) (status in the data block containing the element list for a route)	INT	-	O	VQ	+	**101**: Elements are activated according to the mode levels. **102**: Route are deactivated (held or terminated). **103**: Route is deactivated (held).
QSTATE Permitted values 112 to 117	Diagnostics: Route status (FB 801) (status in the data block containing the element list for a route)	INT	-	O	VQ	+	**112**: Route is being held due to an error. **113**: Route is being deactivated due to an error. **114**: Transition route between state 112 and 115 in case of a route error. The start and restart button is deactivated. **115**: Elements are released after a route error before the transition to Stop. **116**: Waiting until all remote elements have reported themselves released within the timeout. **117**: At least one remote element could not be released.
QSTATE Permitted value 200	Diagnostics: Route status (FB 801) (status in the data block containing the element list for a route)	INT	-	O	VQ	+	**200**: Route is deactivated due to a cross-coupling receive error; slave AS is waiting for new activation by the master AS.(Status 200 only possible for routes to the slave AS.)
QRCM_STA	Diagnostic route status (FB 800) (status in instance DB)	INT	-	O	UQ	-	For permissible values, see output QSTAT

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
EXT_1_O ... EXT_24_O	Current return value for external parameter element with index #1 ... Current return value for external parameter element with index #24	REAL ... REAL	- ... -	O ... O	UQ ... UQ	- ... -	
GETXSTS	Status of actual values of external parameter elements	BYTE	-	O	UQ	-	0: Invalid values 1: Valid values Additional information is available in the section Updating external parameter elements (Page 123)
GETXDIAG	Diagnostic output	WORD	-	O	UQ	-	Additional information is available in the section Updating external parameter elements (Page 123)
NA_SOURCE	ID, space character, name of the source location in text format	STRING [32]	-	O	VQ	+	e. g. 00023 Sourcetank_1
NA_DEST	ID, space character, name of the destination location in text format	STRING [32]	-	O	VQ	+	
NA_VIA1 ... NA_VIA10	ID, space character, name of the via location #1 in text format ... ID, space character, name of the via location #10 in text format	STRING [32] ... STRING [32]	- ... -	O ... O	VQ ... VQ	+ ... +	
NA_MAT	Material name	STRING [32]	-	O	VQ	+	Name of the current material
QDINO	Diagnostics: Number of instance data block using this RC_IF_ROUTE block	INT	-	O	UQ	-	
QREQ_TIM	Current value for duration of the last route request	INT	-	O	UQ	+	
QSERV_IP	IP address of the current RC server	DWORD	-	O	UQ	+	
QSP_MODE	Current setpoint of the mode level (MODE)	DWORD	-	O	UQ	+	
QOOSREQG	Maintenance request for the AS is present.	BOOL	-	O	VQ	-	
QOOSSTAG	AS is in maintenance.	BOOL	-	O	VQ	-	
QOOSREQL	Reserved for future expansions	BOOL	-	O	UQ	-	
QOOSSTAL	Reserved for future expansions	BOOL	-	O	UQ	-	

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
REQ_AU	This input is taken into consideration if the route is in automatic mode. (Value at input MAN_AUT = 1) Interconnectable input for route-request activation	BOOL	-	I O	VQ	+	0: No route request 1: Activate route request Note: Route request is executed even if the STOP_AU input has a value of 1.
ON_AU	This input is taken into consideration if the route is in automatic mode. (Value at input MAN_AUT = 1) Interconnectable input for starting the route	BOOL	-	I O	VQ	+	0: Route not (yet) started. 1: Route has been started. Note: The start route operation is executed even if the STOP_AU input has a value of 1.
HOLD_AU	This input is taken into consideration if the route is in automatic mode. (Value at input MAN_AUT = 1) Interconnectable input for holding the route	BOOL	-	I O	VQ	+	0: Route has not (yet) been held. 1: Route has been held. Note: To resume the route, this input must be reset to 0.
ACK_AU	This input will be taken into consideration if the route is in automatic mode. (Value at input MAN_AUT = 1) Interconnectable input for acknowledging route errors	BOOL	-	I O	VQ	+	0: Error not acknowledged. 1: Error acknowledged. Note: If the route is in "Held" status (due to an error), this input acts to resume the route if the HOLD_AU input has a value of 0 simultaneously.
STOP_AU	This input is taken into consideration if the route is in automatic mode. (Value at input MAN_AUT = 1) Interconnectable input for stopping the route	BOOL	-	I O	VQ	+	0: Route not (yet) stopped. 1: Route is stopped if input ON_AU has the value 0 at the same time.
MAN_AUT	Specifies whether the faceplate will be used to control the route: This input is operated by means of the faceplate and cannot be interconnected.	BOOL	-	I O	V	+	0: Control by means of the faceplate/Route Control Center (false) 1: Control by means of the AS/automatic mode (true)
REQ_MAN	This input is taken into consideration if the route is controlled by means of the faceplate/RCC. (Value at input MAN_AUT = 0) Activating a route request by means of the faceplate: This input cannot be interconnected.	BOOL	-	I O	V	+	0: No route request 1: Route request is activated.

Parameter	Meaning	Type	Default	In-put or out-put	Attr.	OCM	Permitted values
ON_MAN	This input is taken into consideration if the route is controlled by means of the faceplate/RCC. (Value at input MAN_AUT = 0) Starting a route by means of the faceplate: This input cannot be interconnected.	BOOL	-	I O	V	+	0: Route not (yet) started. 1: Route started.
HOLD_MAN	This input is taken into consideration if the route is controlled by means of the faceplate/RCC. (Value at input MAN_AUT = 0) Holding a route by means of the faceplate	BOOL	-	I O	V	+	0: Route has not (yet) been held. 1: Route held. This input cannot be interconnected.
ACK_MAN	This input is taken into consideration if the route is controlled by means of the faceplate/RCC. (Value at input MAN_AUT = 0) Acknowledging route errors by means of the faceplate Note: This input can be set to resume a route set to "Held" status. This input cannot be interconnected.	BOOL	-	I O	V	+	0: Error has not (yet) been acknowledged. 1: Error acknowledged.
STOP_MAN	This input is taken into consideration if the route is controlled by means of the faceplate/RCC. (Value at input MAN_AUT = 0) Specifies whether the faceplate has stopped the route.	BOOL	-	I O	V	+	0: No (false) 1: Yes, route stopped by means of the faceplate (true).
GET_ID	This input is taken into consideration if the route is controlled by means of the faceplate/RCC. (Value at input MAN_AUT = 0) Specifies whether the faceplate has initiated an ID request.	BOOL	-	I O	U	+	0: No (false) 1: Yes, ID has been requested by means of the faceplate (true).
SVRT_AU	Automatic: Saving the active route	BOOL	-	I O	U	+	0->1: the parameters of the currently active route are saved
ONSR_AU	Automatic: Starting a saved route	BOOL	-	I O	U	+	1: If there is a saved route for the default parameters, this route is started

Parameter	Meaning	Type	Default	In-put or out-put	Attr.	OCM	Permitted values
SVRT_MAN	Manual: Saving the active route	BOOL	-	I O	U	+	0->1: the parameters of the currently active route are saved
ONSR_MAN	Manual: Starting a saved route	BOOL	-	I O	U	+	1: If there is a saved route for the default parameters, this route is started

Note

Handling inputs and outputs

Handling the QRESTPOS output

The handling of the QRESTPOS output at RC_IF_ROUTE (FB 800) has changed during the course of the further development of Route Control.

The compatibility block, RC_ResPosV5, is available in order to offer the same behavior with regard to QRESTPOS as that in version 5 for the subsequent versions. As of V7.1.2, this now provides the behavior of the V5 at the QRESTPOS output.

The block is called from FB 803 if and only if a specific ID is registered in DB100/RC_CFG. If you want to set the response of V5, enter the value W#16#ABAB for the ID "wLikeV5" (byte offset 80.0) in DB100/RC_CFG in all automation systems.

Handling the inputs ON_AU and STOP_AU

Setting the input ON_AU starts the route. Resetting the input ON_AU stops the route.

The input STOP_AU also stops the route, but only if ON_AU is set to 0.

Configuration

Step	Procedure
1	Create a new CFC chart or copy a previously-created sample chart to your project
2	If you assign fixed route IDs: assign a unique route ID. Additional information is available in the section "Valid Route IDs" (Page 603). Change the value at parameter FIXED_ID to 1. If you assign dynamic IDs: change the value at parameter FIXED_ID to 0. Additional information is available in the section "Guide to Dynamic ID Assignment" (Page 284).
3	Create your user program (FB) for activating the route block or use a copy of the sample SFC and position your block in the same CFC chart

Step	Procedure
4	Interconnect the control inputs XXX_AU and MODE to the user program
5	Program the route parameters (location IDs, time setpoints, mode IDs, mode tables) or interconnect these inputs with your user program
6	Interconnect other inputs (for material management, external parameter elements), if available
7	Interconnect the outputs of the RC_IF_ROUTE to the upstream user program
8	Start the Route Control Wizard and export the route ID for the Route Control Engineering project. The instances of the RC_IF_ROUTE block are displayed at the "Routes" entry.
9	Start the Route Control Wizard and generate the Route Control server messages for this route in your PCS 7 OS project. Note: You must repeat this step following a memory reset of the PCS 7 OS project.

Example

- Section "SFC: Overview" (Page 279)

8.3.2.2 RC_IF_ROUTE.QREC_STA

Meaning of Parameter

This parameter provides information about the status of a route request.

Parameter Return Values

QREC_STA	Meaning
0000	Internal status is IDLE
0002	A route request is currently active.
0004	Route list received; route request was successful.
0010	Detailed information about route request: Send batch data to server
0020	Detailed information about route request: Wait for receipt of new route list
8000	Transmission error
8001	Route Control server has not responded within the request monitoring time. The route list and/or the TransOK flag (indicating enabling by the server) does not exist.
8002	No route was found in the server.
8003	Control elements and/or partial routes of the located route are already being used by another route and no other alternative route could be found. Remedy: Request the route again at a later time when the resources have been released by the other route, or expand the route network to include alternative routes.
8004	One or more of the specified source, via and/or destination locations are zero (0).
8005	Error in route list received: The number of elements and/or the length of a data record is/are incorrect. Cause: Server and AS version (library) do not match. Remedy: Install suitable versions.
8006	No route found: Elements with incorrect status were discovered during the route search; for example, in manual mode, element is locked (out of service).

QREC_STA	Meaning
8007	No route was found; maximum number of licensed material transports has been reached
8008	Route request can not be sent to the server.
80FF	Material is not permitted as a successor; route search failed.

8.3.2.3 RC_IF_ROUTE.QRET_VAL

QRET_VAL Return Values for a Route (RC_IF_ROUTE)

This output is used by the route to provide error information for evaluation in a user program.

QRET_VAL	Meaning
0	No errors occurred during execution of RC_IF_ROUTE.
8000	Route Control server could not send the element lists of the route to all of the automation systems involved. Check the connections between the RC server and all RC automation systems.
8001	Time exceeded when the route list was requested. The Route Control server has not sent the route list or signaled final enabling ("TransOk") of the route from the server perspective in the specified monitoring time (for example, 240 seconds). Check whether the Route Control server is active. Check the connection between the Route Control server and the RC AS requesting the route.
8002	No path could be found for the specified source, via, and/or destination locations. Remedy: Use other locations or check your configuration (route network) in the RC engineering tool.
8003	Control elements and/or partial routes of the located route are already being used by another route and no other alternative route could be found. Remedy: Request the route again at a later time when the resources have been released by the other route, or expand the route network to include other alternative routes.
8004	One or more of the specified source, via and/or destination locations are zero (0).
8005	Error in route list received: The number of elements and/or the length of a data record is/are incorrect. Cause: Server and AS version (library) do not match. Remedy: Install suitable versions.
8006	No route found: Elements with incorrect status were discovered during the route search; for example, in manual mode, element is locked (out of service).
8007	No route was found; maximum number of licensed material transports has been reached.
8008	Route request can not be sent to the server.
8010	Compilation ID in route list and DB_CFG (DB 100) are different. Cause: Blocks from different Route Control libraries were used.
8013	Status of route list is not defined. Remedy: The system corrects this error by itself (route list goes to IDLE state).
8016	Route request is not possible as instance of the FB 800 is missing from the route list.

QRET_VAL	Meaning
8017	Route request not possible because this AS has the status 'Maintenance' or because a maintenance demanded message is pending.
8022	Monitoring time for receipt of data has expired. (Cross-coupling in the peer AS (slave))
8027	Route ID (recognition feature) is incorrect in the receive buffer.
8028	Monitoring time for receipt of data has expired. (Cross-coupling in the peer AS (slave))
8030	Equipment error for a control or sensor element (CE, SE)
8031	Monitoring time has expired.
8032	Fault-tolerance time has expired.
8033	Monitoring time for the idle state has expired. Cause: At least one element has strayed from its idle state for longer than the tolerated period.
8034	Data block is missing for the control elements.
8035	Error occurred when the RC_ATTRIB_PTR function block for control elements was called. Remedy: Instead, call up the Route Control Wizard. This checks the IDs for validity and scope. Header data for an element data block is invalid.
8036	Data block is missing for the sensor elements.
8037	Error occurred when the RC_ATTRIB_PTR function block for sensor elements was called. Remedy: Instead, call up the Route Control Wizard. This checks the IDs for validity and scope. Header data for an element data block is invalid.
8038	Data block is missing for the parameter elements.
8039	Error occurred when the RC_ATTRIB_PTR function block for parameter elements was called. Remedy: Instead, call up the Route Control Wizard. This checks the IDs for validity and scope. Header data for an element data block is invalid
803A	Data block is missing for the link elements
803B	Error occurred while calling the RC_ATTRIB_PTR function block for link elements. Remedy: Instead, call up the Route Control Wizard. This checks the IDs for validity and scope. Header data for an element data block is invalid
8044	Data block is missing for the control elements
8045	Error occurred when the RC_ATTRIB_PTR function block for control elements was called. Remedy: Call the Route Control Wizard, which checks the IDs for validity and scope. Header data for an element data block is invalid
8046	Data block is missing for the control elements
8047	Error occurred while calling the RC_ATTRIB_PTR function block for link elements. Remedy: Instead, call up the Route Control Wizard. This checks the IDs for validity and scope. Header data for an element data block is invalid
8048	Data block is missing for the parameter elements.

QRET_VAL	Meaning
8049	Error occurred while calling the RC_ATTRIB_PTR function block for link elements. Remedy: Instead, call up the Route Control Wizard. This checks the IDs for validity and scope. Header data for an element data block is invalid.
8071	Error occurred when the RC_FIFO_INPUT_FC function block was called
80FF	Routes containing this material as a successor material to the previous material are not permitted. Remedy: Repeat the route request with another material, for example, perform cleaning first and then request the route again with the new material or use an alternative route (different source/destination).
8582	Active AS: A message frame with an incorrect route ID (receive ID) was received.
8583	Monitoring time for receipt of data has expired; Slave AS is not sending.
8FF2	Data block is missing for this route (number of data block = 100 + route ID).
8FF3	No available route ID was found (for dynamic route ID assignment only). Possible causes: • All route IDs in this AS are occupied by other instances of RC_IF_ROUTE. Remedy: Assign other dynamic route IDs to this AS in Route Control Configuration. • Route IDs for dynamic ID assignment have not yet been defined in this AS. Remedy: Assign dynamic route IDs to this AS in Route Control Configuration. • Route Control server has not been started since the last AS download. Remedy: Start the Route Control server. • The RC_CFG DB (DB 100) was downloaded to the AS from the S7 project (offline container). Remedy: Start the Route Control server.
8FF4	Route ID outside the permitted range; you can find additional information in "Valid Route IDs" (Page 603).
8FF5	A second route containing the same route ID is attempting to occupy a route data block already occupied by another (master) route. Cause: Route ID in one route has been changed online. The Route Control Wizard checks the IDs for uniqueness. Remedy: Restart the Route Control Wizard. Synchronize the route IDs in the Route Control engineering project. Load them to the Route Control server.

QRET_VAL	Meaning
8FF6	The route with this ID is not a master route for this AS. Possible causes: • Route Control server has not been started since the last AS download. Remedy: Start the Route Control server. • The RC_CFG DB (DB 100) was downloaded to the AS from the S7 project (offline container). Remedy: Start the Route Control server. • Route ID in one route has been changed online. Remedy: Start the Route Control Wizard, align the route IDs and download the Route Control configuration again.
8FF7	Static data in the route list are not valid. An active route was terminated in manual mode and requested again with modified static data (source, destination, via locations) and then switched back to automatic mode. Remedy: Terminate the route in manual mode and request the route again using the original parameters, or in the case of an inactive route, switch from manual mode back to automatic mode.

8.3.2.4 RC_IF_ROUTE.QMAT_DIAG

Meaning of Parameter

This parameter provides information about the status of the material mode in a route:

- Check of material sequence (result of the Route Control server)
- Storage, that is, transfer of material number to the link elements (AS)

Parameter Return Values

QMAT_DIAG	Meaning
0000	Internal material mode status is IDLE
0001	Material is currently being checked
0002	Transfer or removal of material ID to or from the link element(s) is currently active (or rollback).
0003	Transfer of material ID to the active AS (master) is complete; transfer of the material ID to the passive AS (slave) is still in progress.
8191	Route data block is missing (DB 101 to DB 400).
8192	Route ID is outside the valid range.
8193	Active AS: Watchdog timer for material verification via server
8194	Active AS: Watchdog timer for storing materials in link elements
8195	Not used
8196	Route is not a master, RC_IF_ROUTE is located in the peer AS (slave).

QMAT_DIAG	Meaning
8197	Active AS: Material ID is outside the valid range. You can find additional information in "Valid Material IDs". (Page 605)
8198	Mode can not be executed at the present time due to the route status.
819F	Command error (ROLLBACK and SETMAT inputs are both 1/true at the same time)
80FF	Material ID is not permitted

8.3.2.5 Updating external parameter elements

RC_IF_ROUTE.GETXPE input

With the rising edge of GETXPE, external references, whose values have been updated once already, are set to the default of 0. Furthermore, a trigger signal for sending the actual values is sent to all slaves that have external parameter elements.

Note

Only the actual values of external parameter elements that were already activated once per mode are included.

Then there is a wait until all set AS values differ again from 0, i.e. until all actual values of external parameter elements have been updated.

This process is time-monitored; when the monitoring time (60s) expires, an error message is displayed.

Status of the update: RC_IF_ROUTE.GETXSTS output

- 0: Idle time
- 1: Send trigger to the slaves with external parameter elements
- 2: Wait until all slaves actual values are up to date
- 4: Completed without error
- 8: Completed with error

GETXDIAG	Meaning
8180	Active automation system: Actual values of external parameter elements are not yet valid - have not yet been applied.
8181	Active automation system: No slaves with external parameter elements are present. Any parameter elements which exist in this route are stored in the master AS.
8182	Active automation system: Cross-coupling job for external parameter elements can not be issued.

GETXDIAG	Meaning
8183	Active automation system: Request (GET_EX_PE parameter) can only be executed when route status is "RUN".
818F	Active automation system: Runtime exceeded when actual values of external parameter elements were updated

8.3.2.6 RC_IF_ROUTE.QDIAG

QDIAG Return Values for a Route (RC_IF_ROUTE)

This output is used by the route to return detailed diagnostics information for evaluation in a user program.

QDIAG	Meaning
8061	Active automation system: Error in send buffer when the RC_XC_JOB_USER_IF_FC function block is called; error when cross coupling is called
8062	Active automation system: Cross-coupling send buffer - missing instance data block of FB 800 in route list
8063	Active AS: Cross-coupling send buffer - missing information about destination address in the instance data block of FB 800
8066	Passive AS: Error calling RC_XC_JOB_USER_IF_FC function block
8067	Passive AS: Cross-coupling send buffer - missing instance data block of FB 800 in route list
8068	Passive AS: Cross-coupling send buffer - missing information about destination address in the instance data block of FB 800
8069	Passive AS: Cross coupling send buffer: No master AS ID in send buffer
8161	Active AS: Cross-coupling buffer Block1 cannot be sent
8162	Active AS: Cross-coupling buffer Block2 cannot be sent
8163	Active AS: Cross-coupling buffer Block3 cannot be sent
8164	Active AS: Cross-coupling buffer Block4 cannot be sent

8.3.2.7 Idle-state monitoring

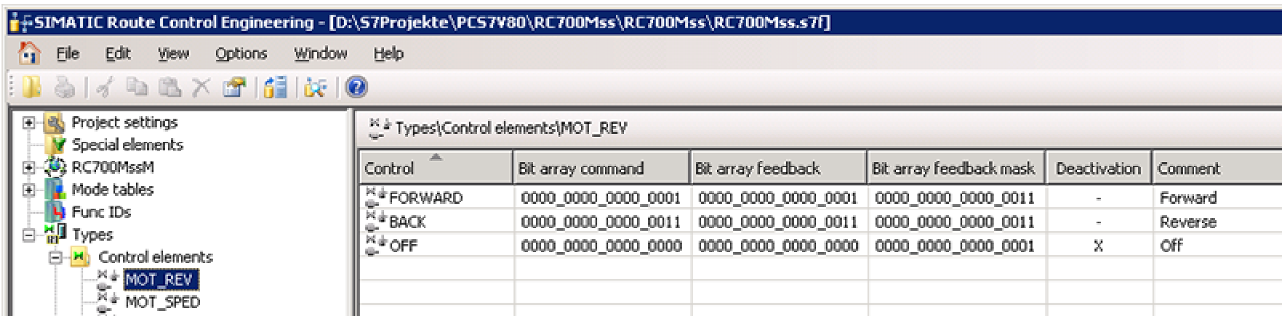
Definition "Idle state"

A route control element is in idle state in the following cases:

- The MODE of the route control element is not active.
- The feedback value corresponds to the value in the "Bit array feedback" text box that received the "Deactivation" attribute when defining the control.

Defining the idle state

When you define control elements, you define controls for each individual control element. You can define one of these controls as idle state with the attribute "Deactivation":



Note

The idle-state monitoring only takes place when **MODE is not active**. It is therefore useful to assign the attribute "Deactivation" multiple times.

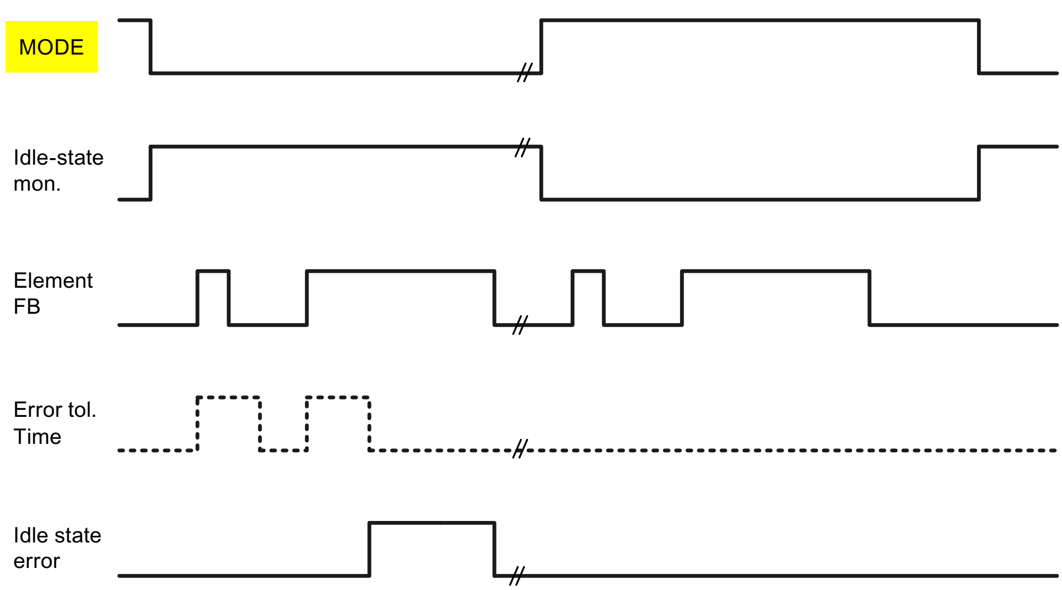
You then activate idle-state monitoring in the properties of the route control element.

Requirement for idle-state monitoring

- The control element is included in a partial route which makes it a route control element.
- The MODE of the route control element is not active.

Error tolerance time with idle-state monitoring

The error tolerance time is used with idle-state monitoring:



Leaving the idle state

Reasons for leaving the idle state	Idle state error
Same route, different mode level activates	No
Different route, not concurrent, activates	Yes
Concurrent route activates	No
Element is activated manually	Yes

Status of the idle state

The following parameters of the RC_IF_ROUTE (FB800) block indicate the status of the idle state of the elements:

- QRESTPOS
- QRPOSERR

See also

RC_IF_ROUTE (FB 800) (Page 101)

How to Insert an Element in a Partial Route (Page 420)

Partial routes (Page 404)

Route Control Element Properties (Page 430)

8.3.2.8 Example using QRESTPOS and QRPOSERR

Introduction

This example illustrates how the QRESTPOS and QRPOSERR outputs for all 32 mode levels behave in certain scenarios. In the example, the elements below represent different outputs:

- QRESTPOSx stands for QRESTPOS1 to QRESTPOS32
- QRPOSERRx stands for QRPOSERR1 to QRPOSERR32.

The example illustrates one valve, which is activated by one or more routes.

Scenario 1 - Activation by One Route in One Activated Mode

One route activates one valve in one Mode 5; the valve will be opened. No other routes or modes are involved.

Mode 5	Activation	Feedback	QRESTPOSx	QRPOSERRx
1	"On"	"On"	Goes from 1 to 0	Remains 1

Scenario 2 - Activation by One Route in One Deactivated Mode

One route activates one valve in one Mode 5. Mode 5 is deactivated and the valve will, therefore, be closed. No other routes or modes are involved.

Mode 5	Activation	Feedback	QRESTPOSx	QRPOSERRx
0	"Off"	"Off"	Goes from 0 to 1	Remains 1

Scenario 3 - Activation by One Route with Two Modes

One route activates one valve in one Mode 5 and one Mode 6. Mode 5 is deactivated and Mode 6 is activated. Mode 5 causes the valve to close and Mode 6 causes the valve to open. No other routes are involved.

Mode 5	Activation	Feedback	QRESTPOS5	QRPOSERR5
0	"Off"	"Off"	Goes from 0 to 1	Remains 0

Mode 6	Activation	Feedback	QRESTPOS6	QRPOSERR6
1	"On"	"On"	Goes from 1 to 0	Remains 0

Scenario 4 - Activation by Two "Concurrent Routes"

One route activates a valve in deactivated Mode 5, while another route with the same FUNC_ID activates the same valve in Mode 6.

Result is the same as in Scenario 3.

Scenario 5 - Activation by Route in Automatic and Manual Mode

Two different routes activate the same valve. Here, it is irrelevant whether the same mode is used. However, the first route activates the valve in manual mode, while the second route activates the valve in automatic mode.

8.3.2.9 Simulated Idle State in RC_IF_ROUTE

Simulated Idle State in RC_IF_ROUTE

The RC_IF_ROUTE block has an output QRPOSERR. This is a 32-bit value that provides feedback about the idle state of the elements of mode levels 1 to 32. It is, therefore, QRPOSERR1 to QRPOSERR32.

The bit QRPOSERRx is set (1) when all active control elements in the respective mode level are in idle state and are providing the correct feedback (OFF, CLOSED).

The bit QRPOSERRx is also set (1) when the element is activated in another mode level of the same route or by a concurrent route (with the same function ID/FUNC_ID).

The simulated idle state is signaled as long as the control element is not activated by its own route and mode level.

8.3.2.10 RC_ResPosV5 (FB 815)

Description

The handling of the QRESTPOS output at RC_IF_ROUTE (FB 800) has changed during the course of the further development of Route Control.

The compatibility block, RC_ResPosV5, is available in order to offer the same behavior with regard to QRESTPOS as that in version 5 for the subsequent versions. As of V7.1.2, this now provides the behavior of the V5 at the QRESTPOS output.

The block is called from FB 803 if and only if a specific ID is registered in DB100/RC_CFG. If you want to set the behavior of V5, enter the value W#16#ABAB for the ID "wLikeV5" (byte offset 80.0) in DB100/RC_CFG for all automation systems.

8.3.2.11 RC_IF_ENCODER (FC 800)

Description

This block is the partner block to RC_IF_DECODER (FC 801) (Page 129). It converts 32 individual binary signals into a 32-bit output value. Therefore, it can be connected upstream of RC_IF_ROUTE in order to convert 32 individual signals for the mode levels into the 32-bit MODE value for the RC_IF_ROUTE block.

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
M_01	Binary signal that represents bit #1	BOOL	-	I	VQ	-	0: Bit #1 of MODE = 0 at RC_IF_ROUTE: Mode level will be activated 1: Bit #1 of MODE = 1 at RC_IF_ROUTE: Mode level will be deactivated
...	...	...	...	...	...	...	...
M_32	Binary signal that represents bit #32	BOOL	-	I	VQ	-	0: Bit #32 of MODE = 0 at RC_IF_ROUTE: Mode level will be activated 1: Bit #32 of MODE = 1 at RC_IF_ROUTE: Mode level will be deactivated
QMODE	32-bit value as linkage of 32 individual input signals	DWORD	-	O	VQ	-	1 ... 2 to the power of 32 -1

Return values of the block

The RC_IF_ENCODER block does not supply any diagnostic information.

Configuration

Step	Procedure
1	Insert an RC_IF_ROUTE into the CFC chart.
2	Insert an RC_IF_ENCODER as a predecessor upstream of the RC_IF_ROUTE block.
3	Interconnect the QMODE output of the RC_IF_ENCODER to the MODE input of the RC_IF_ROUTE block.
4	Specify the MODE_01 to MODE_32 activations via a user block.

You can find additional information in
"RC_IF_DECODER (FC 801)" (Page 129).

Additional information

- Section "Guide to CFC Encoder" (Page 255)

8.3.2.12 RC_IF_DECODER (FC 801)

Description

The RC_IF_DECODER block is the partner block of RC_IF_ENCODER (FC800) (Page 128). It converts the 32-bit input value into 32 separate output values (bits). This block can be connected downstream of RC_IF_ROUTE in order to split its 32-bit outputs into separate values:

- QMODE_AC (feedback levels #1 to #32 achieved)
- QRESTPOS (rest positions)
- QRPOSERR (simulated rest positions)
- QMON_ERR (timeout of activation and deactivation monitoring times)
- QFLT_ERR (timeout of the status monitoring time)
- QGRP_ERR (group error)

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
MODE	32-bit value to be split	DWORD	-	I	VQ	-	0 ... 2 to the power of 32 -1
QM_01	Binary signal that represents bit #1	BOOL	-	O	VQ	-	0: Bit #1 of MODE = 0 at RC_IF_ROUTE: Mode level not reached 1: Bit #1 of MODE = 1 at RC_IF_ROUTE: Mode level reached
...	...	...	...	...	...	...	...
QM_32	Binary signal that represents bit #32	BOOL	-	O	VQ	-	0: Bit #32 of MODE = 0 at RC_IF_ROUTE: Mode level not reached 1: Bit #32 of MODE = 1 at RC_IF_ROUTE: Mode level reached

Return values of the block

The RC_IF_DECODER block does not return any diagnostics information.

Configuration

Step	Procedure
1	Insert an RC_IF_ROUTE into the CFC chart.
2	Insert an RC_IF_DECODER as the successor of the RC_IF_ROUTE block.
3	Interconnect the required output of the RC_IF_ROUTE block with the MODE input of RC_IF_DECODER.
4	Evaluate the return signals of RC_IF_DECODER through a user block.

Additional information

- Section "Guide to CFC DECODER" (Page 255)

8.3.3 Control elements

8.3.3.1 RC_IF_VALVE (FB 826)

Description

This block is the interface block between a valve block and the routing system.

The interface block is interconnected to a valve block from the APL, for example, with FB1911 "VlvS" or from the PCS 7 standard library, for example, to FB73 "VALVE" in CFC and connects its signals to a control element data record in the routing system.

If the valve is involved in the route, the valve is activated according to the interconnection in the route. The valve feedback is evaluated in the route simultaneously.

You can find additional information in the "Route Control Configuration" section.

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	+	Assigned automatically by the Route Control Wizard
FB_CLOSE	Return value (actual value) of the process valve indicating its status	BOOL	-	I	VQ	-	0: Valve is not closed. 1: Valve is closed.
FB_OPEN	Return value (actual value) of the process valve indicating its status	BOOL	-	I	VQ	-	0: Valve is not open. 1: Valve is open.
MONITOR	Feedback-signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active. 0: Monitoring of feedback signals is deactivated; feedback is being simulated.
MAN_AUT	Status of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode. 1: Upstream element is in automatic mode.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
LOCK	Specifies whether an upstream element is locked. You can find additional information in "LOCK Input on Element Blocks". (Page 72)	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search. 0: Upstream element is not locked and will be taken into consideration in the route search.
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search. 0: Maintenance is not pending. Element will be taken into consideration in the next route search.
EV_ID1 ... EV_ID3	Event ID for alarm instance #1 ... Event ID for alarm instance #3	DWORD ... DWORD	- ... -	I ... I	UQ ... UQ	- ... -	- ... -
QID	ID assigned by the Route Control Wizard and used by this route	INT	-	O	VQ	-	-
QBA_EN	Specifies whether an element can be used within the context of a batch. You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH. 0: Element will not be used as part of BATCH.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QOCCUPIED	Indicates whether the element is occupied by a batch You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element is occupied by a batch. 0: Element is not occupied by a batch.
QRET_VAL	Return value for block	WORD	-	O	VQ	-	Return value of the element: **0**: No error **8261**: Incorrect or invalid element ID **8263**: Incorrect or unknown element type; interface block does not correspond to the element type in the Route Control configuration.
QAUTO_OC	Specifies how the valve is activated	BOOL	-	O	VQ	-	0: Valve will be activated shut (CLOSE). 1: Valve will be activated open (OPEN).
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Valve is "in maintenance". 0: Valve is available.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated. 0: The return value of the upstream element will be applied.

Configuration

Step	Procedure
1	Insert the RC_IF_VALVE block in a CFC chart.
2	Interconnect the FB_CLOSE and FB_OPEN inputs and the QAUTO_OC output with the valve block.
3	Start the Route Control Wizard The element ID is entered automatically.
4	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Examples

- Section "Guide to CFC Valve with Feedback" (Page 262)
- Section "Guide to CFC Valve with Interlocking Block" (Page 264)
- Section "Guide to CFC Valve with Dual Feedback Signals" (Page 263)
- Section "Guide to CFC Valve with No Feedback Signal" (Page 265)

8.3.3.2 RC_IF_VAL_MOT (FB 825)

Description

This block is the interface block between a motor-actuated valve and the routing system.

The interface block is interconnected to a valve block from the APL, for example, with FB1900 "VlvMotL" or from the PCS 7 standard library, for example, to FB74 "VAL_MOT" in CFC and connects its signals to a control element data record in the routing system.

If the valve is involved in the route, the valve is activated according to the interconnection in the route. The valve feedback is evaluated in the route simultaneously.

You can find additional information in the "Route Control Configuration" section.

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	+	Assigned automatically by the Route Control Wizard
FB_CLOSE	Return value (actual value) of the process valve indicating its status	BOOL	-	I	VQ	-	0: Valve is not closed. 1: Valve is closed.
FB_OPEN	Return value (actual value) of the process valve indicating its status	BOOL	-	I	VQ	-	0: Valve is not open. 1: Valve is open.
MONITOR	Feedback-signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active. 0: Monitoring of feedback signals is deactivated; feedback is being simulated.
MAN_AUT	Status of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode. 1: Upstream element is in automatic mode.
LOCK	Specifies whether an upstream element is locked. You can find additional information about this in "LOCK Input on Element Blocks" (Page 72).	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search. 0: Upstream element is not locked and will be taken into consideration in the route search.
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search. 0: Maintenance is not pending. Element will be taken into consideration in the next route search.
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
...	...	...	...	...	...	...	...
EV_ID3	Event ID for alarm instance #3	DWORD	-	I	UQ	-	-
QID	ID assigned by the Route Control Wizard and used by this route	INT	-	O	VQ	-	-
QBA_EN	Specifies whether an element can be used within the context of a batch. You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH. 0: Element will not be used as part of BATCH.
QOCCUPIED	Indicates whether the element is occupied by a batch You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element is occupied by a batch. 0: Element is not occupied by a batch.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8251: Incorrect or invalid element ID 8253: Incorrect or unknown element type; interface block does not correspond to the element type in Route Control Configuration.
QAUTO_ON	Specifies if the motor valve has been triggered	BOOL	TRUE	O	VQ	-	Always 1
QAUTO_OC	Specifies how the motor valve has been triggered	BOOL	-	O	VQ	-	0: Motor valve will be activated shut (CLOSE). 1: Motor valve will be activated open (OPEN).
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance". 0: Motor is available.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated. 0: The return value of the upstream element will be applied.

Configuration

Step	Procedure
1	Insert the RC_IF_VAL_MOT block in a CFC chart.
2	Interconnect the FB_CLOSE and FB_OPEN inputs and the QAUTO_ON and QAUTO_OC outputs to the external motor-actuated valve block.
3	Start the Route Control Wizard The element ID is entered automatically.
4	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Example

- Section "Guide to CFC Motor-Actuated Valve" (Page 266)

8.3.3.3 RC_IF_MOTOR (FB 822)

Description

This block is the interface block between the MOTOR block and the routing system for a **motor with two statuses (OFF, ON)**.

The interface block is interconnected to a MOTOR block from the APL, for example, with FB1850 "MotL" or from the PCS 7 standard library, for example, to FB66 "MOTOR" in CFC and connects its signals to a control element data record in the routing system.

If the motor is involved in the route, the motor is activated according to the interconnection in the route. The motor feedback is evaluated in the route simultaneously.

You can find additional information in the "Route Control Configuration" section.

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	+	Assigned automatically by the Route Control Wizard
FB_ON	Motor feedback:	BOOL	-	I	VQ	-	1: Motor is running (ON). 0: Motor is off (OFF).
MONITOR	Feedback-signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active. 0: Monitoring of feedback signals is deactivated; feedback is being simulated.
MAN_AUT	Automatic or manual control type of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode. 1: Upstream element is in automatic mode.
LOCK	Specifies whether an upstream element is locked. You can find additional information in "LOCK Input on Element Blocks" (Page 72).	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search. 0: Upstream element is not locked and will be taken into consideration in the route search.
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search. 0: Maintenance is not pending. Element will be taken into consideration in the next route search.
EV_ID1 ... EV_ID3	Event ID for alarm instance #1 ... Event ID for alarm instance #3	DWORD ... DWORD	- ... -	I ... I	UQ ... UQ	- ... -	- ... -
QID	ID assigned by the Route Control Wizard and used by this route	INT	-	O	VQ	-	-
QBA_EN	Specifies whether an element can be used within the context of a batch. You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH. 0: Element will not be used as part of BATCH.
QOCCUPIED	Indicates whether the element is occupied by a batch You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element is occupied by a batch. 0: Element is not occupied by a batch.
QRET_VAL	Return value for block	WORD	-	O	VQ	-	**0**: No error **8221**: Incorrect or invalid element ID **8223**: Incorrect or unknown element type; interface block does not correspond to the element type in the Route Control configuration.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QAUTO_ON	Motor activation	BOOL	-	O	VQ	-	1: Automatic control is activated (ON), motor is activated (will run). 0: Automatic mode is not active (OFF); motor will be switched off/will not run.
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance". 0: Motor is available.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated. 0: The return value of the upstream element will be applied.

Configuration

Step	Procedure
1	Insert the RC_IF_MOTOR block in a CFC chart
2	Insert a MOTOR block in the CFC chart.
3	Interconnect the two blocks.
4	Start the Route Control Wizard The element ID is entered automatically.
5	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Additional information

- Section "Guide to CFC Motor with Two Statuses" (Page 257)

8.3.3.4 RC_IF_MOT_REV (FB 823)

Description

This block is an interface block between a **bidirectional motor and an OFF status** and the routing system.

The interface block is interconnected to a MOTOR block from the APL, for example, with FB1851 "MotRevL" or from the PCS 7 standard library, for example, to FB67 "MOT_REV" in CFC and connects its signals to a control element data record in the routing system.

If the motor is involved in the route, the motor is activated according to the interconnection in the route. The motor feedback is evaluated in the route simultaneously.

You can find additional information in the "Route Control Configuration" section.

Similar Blocks

- RC_IF_MOTOR (FB 822) (Page 138) unidirectional motor
- RC_IF_MOT_SPED (FB 824) (Page 146) dual-speed unidirectional motor

Inputs and outputs

Parameter	Meaning	Type	Default	In-put or out-put	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	+	Assigned automatically by the Route Control Wizard
FB_ON	Motor feedback:	BOOL	-	I	VQ	-	1: Motor is running (ON). 0: Motor is off (OFF).

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
FB_DIR	Motor feedback regarding direction	BOOL	-	I	VQ	-	1: Reverse 2: Forward This signal is evaluated only if FB_ON = 1.
MONITOR	Feedback-signal monitoring	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active. 0: Monitoring of feedback signals is deactivated; feedback is being simulated.
MAN_AUT	Status of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode. 1: Upstream element is in automatic mode.
LOCK	Specifies whether an upstream element is locked. You can find additional information in "LOCK Input on Element Blocks". (Page 72)	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search. 0: Upstream element is not locked and will be taken into consideration in the route search.
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
PEND_OOS	"Pending out of Service" Indicates whether element :non-availability" is in effect, e.g. during maintenance	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search. 0: Maintenance is not pending. Element will be taken into consideration in the next route search.
EV_ID1 ... EV_ID3	Event ID for alarm instance #1 ... Event ID for alarm instance #3	DWORD ... DWORD	- ... -	I ... I	UQ ... UQ	- ... -	 ...
QID	Element ID automatically assigned by the wizard	INT	-	O	VQ	-	
QBA_EN	Specifies whether an element can be used within the context of a batch. You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element can be used for batch 0: Element cannot be used
QOCCUPIED	Indicates whether the element is occupied by a batch You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element is occupied by a batch. 0: Element is not occupied by a batch.
QRET_VAL	Return value of the element	WORD	-	O	VQ	-	**0**: No error **8231**: Incorrect or invalid element ID **8233**: Incorrect or unknown element type; interface block does not correspond to the element type in the Route Control configuration.
QAUTO_ON	Automatic activation	BOOL	-	O	VQ	-	1: Automatic control is activated (ON), motor is activated (will run). 0: Automatic mode is not active (OFF), motor will be switched off/will not run.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QAUT_DIR	Motor direction:	BOOL	-	O	VQ	-	1: Motor will run in reverse. 0: Motor will run forward.
QMAINT	Motor is in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance". 0: Motor is available.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	
QMODE_NO	Mode level of route activating this element	INT	-	O	UQ	-	
QCOMM_ID	Remote element ID	INT	-		UQ	-	
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated. 0: The return value of the upstream element will be applied.

Configuration

Step	Procedure
1	Insert the RC_IF_MOT_REV in a CFC chart.
2	Interconnect to a motor block, for example, a motor block from the PCS 7 standard library.
3	Start the Route Control Wizard and allow the element ID to be entered automatically.
4	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Additional information

- Section "Guide to CFC Bidirectional Motor" (Page 261)

8.3.3.5 RC_IF_MOT_SPED (FB 824)

Description

This block is an interface block between a **dual-speed motor (fast, slow and OFF)** and the routing system.

The interface block is interconnected to a MOTOR block from the APL, for example, with FB1856 "MotSpdL" or from the PCS 7 standard library, for example, to FB68 "MOT_SPEED" in CFC.
If the motor is involved in the route, the motor is activated according to the interconnection in the route. The motor feedback is evaluated in the route simultaneously.

You can find additional information in the "Route Control Configuration" section.

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	+	Assigned automatically by the Route Control Wizard
FB_ON	Motor feedback:	BOOL	-	I	VQ	-	1: Motor is running (ON). 0: Motor is off (OFF).
FB_SPEED	Return value of motor – speed	BOOL	-	I	VQ	-	1: Motor is running fast (FAST) 0: Motor is running slowly (SLOW)

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
MONITOR	Monitor feedback	BOOL	TRUE	I	VQ	+	1: Monitoring of feedback signals is active. 0: Monitoring of feedback signals is deactivated; feedback is being simulated.
MAN_AUT	Control type of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode. 1: Upstream element is in automatic mode.
LOCK	Indicates whether element is locked You can find additional information in "LOCK Input on Element Blocks". (Page 72)	BOOL	-	I	VQ	-	1: Element is locked and will not be taken into consideration in route search. 0: Element will be taken into consideration in the route search.
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search. 0: Maintenance is not pending. Element will be taken into consideration in the next route search.
EV_ID1 ... EV_ID3	Event ID for alarm instance #1 ... Event ID for alarm instance #3	DWORD ... DWORD	- ... -	I ... I	UQ ... UQ	- ... -	...
QID	Element ID automatically assigned by the wizard	INT	-	O	VQ	-	

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QBA_EN	Specifies whether an element can be used within the context of a batch. You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH. 0: Element will not be used as part of BATCH.
QOCCUPIED	Indicates whether element is occupied within the context of a batch. You can find additional information in the SIMATIC BATCH documentation section.	BOOL	-	O	VQ	-	1: Element is occupied by a batch. 0: Element is not occupied by a batch.
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8241: Incorrect or invalid element ID 8243: Incorrect or unknown element type; interface block does not correspond to the element type in Route Control Configuration.
QAUTO_ON	Motor activation	BOOL	-	O	VQ	-	1: Automatic control is activated (ON), motor is activated (will run). 0: Automatic mode is not active (OFF), motor will be switched off/will not run.
QAUT_SPD	Speed	BOOL	-	O	VQ	-	1: Motor will run fast (FAST). 0: Motor will run slowly (SLOW).
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance". 0: Motor is available.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QCOMM_ID	Remote element ID	INT	-	O	UQ	-	

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated. 0: The return value of the upstream element will be applied.

Configuration

Step	Procedure
1	Insert the RC_IF_MOT_SPED in a CFC chart.
2	Insert the MOTOR block in the CFC chart.
3	Interconnect the two blocks.
4	Start the Route Control Wizard. The element ID is entered automatically.
5	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Additional information

- Section "Guide to CFC Dual-Speed Motor" (Page 260)

8.3.3.6 RC_IF_USER_CE (FB 829)

Description

This block provides an interface with user-definable activations and feedback for creating user-defined control elements. It can be interconnected with any technological block.

If the control element is involved in the route, the element is activated according to the interconnection in the route. The element feedback is evaluated in the route simultaneously.

Note

The RC_IF_USER_CE block does not cover feedback simulation. If required, you can implement feedback simulation by appropriately interconnecting the activation outputs with the feedback inputs in the CFC chart. In the simplest case, this is achieved by looping back the activations to the corresponding feedback.

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
ID	Unique element ID within the automation system	INT	-	I	U	+	Assigned automatically by the Route Control Wizard
ACTIVE	Idle-state feedback	BOOL	-	I	VQ	-	1: Element is active, it is no longer in the idle state. 0: Element is not active, it has reached the idle state.
FB_00 ... FB_12	Bit 0 for element feedback You can find additional information in "Feedback Bit Assignment" (Page 154). ... Bit 12 for element feedback You can find additional information in "Feedback Bit Assignment" (Page 154).	BOOL ... BOOL	- ... -	I ... I	VQ ... VQ	- ... -	0, 1 ... 0, 1
MAN_AUT	Control type of upstream element	BOOL	-	I	VQ	-	0: Upstream element is in manual mode. 1: Upstream element is in automatic mode.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
LOCK	Specifies whether an upstream element is locked. You can find additional information in "LOCK Input on Element Blocks". (Page 72)	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search. 0: Upstream element is not locked and will be taken into consideration in the route search.
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	+	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	+	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search. 0: Maintenance is not pending. Element will be taken into consideration in the next route search.
EV_ID1 ... EV_ID3	Event ID for alarm instance #1 ... Event ID for alarm instance #3	DWORD ... DWORD	- ... -	I ... I	UQ ... UQ	- ... -	- ... -
TypeName	Name of the control element type	STRING [24]	"MY_CE"	I	V	-	Any character string up to 24 characters
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8229: Incorrect or invalid element ID
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QID	ID assigned by the Route Control Wizard and used by this element	INT	-	O	VQ	-	-
Q_C_00 ... Q_C_15	Bit 0 for element activation You can find additional information in "Activation Bit Assignment". (Page 153) ... Bit 15 for element activation You can find additional information in "Activation Bit Assignment". (Page 153)	BOOL ... BOOL	- ... -	O ... O	VQ ... VQ	- ... -	1: Activation has been activated. Element is controlled. 0: Activation is not active. ... 1: Activation has been activated. Element is controlled. 0: Activation is not active.
QBA_EN	Specifies whether an element can be used within the context of a batch. You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH. 0: Element will not be used as part of BATCH.
QOCCUPIED	Indicates whether the element is occupied by a batch You can find additional information in the SIMATIC BATCH documentation.	BOOL	-	O	VQ	-	1: Element is occupied by a batch. 0: Element is not occupied by a batch.
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	+	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	-
QMAINT	Element in maintenance	BOOL	-	O	UQ	+	1: Motor is "in maintenance". 0: Motor is available.

Configuration

Step	Procedure
1	Insert RC_IF_USER_CE in a CFC chart.
2	Configure the "TypeName" input Change the name of the subtype from "MY_CE" to a name of your choosing
3	Interconnect your user-defined block to another block, e.g., blocks from the PCS 7 standard library, blocks from the SC library or the PTE library.
4	Start the Route Control Wizard The element ID is entered automatically.
5	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Note

To activate this control element in routes, perform the following steps:

1. Create relevant commands on the subtype in Route Control Configuration.
2. Edit the activation and feedback masks in accordance with the assignment of activation and feedback inputs on the block.

Example

- Section "Example of a User-Defined Type" (Page 168)

8.3.3.7 Activation Bit Assignment

Assigning Activation Bits on the Block to the Activation Mask in the Route Control Configuration

Activation bit on the block	Bit in the activation mask
Output Q_C_00	Bit 0 The least-significant bit on the right in the activation mask
Output Q_C_01 .... Output Q_C_15	Bit 1 .... Bit 15 The most-significant bit on the left in the activation mask

8.3.3.8 Feedback Bit Assignment

Assigning Feedback Bits on the Block to the Feedback Mask in the Route Control configuration

Feedback bits on the block	Bit in the feedback mask
Input FB_00	Bit 0 The least-significant bit on the right in the activation mask
Input FB_01 .... Input FB_12	Bit 1 .... Bit 12 The most-significant bit on the left in the activation mask

Note

Bits 13 to 15 in the feedback mask are already occupied by Route Control and are not available for user-defined feedback.

8.3.4 Sensor elements

8.3.4.1 RC_IF_SENSOR (FB 845)

Description

This block is the interface block between a binary process sensor and the routing system.

Inputs and outputs

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	-	Assigned automatically by the Route Control Wizard
FB_00	Return value of the actual value of a process sensor	BOOL	-	I	VQ	-	1: Upstream sensor returns 1=TRUE 0: Upstream sensor returns 0=FALSE
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.

Parameter	Meaning	Type	Default	Input or output	Attr.	OCM	Permitted values
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	-	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for alarm instance #2	DWORD	-	I	UQ	-	-
QID	ID assigned by the Route Control Wizard and used by this route	INT	-	O	VQ	-	-
QRET_VAL	Return value for block	WORD	-	O	VQ	-	0: No error 8451: Incorrect or invalid element ID 8453: Incorrect or unknown element type; interface block does not correspond to the element type in the Route Control configuration.
QFB_00	Return value (actual value) of sensor; passed through for checking.	BOOL	-	O	VQ	-	Input FB_00 is passed through.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-

Parameter	Meaning	Type	Default	In-put or out-put	Attr.	OCM	Permitted values
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Configuration

Step	Procedure
1	Insert the RC_IF_SENSOR block in a CFC chart.
2	Interconnect the FB_00 inputs, ERROR with external sensor.
3	Start the Route Control Wizard The element ID is entered automatically.
4	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Example

- Section "Guide to CFC Sensor Element" (Page 268)

8.3.4.2 RC_IF_CONDUCT (FB 846)

Description

This block is an interface block that is located between an analog sensor and the routing system and that maps a real value onto four discrete increments.

If the sensor is involved in the route, the feedback is evaluated according to the interconnection in the route.
You can find additional information in "Route Control Configuration".

The block behaves in a similar way to the RC_IF_SENSOR (FB845) (Page 154) block. However, RC_IF_SENSOR only recognizes a binary evaluation (value reached? yes/no; for example, damper open/closed). By contrast, RC_IF_CONDUCT recognizes four discrete statuses and can, therefore, be used, for example, to measure conductivity in pipelines and then indicate "water", "material", "acid", and "base".

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	-	Assigned automatically by the Route Control Wizard
LEVEL_1	Limit value #1	REAL	-	I	VQ	-	Assignment of first limit value
LEVEL_2	Limit value #2	REAL	-	I	VQ	-	Assignment of second limit value
LEVEL_3	Limit value #3	REAL	-	I	VQ	-	Assignment of third limit value
LEVEL_4	Limit value #4	REAL	-	I	VQ	-	Assignment of fourth limit value
HYS	Hysteresis	REAL	-	I	VQ	-	Assignment of hysteresis.
ACTUAL	Current value from the process	REAL	-	I	VQ	-	-
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	-	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for alarm instance #2	DWORD	-	I	UQ	-	-
QID	ID assigned by the Route Control Wizard and used by this route	INT	-	O	VQ	-	-
QRET_VAL	Return value of the element	WORD	-	O	VQ	-	0: No error 8461: Incorrect or invalid element ID 8463: Incorrect or unknown element type; interface block does not correspond to the element type in the Route Control configuration.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QLEVEL1	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #1 not reached 1: Limit value #1 reached
QLEVEL2	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #2 not reached 1: Limit value #2 reached
QLEVEL3	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #3 not reached 1: Limit value #3 reached
QLEVEL4	Binary signal indicating whether or not the limit value has been reached	BOOL	-	O	VQ	-	0: Limit value #4 not reached 1: Limit value #4 reached

Configuration

Step	Procedure
1	Insert the block in a CFC chart.
2	Specify LEVEL_1 ... LEVEL_4 limit values.
3	Specify a hysteresis.
4	Interconnect the ACTUAL parameter (actual value).
5	Interconnect the return values.

Step	Procedure
6	Start the Route Control Wizard The element ID is entered automatically.
7	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Additional information

- Section "Guide to CFC Conductivity" (Page 269)

8.3.4.3 RC_IF_USER_SE (FB 848)

Description

This block provides an interface with user-definable feedback for creating user-defined sensor elements.

If the sensor is involved in the route, the feedback is evaluated according to the interconnection in the route.

You can find additional information in the "Route Control Configuration" section.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	-	Assigned automatically by the Route Control Wizard
FB_00	Bit 0 for element feedback You can find additional information in "Feedback Bit Assignment" (Page 154).	BOOL	-	I	VQ	-	0, 1
...	...	...	...	...	...	...	...
FB_12	Bit 12 for element feedback You can find additional information in "Feedback Bit Assignment" (Page 154).	BOOL	-	I	VQ	-	0, 1
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	-	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for alarm instance #2	DWORD	-	I	UQ	-	-
TypeName	Name of the sensor element type	STRING [24]	"MY_SE"	I	V	-	Any character string up to 24 characters
QID	ID assigned by the Route Control Wizard and used by this element	INT	-	O	VQ	-	-
QRET_VAL	Return value of the element	WORD	-	O	VQ	-	0: No error 8481: Incorrect or invalid element ID
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Configuration

Step	Procedure
1	Insert RC_IF_USER_SE in a CFC chart.
2	Configure the "TypeName" input. Change the name of the subtype of "MY_SE" to a name of your choosing.
3	Interconnect the user-defined block to the feedback signals.

Step	Procedure
4	Start the Route Control Wizard The element ID is entered automatically.
5	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Note

To activate this control element in routes, perform the following steps:

1. Create relevant commands on the subtype in Route Control Configuration.
2. Edit the activation and feedback masks in accordance with the assignment of activation and feedback inputs on the block.

Additional information

User-defined sensor elements are created in the same way as control elements.

You can find additional information in
"Example of a User-Defined Type" (Page 168).

8.3.5 Parameter elements

8.3.5.1 General Information About Parameter Elements

General Information About Parameter Elements

Parameter elements represent a setpoint (QVALUE_I, _D, _R) which can be further processed by user programs and take an actual value (ACT_VAL) from the process. Parameter elements are used to specify setpoints, whereby the setpoint specification can depend on a given route. For example, the calculation of the discharge quantity may depend on the volume of a pipe.

PE Types

SIMATIC Route Control provides two predefined PE types:

- RC_IF_VOLUME (FC 808) (Page 163)
- RC_IF_TIMER (FC 809) (Page 164)

An interface block is available for user-defined parameter elements. You call this block in the user programs in order to access the SIMATIC Route Control internal PA data structures:

- RC_IF_USER_PE (FC 807) (Page 165)

Parameter Element Types

SIMATIC Route Control distinguishes between two types of parameter elements:

- Internal parameter elements
- External parameter elements

You can mix internal and external parameter elements when a parameter element is inserted in a partial route.

Internal Parameter Elements

The setpoints of internal parameter elements are known at the time of the configuration (Route Control).

Examples: Volumes/quantity of a material in the pipes, fixed times.

External Parameter Elements

The setpoints of external parameter elements are not known at the time of the configuration (Route Control).

Examples: Weighed quantities, which are usually specified by recipes.

Whereas the setpoint is specified directly at the RPE (Route Parameter Element) as a property for an internal parameter element, it is configured as an index for an external parameter element. This index references one of the inputs (EXT_..._I, ... = 1 to 24) at the route (RC_IF_ROUTE) during runtime. The setpoint located there is passed by the route block to the EXT_..._O outputs and also output to the parameter element interface blocks (e.g., RC_IF_VOLUME, RC_IF_TIMER).

Summation and non summation parameter elements

You obtain a summation parameter element when you selected the "Sum type" option in the "Properties of route parameter elements" dialog for an internal parameter element. External parameter elements cannot also be summation parameter elements.

You can mix summation and non summation parameter elements when a parameter element is inserted in a partial route.

When a route is requested or started, the Route Control server forms a sum from the setpoints of all summing parameter elements involved in the route. When a mode containing one or more summing PEs is activated, this sum is passed to all PEs configured in this mode, specifically at the QVALUE_x output of the PE interface block.

The sum of the individual values of PEs placed in this mode are shown in the respective Mode column for each configured PE in the Route Control Center.

The feedback values displayed in the Route Control Center indicate the value interconnected to the ACT_VAL input of the PE interface block.

Non summation parameter elements of this route are not taken into account when the sum is formed and are supplied with the value defined for it.

RC_IF_VOLUME

A volume parameter element is used when an action is to be performed for a specific volume, depending on the selected route.

Example: Material should only exit a pipe until the output valve closes and the destination container valve opens.

RC_IF_TIMER

A timer parameter element is used when an action is to be performed at a specific time, depending on the selected route.

Example: Material should only exit a pipe until the output valve closes and the destination container valve opens.

Additional information

- Section "RC_IF_ROUTE (FB 800)" (Page 101)

8.3.5.2 RC_IF_VOLUME (FC 808)

Description

This block is a parameter element for a volumetric value. The RC_IF_VOLUME and RC_IF_TIMER blocks use the RC_PE_COMMON block internally.

A parameter element specifies a setpoint. The actual value of the parameter element is only used for visualization on the Route Control Center.

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route. The parameter-element feedback is not evaluated in the route.

Inputs and Outputs

You can find additional information about inputs and outputs in "RC_PE_COMMON (FC 810)". (Page 206)

Block Return Values

QRET_VAL	Meaning
0	No error
8102	Incorrect or invalid element ID
8103	External parameter elements only: The index is outside the permissible range (1 to 24).
8104	External parameter elements only: The route ID is outside the permissible range (1 to the maximum number of routes). The maximum number of routes is specified using the NoRoutes input on FB 850 RC_IF_CFG.

Configuration

Step	Procedure
1	Insert a user-defined block in a CFC.
2	Interconnect the user-defined block to technological blocks, such as PCS 7 standard library blocks.
3	Start the Route Control Wizard. The element ID is entered automatically.
4	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Example

- Section "Guide to CFC Parameter Element" (Page 269)

8.3.5.3 RC_IF_TIMER (FC 809)

Description

This block is a parameter element for a time value. The RC_IF_VOLUME and RC_IF_TIMER blocks use the RC_PE_COMMON block internally.

A parameter element specifies a setpoint. The actual value of the parameter element is only used for visualization on the Route Control Center.

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route. The parameter-element feedback is not evaluated in the route.

Inputs and Outputs

You can find additional information about inputs and outputs in "RC_PE_COMMON (FC 810)". (Page 206)

Block Return Values (QRET_VAL)

QRET_VAL	Meaning
0	No error
8102	Incorrect or invalid element ID
8103	External parameter elements only: The index is outside the permissible range (1 to 24).
8104	External parameter elements only: The route ID is outside the permissible range (1 to the maximum number of routes). The maximum number of routes is specified using the NoRoutes input on the FB850 RC_IF_CFG.

Configuration

Step	Procedure
1	Insert a user-defined block in a CFC chart.
2	Interconnect the user-defined block to technological blocks, such as PCS 7 standard library blocks.
3	Start the Route Control Wizard. The element ID is entered automatically.
4	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

8.3.5.4 RC_IF_USER_PE (FC 807)

Description

This block is a parameter element for a volumetric value. Internally, it uses the RC_PE_COMMON block.

A parameter element specifies a setpoint. The actual value of the parameter element is used for visualization in the Route Control Center.

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route. The parameter-element feedback is not evaluated in the route.

Inputs and Outputs

You can find additional information about inputs and outputs in "RC_PE_COMMON (FC 810)". (Page 206)

Additional input on RC_IF_USER_PE:

Parameter	Meaning	Type	Default	Input or Output	Attr.	OCM	Permitted values
TypeName	Name of the sensor element type	STRING [24]	--	I	V	-	Any character string up to 24 characters

Block Return Values

QRET_VAL	Meaning
0	No error
8102	Incorrect or invalid element ID
8103	External parameter elements only: The index is outside the permissible range (1 to 24).
8104	External parameter elements only: The route ID is outside the permissible range (1 to the maximum number of routes). The maximum number of routes is specified using the *NoRoutes (number of routes)* input on RC_IF_CFG (FB 850) (Page 172).

Configuration

Step	Procedure
1	Insert the RC_IF_USER_PE block in a CFC chart.
2	Configure the "TypeName" input. Change the name of the subtype to a name of your choosing.
3	Interconnect the user-defined block to technological blocks, such as PCS 7 standard library blocks.
4	Start the Route Control Wizard. The element ID is entered automatically.
5	Transfer the element ID and the new subtype to Route Control Configuration by performing an S7 Import operation.

Note

To activate this parameter element in routes, you still have to edit the unit for visualization on the Route Control Center on the subtype in the Route Control configuration tool.

Additional information

User-defined parameter elements are created in the same way as control elements.

You can find additional information in
"Example of a User-Defined Type" (Page 168).

8.3.6 Link element

8.3.6.1 RC_IF_LE (FB 828)

Description

This block stores the **status of alink element** (LE) of the route control system, for example, the **material**. It thus represents one unit of the material transport medium (for example, one piece of pipeline). Normally, one link element is inserted for each partial route.

Note

A link element must be inserted into the partial route when configuring permissible material sequences because these link elements store information about the material that was last transported.

Inputs and outputs

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
ID	Element key that is unique from all others in this automation system Checked by the Route Control Wizard and, in the case of 0, a new ID is assigned.	INT	-	I	U	-	You can find additional information in "Valid ID Ranges for CEs, SEs, LEs, and PEs" (Page 605).
DEF_VAL	Default value that can be transferred to the link element using the SET_DEF input	INT	0	I	VQ	-	-
SET_DEF	Initiate application of default value (on rising edge)	INT	1	I	VQ	-	0 -> 1: Setpoint transfer
QID	ID assigned by the Route Control Wizard and used by this route	INT	-	O	VQ	-	-
QRET_VAL	Return value for block	BOOL	-	O		-	0: No error 8xxx:: Error
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QMAT_I	Material ID of the link element	INT	-	O	UQ	-	-
QMAT_DI	Material ID of the link element	DINT	-	O	VQ	+	-
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-

Configuration

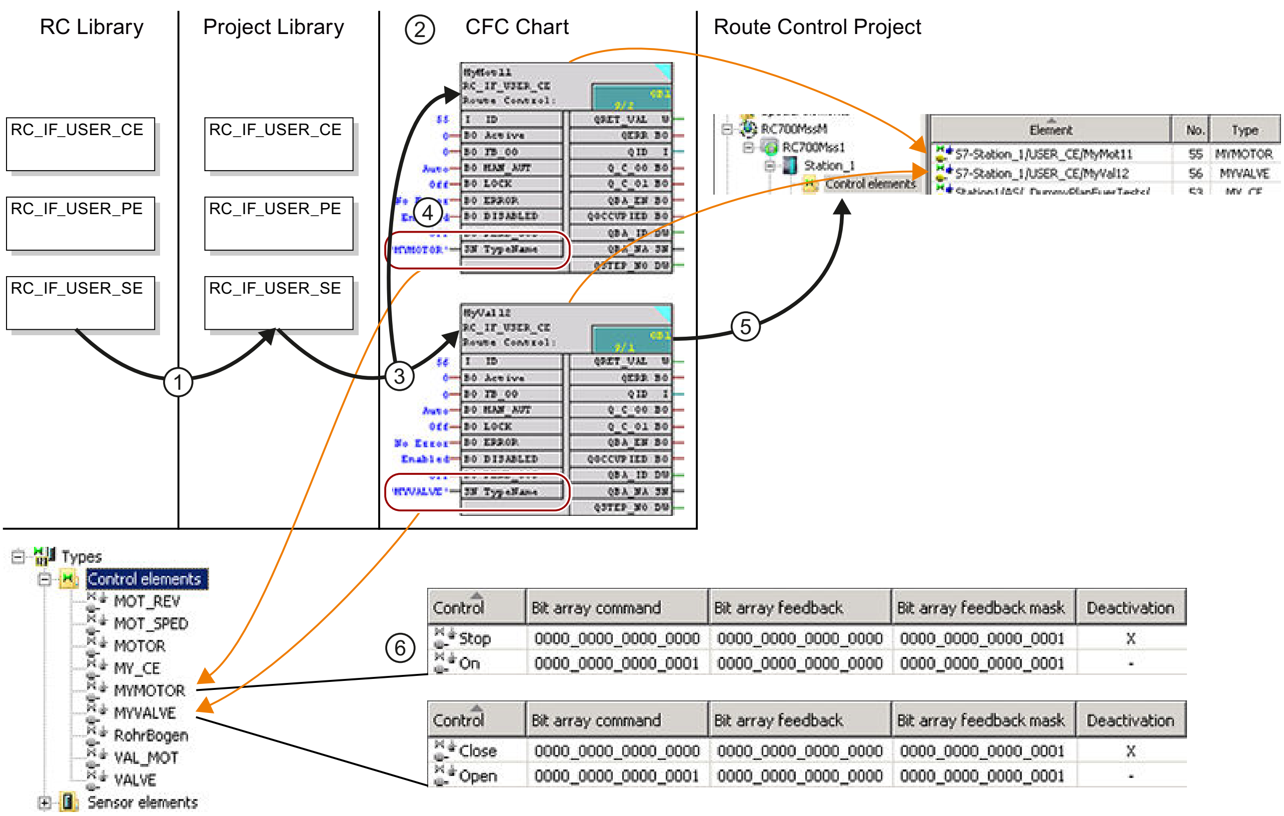
Step	Procedure
1	Insert the block in a CFC chart.
2	Start the Route Control Wizard The element ID is entered automatically.
3	Transfer the element ID to Route Control Configuration by performing an S7 import operation.
4	If necessary following compilation of the PCS 7 OS: Visualize the QMAT_DI output as a signal to change colors in a PCS 7 OS picture

8.3.7 User-defined type

Introduction

Route Control supports the creation of user-specific elements by providing three interface blocks, namely RC_IF_USER_CE (FB829) (Page 150), RC_IF_USER_SE (FB848) (Page 159) and RC_IF_USER_PE (FC807) (Page 165). Use these block templates as a basis for creating user-defined types.

Overview



Basic procedure

Step	Procedure
1	Copy the RC_IF_USER_CE (PE, SE) block templates included in the Route Control library to the library of your S7 project.
2	Create a new CFC chart in which you are going to insert the user element blocks.
3	Install the block in the CFC chart and name the element: "MyMot11" and "MyVal12" in this example.
4	Define the element type.
5	Change the input value "TypeName" at the instance of the RC_IF_USER_CE block to "MY-MOTOR" or "MYVALVE", for example.

Step	Procedure
6	Interconnect the interface block to the corresponding element from the basic library, for example, VALVE or MOTOR.
7	Open the Route Control Wizard and transfer the new block instance to the Route Control configuration The Wizard exports the instance name of the block as an element name, and the value at input "TypeName" as an element type.
8	Add the control commands and return values and masks for the new imported types ("MyOff", "MyOn", "MyOpen", and "MyClose" in the example) in the Route Control project. The new element with these control commands is now ready for use in partial routes.
9	Download the Route Control configuration to the Route Control Server and activate the changes using the RCC.
10	Compile the CFC chart.
11	Download the compiled blocks to the automation system.
12	Request a route that uses this element for a test in manual mode.

8.3.8 Generic user-defined elements

Introduction

You can group elements that are technologically associated and always installed in the same partial route by means of a generic user-defined element (GE block). You can include standard elements such as RC_IF_VALVE and user-defined elements such as RC_IF_USER_CE in a GE block.

Nesting of GE blocks (GE block in GE block) is not supported.

The Route Control Wizard identifies these GE blocks and the elements they contain based on special user-defined attributes (UDA) and imports the elements as separate elements to Route Control Engineering.

As these elements reside in the same block, you must always install all elements of a GE block in a partial route.

Note

You run the risk of malfunctions if you ignore this rule.

Note

No link elements

Link elements are not supported in GE blocks.

Description

The I/O of the installed blocks you are going to interconnect with other blocks must be placed on the sheet bar of the GE block.

The "ID" inputs of all interface blocks you installed and the "TypeName" inputs of the inserted user-defined elements must be available for external programming at the GE block. You need the names of these GE block inputs to program the UDA.

A GE block header must contain the following UDAs:

UDA	Value
RC_type	'GE'
RC_id_param	Names of all GE block inputs at which you program the IDs of the elements contained therein. Example with three elements: 'CE_ID, VV_ID, PE_ID'

The so-called ID input variables of the GE block must contain both the "RC_type" and "RC_subtype" UDAs.

The following table shows the values of these UDAs for each possible element:

Element	RC_type	RC_subtype
RC_IF_MOT_REV	'CE'	'MOT_REV'
RC_IF_MOT_SPED	'CE'	'MOT_SPED'
RC_IF_VAL_MOT	'CE'	'VAL_MOT'
RC_IF_MOTOR	'CE'	'MOTOR'
RC_IF_VALVE	'CE'	'VALVE'
RC_IF_SENSOR	'SE'	'SENSOR'
RC_IF_CONDUCT	'SE'	'CONDUCTIVITY'
RC_IF_VOLUME	'PE'	'VOLUME'
RC_IF_TIMER	'PE'	'TIMER'
RC_IF_USER_CE	'CE'	'IS_USER_ELEMENT'
RC_IF_USER_SE	'SE'	'IS_USER_ELEMENT'
RC_IF_USER_PE	'PE'	'IS_USER_ELEMENT'

The ID input variable for a user-defined element must contain a third UDA: "RC_Typ_Param".

In this UDA, enter the name of the input at the GE block at which you configure the "TypeName" input of the corresponding user-defined element, for example, 'CE_Name'.

Sample blocks and charts

The RC Library V8.0 provides three block sources with identical functionality to serve as patterns or templates:

- "GE_AWLDE": STL with mnemonics and comments in German
- "GE_AWLEN": STL with mnemonics and comments in English
- "GE_SCL": SCL with comments in English

You generate the block
FB "GE_AWLorSCL" by compiling one of these sources in the corresponding environment.

The CFC chart "GE_AWLorSCL" contains a textually interconnected instance of this FB.

The CFC chart "GE_CFC" shows how you can create a GE block as multiinstance block in CFC.

Basic procedure for creating a GE Block in CFC

Step	Procedure
1	Create a new CFC chart.
2	Install the required RC_IF_xxx interface blocks.
3	Create the required chart connections.
4	Enter the UDAs in the ID input variables of the GE block in the "Attributes" tab of the Object Properties dialog of the chart connections.
5	Interconnect the inputs and outputs with the chart connections.
6	Compile the CFC chart as a block type. Enter the UDAs for the block header in the "Attributes" tab.

Configuration

Step	Procedure
1	Insert the GE block in a CFC chart.
2	Configure the inputs at which you define the names of the subtypes for the inserted user-defined elements.
3	Interconnect the GE block with other blocks such as blocks from the PCS 7 standard library, SC library or PTE library.
4	Start the Route Control Wizard. The RC Wizard assigns unique IDs if the value "0" is set at the element IDs.

Generic elements in Route Control

In Route Control, the elements of a GE block are assigned the name of the the GE block. In order to identify a specific element, the name of the input variables for the element ID is appended in parentheses to the block name, for example, (CE_ID).

8.3.9 Configuration and Cross-Coupling

8.3.9.1 Block Overview

Overview of Cross-Coupling Blocks

The following blocks are available for cross-coupling:

Blocks	Purpose
RC_IF_CFG (FB850) (Page 172)	Configuration of the AS-server coupling Configuration of the AS-AS coupling (cross-coupling)
RC_IF_XC_DIAG (FB 884) (Page 178) RC_IF_XC_LIFE (FC 884) (Page 182)	Diagnostics for cross-coupling

8.3.9.2 RC_IF_CFG (FB 850)

Description

Insert this function block into an (RC configuration) CFC chart and program it once for each AS. The block receives the parameters of this AS and of the Route Control servers via its inputs. It also enables system blocks of the Route Control Library to be called in the AS. The sublevel blocks of the Route Control system which are needed to execute route control are then called from these blocks in the AS.

FB 850/RC_IF_CFG must be executed in a valid watchdog interrupt OB (OB 30 to OB 35). Position the block, therefore, on an appropriate sequence level. Due to its internal programming it is also called in OB 1, in the restart OBs OB 100/OB 101/OB 102, and in the error OBs OB 121/OB 122 of the corresponding AS.

To ensure communication with the RC server is fast enough, we recommend that FB 850/ RC_IF_CFG is inserted in OB 35 (with 100 ms). This value must then also be available at the OB_KOMM input. All other Route Control system tasks can be executed in OB 1 cyclic operation. Therefore, you must select a value of 1 for both inputs OB_SYS and OB_XC.

Note

If you want to execute FB 850/RC_IF_CFG in a different watchdog interrupt OB (OB 30 to OB 34), you must insert it in the corresponding sequence group.

However, please note that in such cases you will need to adapt the values at the OB_KOMM, OB_SYS, and OB_XC inputs to this new setting. These inputs can then only be programmed using the number of the watchdog interrupt OB in which you have placed FB 850/RC_IF_CFG, as well as OB 1.

In block RC_IF_CFG, the Route Control Wizard also automatically enters and configures the local communication IDs for the cross-coupling connections to the peer automation system.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr	OCM	Permitted values
RC_AS_ID	Number of the Route Control AS (property of the AS)	INT	1	I	U	-	The range of values is listed in the section "Valid AS Numbers" (Page 606)
OB_KOMM	Defines the OB that handles communication with the RC server.	INT	35	I	V	-	1, 30, 31, 32, 33, 34, 35
OB_SYS	Defines which OB processes the list of elements for a route.	INT	1	I	V	-	1, 30, 31, 32, 33
OB_XC	Defines which OB is to process AS-AS communication (cross-coupling).	INT	1	I	V	-	1, 30, 31, 32, 33, 34, 35
NoRoutes	The highest route ID that can be started in the Route Control Center. 1 to 299: If the number is less than 300, processing in Route Control is optimized with respect to time because not all of the routes, and thus not all of the IDs, are being processed. The value must be greater than or equal to the maximum number of simultaneously active routes.	INT	300	I	V	-	1 to 300
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	U	-	-
EV_ID2	Event ID for alarm instance #2	DWORD	-	I	U	-	-
CE_SIMU	Defines whether to simulate processing or the return values of the control elements in this AS.	BOOL	-	I	VQ	+	0: No simulation, the real return values from the process are used. 1: Simulation of return values, for example, during commissioning
SE_SIMU	Defines whether to simulate processing or the return values of the sensor elements in this AS.	BOOL	-	I	VQ	+	0: No simulation, the real return values from the process are used. 1: Simulation of return values, for example, during commissioning
AS_ID_01	Route Control AS ID for connection #1	INT	0	I	V	-	You can find additional information in the section "Valid AS Numbers" (Page 606)
ASConn01	Local communication ID derived from NetPro for connection #1	WORD	W#16#0	I	V	-	-
AltCon01	Alternative connection for AS_ID_01	WORD	W#16#0	I	V	-	-
...	...	...	...	...	...	...	...

Parameter	Meaning	Type	Default	Type	Attr	OCM	Permitted values
AS_ID_32	Route Control AS ID for connection #32	INT	0	I	V	-	-
ASConn32	Local communication ID derived from NetPro for connection #32	WORD	W#16#0	I	V	-	-
AltCon32	Alternative connection for AS_ID_32	WORD	W#16#0	I	V	-	-
Red_Bus	Indicates whether a redundant AS bus is available.	BOOL	FALSE	I	VQ	-	1: Redundant AS bus available 0: No redundant AS bus available
IDServer	Diagnostic information: Local NetPro ID of the Route Control server currently acting as the master server. This number changes if the partner of a redundant server assumes control.	WORD	-	I	VQ	-	0: The Route Control master server has not been restarted since the last download of blocks to the AS. <>0: NetPro ID downloaded from the Route Control master server
IDStandby	Diagnostic information: Local NetPro ID of the Route Control server currently acting as the standby server. This number changes if the partner of a redundant server assumes control.	WORD	-	I	V	-	0: The Route Control standby server has not been restarted since the last download of blocks to the AS. <>0: NetPro ID downloaded from the Route Control standby server
OOSREQUP	Maintenance request by program: • Must be enabled in the Route Control Center • Sets output QOOSREQG	BOOL	FALSE	I	VQ	+	0: No request 1: Request of the "AS in maintenance" status by a program
Q_AS_ID	ID of the local AS; the input ID is assigned by the RC Wizard and made available here for diagnostics by the block.	INT	-	O	VQ	-	You can find additional information in the section "Valid AS Numbers" (Page 606)
QERR	Indicates error events.	BOOL	-	O	VQ	-	0: No error (false) 1: Error in route block (true)
QRET_VAL	Diagnostic information of the block (hexadecimal)	WORD	-	O	VQ	-	**8501**: Invalid AS ID (outside the valid range). **8503**: RC_IF_CFG is not executed in the OB specified in OB_KOMM. **8504**: RC_IF_CFG is not executed in the OB specified in OB_SYS. **8505**: RC_IF_CFG is not executed in the OB specified in OB_XC. Check the input parameters or the call environment of the OB for 8xxx values.

Parameter	Meaning	Type	Default	Type	Attr	OCM	Permitted values
IniServ1	Diagnostic information: Result of initialization of communication with the Route Control master server	BOOL	-	O	VQ	-	1: Initialization of communication failed 0: Initialization successful
IniServ2	Diagnostic information: Result of initialization of communication with the Route Control standby server	BOOL	-	O	VQ	-	1: Initialization of communication failed 0: Initialization successful
ComServ1	Diagnostic information: Error in communication with the Route Control master server	BOOL	-	O	VQ	-	0: OK 1: Error
ComServ2	Diagnostic information: Error in communication with the Route Control standby server	BOOL	-	O	VQ	-	0: OK 1: Error
ConnAS01 ... ConnAS32	Status of the connection to the peer AS #1 ... Status of the connection to the peer AS #32	BYTE ... BYTE	- ... -	O ... O	VQ ... VQ	+ ... +	**0**: Communication or connection error **1**: OK, connected to remote AS **2**: Local automation system **3**: Not used ... You can find additional information under ConnAS01.
XC_CfgErr	Diagnostic information, return value if the cross-coupling configuration is faulty	INT	-	O	VQ	-	**0**: No configuration errors detected **-1**: Invalid internal AS ID (=0) **-2**: The internal AS ID is not included in the configuration table of the AS_ID_XX inputs **-10**: No access to data record in XC_PCU data block. Check "RC_XC_PCU" max; this parameter must contain the number of data records. **-30350**: Error in the connection table (ConnID=0 or incorrect sequence) **-30351**: At least one connection is faulty
DiaASID	Diagnostic value of cross-coupling: Route Control AS ID (Note: The diagnostic function is selected by setting input DiaConIndx.)	INT	-	O	VQ	-	-

Parameter	Meaning	Type	Default	Type	Attr	OCM	Permitted values
DiaDSNo	Diagnostic value of cross-coupling: Calculated data record in cross-coupling DB (RC_XC_PCU) Note: This data-record number usually does not match the connection number (ASConxx). For additional information, interconnect this output with the "RC_IF_XC_DIAG" block.	INT	-	O	VQ	-	-1: No data-record index, as in local AS 1 to 31: Data-record number
DiaErr	Diagnostic value of cross-coupling: Error value in cross-coupling DB (RC_XC_PCU) (Note: The diagnostic function is selected by setting input DiaConIndx.)	INT	-	O	VQ	-	**-1**: Instance data block of cross-coupling is missing **-2**: Incorrect instance DB number in the data record of cross-coupling (XC_PCU) **-3**: Invalid ID of the remote AS (ID <= 0!) **-4**: The ID of the remote AS is identical to the ID of the local AS -> System cannot find remote AS **-5**: The cross-coupling data records contain several instances of the remote AS ID
DiaState	Diagnostic value of cross-coupling: Status of peer AS Note: The diagnostic function is selected by setting input DiaConIndx.	INT	-	O	VQ	-	**0**: Peer is in STOP **2**: Peer AS is in RUN, that is: OK, no error **-1**: Error Additional values: Information under the LOCAL output of SFB STATUS (SFB 22).
DiaConn1	Diagnostic value of cross-coupling: Status of the connection to RC server #1	INT	-	O	VQ	-	-1: Connection error 2: OK, no error
DiaConn2	Diagnostic value of cross-coupling: Status of second connection to peer AS (Note: The diagnostic function is selected by setting input DiaConIndx.)	INT	-	O	VQ	-	-1: Connection error 2: OK, no error Additional values: Information under the STATUS output of SFB STATUS (SFB 22).
DiagParam	Diagnostic value of cross-coupling: Note: The diagnostic function is selected by setting input DiaConIndx.	BOOL	-	O	UQ	-	0: No error 1: Peer AS did not acknowledge the last PUT job.

Parameter	Meaning	Type	Default	Type	Attr	OCM	Permitted values
QSERV_IP	IP address of the currently active RC server. The active RC server is the one that processes route requests.	DWORD	-	O	VQ	-	IP address of the server. Theoretically, 0.0.0.0 to 255.255.255.255
DiaConIndx	Index for selection of the peer AS for displaying detailed diagnostic data of cross-coupling	INT	0	IO	V	-	1 to 32
QOOSENUP	Enable maintenance requests from the user program	BOOL	-	O	VQ	-	0: Maintenance requests are not permitted from the user program. 1: Maintenance requests are permitted from the user program (see also OOSREQUP).
QOOSSTAG (used to be Q_OOS)	AS in terms of Route Control in "Production" or "Maintenance" status (see QOOSREQG)	BOOL	-	O	V	-	0: AS in "Production" status 1: AS in "Maintenance" status
QOOSREQG (used to be QPENDOOS)	A "Production" or "Maintenance" request was set at input OOSREQUP by operator input at the Route Control Center or by a program. If the request is met, output QOOSSTAG is set.	BOOL	-	O	V	-	0: A "Production" request is active. 1: A "Maintenance" request is active.

Return value QRET_VAL

Value	Meaning
8501 (hex)	The value at parameter RC_AS_ID is outside the valid range. Additional information is available in the section "Valid AS numbers" (Page 606)
8503	Not processing server communication. FB 850 is not processed in the OB specified at input OB_KOMM. Change the input value or check the installation position of FB 850.
8504	The element list of a route is not being processed. FB 850 is not being processed in the OB specified at input OB_SYS. Change the input value or check the installation position of FB 850.
8505	The cross-coupling is not being processed FB 850 is not being processed in the OB specified at input OB_XC. Change the input value or check the installation position of FB 850.

Configuration

Step	Procedure
1	Create a new CFC chart in an AS
2	Copy the sample chart from the Route Control library to your project
3	Program input RC_AS_ID. The valid range of values is defined in the section "Valid AS Numbers" (Page 606)
4	Start the Route Control Wizard. The local communication IDs for AS-AS connections (cross-coupling) to the peer ASs are entered automatically. To activate this step, see the Route Control Wizard dialog box in the section "Actions of the Route Control Wizard" (Page 346)

CAUTION

Old connection ID

As the SFB PUT saves the connection ID passed during the initial call, an AS restart is required each time the connection ID is changed (inputs ASConn01 to ASConn32 or AltCon01 to AltCon32). SFB PUT continues transmission with the old connection ID and to the wrong peer AS if you do not restart the AS.

8.3.9.3 RC_IF_XC_DIAG (FB 884)

Description

This block is a diagnostic block for Route Control that provides detailed information about the status of the AS-AS connections to another partner automation system (cross-coupling). This function block is inserted centrally once for each AS and interconnected with RC_IF_CFG.

You only need to insert this block if you want to obtain diagnostic information about AS-AS communication. The function block should be inserted following RC_IF_CFG in the runtime group (OB) in which AS-AS communication (cross-coupling) is being processed.

You can find additional information under OB_XC of RC_IF_CFG.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
DiaDSNo	Indicates the data record for cross-coupling Interconnect this input with output DiaDSNo of RC_IF_CFG	INT	-	I	VQ	-	1 ... 32
CHK_LEN	Activates length check	BOOL	-	I	VQ	-	0: Check deactivated 1: Check activated

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
QRET_VAL	Diagnostic block return value	WORD	-	O	VQ	-	**8831**: Data record missing **8832**: Data record is invalid (DiaDSNo too large) **8833**: The cross-coupling data block is missing (see QJOB_DB output)
PCU_NO	Number of diagnosed AS	INT	-	O	VQ	-	-
QJOB_DB	Number of the cross-coupling data block	INT	-	O	VQ	-	-
QXC_DB	Number of the send/receive data block	INT	-	O	VQ	-	-
QXC_IDB	Number of the cross-coupling channel (instance-data-block number)	INT	-	O	VQ	-	-
QINIT	Indicates whether or not the cross-coupling connection is currently being initialized	BOOL	-	O	VQ	-	0: Initialization not running 1: Initialization is currently active
QCHK_LEN	Indicates whether length check is taking place	BOOL	-	O	VQ	-	0: Check not running 1: Check is currently active
QLEN1	Maximum length of connection #1	INT	-	O	VQ	-	-
QLEN2	Maximum length of connection #2	INT	-	O	VQ	-	-
CONN_ID1	Local NetPro ID for connection #1	WORD	-	O	VQ	-	-
CON1_PHS	Return value for system-communication block SFB22 (physical status of connection #1) – as hexadecimal value	BYTE	-	O	VQ	-	10H: OK, no error 13H: Intervention required. Additional values: See PHYS output of SFB STATUS (SFB 22)
CON1_STAT	Return value for system-communication block SFB 22 (operating status of peer AS connection #1)	INT	-	O	VQ	-	0H: Peer AS in STOP status 2H: Peer AS in RUNNING status Additional values: Information under the LOCAL output of SFB STATUS (SFB 22).

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
CON1_ERR	Error display for system-communication block SFB22 You can find additional information under the ERROR output of SFB STATUS (SFB 22).	BOOL	-	O	VQ	-	0: OK, no error 1: Error
CON1_DIA	Return value of system-communication block SFB22 (standard return value for connection #1) – Decimal value: 25: Communication is being processed, no error Additional values: Information under the STATUS output of SFB STATUS (SFB 22).	INT	-	O	VQ	-	-
CONN_ID2	Local NetPro ID for connection #2	...	...	O	...	...	...
CON2_PHS	As for connection #1	...	...	O	...	...	...
CON2_STAT	As for connection #1	...	...	O	...	...	...
CON2_ERR	As for connection #1	...	...	O	...	...	...
CON2_DIA	As for connection #1	...	...	O	...	...	...
PUTJOBNO	Point to job data record in cross-coupling data block (XC_JOB_DB)	INT	...	O	UQ	-	-
JOB_STATE	Status of cross-coupling job to be processed currently	INT	-	O	VQ	-	**0**: No jobs pending (IDLE) **2**: Job is running (RUN) **4**: Job sent successfully (DONE OK) **8**: Job ended with error (DONE ERROR)
PUT_STEP	Status of algorithm for activation of SFB PUT in FB 881 RC_XC_PCU_FB	INT	-	O	VQ	-	**0**: No jobs pending (IDLE) **1**: Data are being sent via connection #1 **2**: Waiting for a job on connection #1 to be concluded **3**: Data are being sent via connection #2 **4**: Waiting for a job on connection #2 to be concluded

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
SEARC_STP	Status of search algorithm through data records of cross-coupling jobs:	INT	-	O	UQ	-	**0**: Initializing algorithm **1**: Searching for next job **2**: Waiting until peer AS is in "Run" status **3**: Processing job (next send job)
PUT1_ERR	Error display of system-communication block SFB 15 (error value of connection #1)	BOOL	-	O	VQ	-	0: OK, no error 1: Error
PUT1_DIA	Return value of system-communication block SFB 15 (standard return value of connection #1) – hexadecimal value	INT	-	O	VQ	-	For range of values, refer to STATUS output of SFB15
PUT2_ERR	Error display of system-communication block SFB 15 (error value of connection #2)	BOOL	-	O	UQ	-	0: OK, no error 1: Error
PUT2_DIA	Return value of system-communication block SFB 15 (standard return value of connection #2) – hexadecimal value	INT	-	O	UQ	-	For range of values, refer to STATUS output of SFB15
JOB1_NO	Number of current job in send buffer	INT	-	O	UQ	-	-
JOB_TYPE	Job type:	INT	-	O	VQ	-	1: Job without acknowledgment of receipt 2: Job with acknowledgment of receipt
SRC_Block	Job source: Data block number	INT	-	O	VQ	-	-
SRC_BYTE	Job source: Offset (byte address)	INT	-	O	VQ	-	-
SRC_NUM	Job source: Number of bytes to be sent	INT	-	O	VQ	-	-
DST_Block	Job destination: Data block number	INT	-	O	VQ	-	-
DST_BYTE	Job destination: Offset (byte address)	INT	-	O	VQ	-	-
START_TIM	Job start time in seconds since 1.1.1970	DINT	-	O	UQ	-	-
SEND_TIME	Job send time in seconds since 1/1/1970	DINT	-	O	UQ	-	-
SEND_STEP	Status of send job	INT	-	O	VQ	-	0: No jobs pending 1: Job is currently being sent 2: Waiting for acknowledgment

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
WAIT_TIME	Current duration of send job in status 1, "Job being sent" In seconds	INT	-	O	VQ	-	-
MAX_TIME	Maximum time for job in seconds	INT	-	O	VQ	-	-
QUIT_PCU	Acknowledgment received from peer AS	INT	-	O	UQ	-	-
SND_MODE	Send mode	INT	-	O	VQ	-	1: Sending job without repetition 2: Waiting for acknowledgment (peer sets send status to 0)
RCV_STEP	Receive mode	INT	-	O	VQ	-	0: No jobs pending 1: Data are currently being received 2: Sending response
SND_JOB	Job number in send buffer	INT	-	O	VQ	-	-
ANSWER	Shows whether an answer has been received from the peer.	BOOL	-	O	VQ	-	0: Waiting for response from peer. 1: Response from peer AS has not been received within the maximum time (MAX_TIME parameter).

Configuration

Step	Procedure
1	Interconnect input DiaDSNo with output DiaDSNo of RC_IF_CFG.
2	Select a connection index (1 to 32) by means of the DiaConIndx input on RC_IF_CFG The RC_XC_DIAG block displays the diagnostic information for the selected connection.

8.3.9.4 RC_IF_XC_LIFE (FC 884)

Description

At its output, this block displays the AS number and seconds pulses sent by the peer AS. In this way, the connection between the two peer automation systems can be monitored to ensure that it remains intact and active.

You only need to insert this block if you want to obtain diagnostic information about AS-AS communication.

We recommend it is inserted in OB 32 or OB 1.

Inputs and outputs

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
QRET_VAL	Return value of block (hexadecimal)	INT	-	O	VQ	-	0: OK, no error 8333: Error; data block XC_PCU_DB does not exist.
REM_AS1	AS number of peer AS #1	INT	-	O	VQ	-	-
LIFEAS1	Seconds pulses, which continuously increase as long as communication is active. Connection to peer AS #1	INT	-	O	VQ	-	-
...	...	...	...	...	...	...	...
REM_AS31	AS number of peer AS #31	INT	-	O	VQ	-	-
LIFEAS31	Seconds pulses, which continuously increase as long as communication is active. Connection to peer AS #31	INT	-	O	VQ	-	-

Configuration

No configuration is required.

8.3.10 REMOTE blocks

8.3.10.1 Overview of REMOTE blocks

Note

These REMOTE blocks are only required for communication between automation systems from different projects.

REMOTE blocks

Blocks for REMOTE elements are used when route elements from another project are to be used.

The following REMOTE blocks are available for elements:

- RC_IF_REMOTE_CE (FB821) (Page 185) for control elements
- RC_IF_REMOTE_SE (FB842) (Page 187) for sensor elements
- RC_IF_REMOTE_PE (FB 843) (Page 190) for parameter elements

Two additional communication blocks are required for data exchange with the remote automation system that contains the remote elements:

- RC_IF_REMOTE_SEND (FB 831) (Page 193)
- RC_IF_REMOTE_RECV (FB833) (Page 196)

For remote operation of controls, parameter and sensor elements, only the most important element data is transmitted between the controlling and connected remote element. Consequently, in contrast to local mode, not all outputs can be controlled on the connected remote element.

On the connected remote element, the number of the DB used for data transmission is multiplied by -1 and output at the QFUNC_ID output as an identifier for the remote control.

Example

Section "CFC Charts with REMOTE Elements" (Page 270)

8.3.10.2 Diagnostics

If a remote element is not available for a route, the route signals an error. Only the local ID of the respective element is displayed in the Route Control Center.

To search for the associated remote ID of a remote element, use the attribute "s7_edit = para" of the input parameters LOC_xE and REM_xE of the following blocks:

- RC_IF_REMOTE_CE
- RC_IF_REMOTE_SE
- RC_IF_REMOTE_PE

The attribute "s7_edit = para" is available as of RC version 8.0 SP1. Use the attribute "s7_edit = para" to display input parameters LOC_xE and REM_xE in the "Parameters" tab of the process object view of SIMATIC Manager.

If you set the filter to "Block type" / "RC_IF_REMOTE", all instances of the blocks RC_IF_REMOTE_CE, RC_IF_REMOTE_SE and RC_IF_REMOTE_PE with the input parameters LOC_xE and REM_xE are displayed. This way you assign the remote ID to the local ID.

Note

The new attribute will only become active with new CFC instances of the blocks RC_IF_REMOTE_CE, RC_IF_REMOTE_SE and RC_IF_REMOTE_PE. Existing instances are not changed by the CFC block type import.

You can also set the "Parameter" attribute manually. To do so, open the properties of a corresponding input parameter of a CFC instance, for example, REM_CE, and activate the option "Parameter" in the "Process object view" area.

See also

RC_IF_REMOTE_CE (FB 821) (Page 185)

RC_IF_REMOTE_SE (FB 842) (Page 187)

RC_IF_REMOTE_PE (FB 843) (Page 190)

8.3.10.3 RC_IF_REMOTE_CE (FB 821)

Note

These REMOTE blocks are only required for communication between automation systems from different projects.

Description

Block RC_IF_REMOTE_CE is a REMOTE interface block that is used to activate a control element (CE) in another Route Control project in another AS. One of these blocks must be inserted in a CFC chart and configured accordingly for each remote control element.

Organization Block (OB)

This block can be inserted into any organization block. Please note that all REMOTE elements of a connection (i.e. with an identical SNDRCVDB) must be inserted into the same runtime group as the associated RC_IF_REMOTE_SND block.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
LOC_CE	ID of the control element in the local AS; if the value is 0, the wizard assigns the ID.	INT	-	I	U	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
REM_CE	ID of the control element in the remote AS	INT	-	I	VQ	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
SNDRCVDB	Number of the data block in the local AS used for data exchange between the local and remote elements	INT	-	I	VQ	-	You can find additional information under "Valid SNDRCVDB Block Numbers for Remote Elements" (Page 606).

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
ALT_VAL	Alternate value entered in the element in case of communication problems with the remote AS or with the remote element. You can find additional information under the QRET_VAL parameter.	WORD	W#16#0000	I	VQ	-	Examples of ALT_VAL: 0: Element receives feedback "undefined" H8000: Element receives feedback "fault".
TypeName	CE subtype of the remote element. This parameter is required for an S7 import to Route Control Configuration.	STRING [24]	"VALVE"	I	VQ	-	A CE subtype is, for example, MOTOR, VALVE or another user-defined type.
QLOC_ID	ID of local control element	INT	-	O	VQ	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
QCOMM_ID	Serial number of the element in the central send data block (you can find additional information under SNDRCVDB)	INT	-	O	VQ	-	-
QCOMMAND	Diagnostic information: 16-bit value of the command transferred to the remote element	WORD	-	O	VQ	-	-
QROUTE	Route ID	INT	-	O	UQ	-	-
QFUNC_ID	Function ID (FUNC_ID) of route	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	-
Q_FBACK	Return value of the remote control element	WORD	-	O	VQ	-	-
QRET_VAL Permitted values 8211-8216	Return value for block	WORD	-	O	VQ	-	**8211**: The CE ID entered is too small. **8212**: The CE ID entered is too large. **8213**: The CE ID of the peer element is too small. **8214**: The CE ID of the peer element is too large. **8215**: The number of the send/receive block (SNDRVCDB) is too small and is therefore outside the permitted range. **8216**: The number of the send/receive block (SNDRVCDB) is too large and is, therefore, outside the permitted range.

Parameter	Meaning	Type	Default	Type	Attr.	OC M	Permitted values
QRET_VAL Permitted values 8217-8219		WORD	-	O	VQ	-	**8217**: You are attempting to transfer data from more control elements than is allowed. *The total number of all CEs, SEs and PEs* that can be linked remotely cannot exceed 1,024. **8218**: Timeout or receive error in the send/receive program. The alternate value (ALT_VAL) is used. **8219**: The number of elements to be transferred does not match in the two peer automation systems. Solution: Trigger a positive edge at the NEW_GEN input at the RC_IF_REMOTE_SEND (FB 831) (Page 193) block. This performs an initialization.
QERR	You can find additional information under the QRET_VAL parameter.	BOOL	-	O	VQ	-	1: Error 0: OK

Configuration

You can find additional information about configuration in section "Configuration of REMOTE elements" (Page 274)

Example

- Example chart in the Route Control library
- Section "CFC Charts with REMOTE Elements" (Page 270)

8.3.10.4 RC_IF_REMOTE_SE (FB 842)

Note

These REMOTE blocks are only required for communication between automation systems from different projects.

Description

Block RC_IF_REMOTE_SE is a REMOTE interface block that is used to reference a sensor element (SE) in another Route Control project in another AS. One of these blocks must be inserted in a CFC chart and configured accordingly for each remote sensor element.

Organization Block

This block can be inserted into any organization block. Please note that all REMOTE elements of a connection (i.e. with an identical SNDRCVDB) must be inserted into the same runtime group as the associated RC_IF_REMOTE_SND block.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
LOC_SE	ID of the sensor element in the local AS	INT	-	I	U	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
REM_SE	ID of the sensor element in the remote AS	INT	-	I	U	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
SNDRVCDB	Number of the data block in the local AS used for data exchange between the local and remote elements	INT	-	I	VQ	-	You can find additional information under "Valid SNDRCVDB Block Numbers for Remote Elements" (Page 606).
ALT_VAL	Alternate value entered in the element in case of communication problems with the remote AS or with the remote element. You can find additional information under the QRET_VAL parameter.	WORD	W#16#0000	I	VQ	-	Examples of ALT_VAL: 0: Element receives feedback "false" 1: Element receives feedback "true" H8000: Element receives feedback "fault".
TypeName	Type of remote element	STRING [24]	"SENSOR"	I	VQ	-	-
QLOC_ID	ID of local sensor element	INT	-	I	U	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
QCOMM_ID	Serial number of the element in the central send data block (you can find additional information under SNDRCVDB)	INT	-	O	VQ	-	-
Q_FBACK	Return value of the remote sensor element	WORD	-	O	VQ	-	-
QROUTE	Route ID	INT	-	O	UQ	-	-
QFUNC_ID	Function ID (FUNC_ID) of route	INT	-	O	UQ	-	-

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
QRET_VAL Permitted values 8421-8426	Return value for block	WORD	-	O	VQ	-	**8421**: The SE ID entered is too small. **8422**: The SE ID entered is too large. **8423**: The SE ID of the peer element is too small. **8424**: The SE ID of the peer element is too large. **8425**: The number of the send/receive block (SNDRVCDB) is too small and is therefore outside the permitted range. **8426**: The number of the send/receive block (SNDRVCDB) is too large and is therefore outside the permitted range.
QRET_VAL Permitted values 8427-8429	Return value for block	WORD	-	O	VQ	-	**8427**: You are attempting to transfer data from more control elements than is allowed. *The total number of all CEs, SEs and PEs* that can be linked remotely cannot exceed 1,024. **8428**: Timeout or receive error in the send/receive program. The substitute value (ALT_VAL) is used instead. **8429**: The number of elements to be transferred does not match in the two peer automation systems. Solution: Trigger a positive edge at the NEW_GEN input at the RC_IF_REMOTE_SEND (FB 831) (Page 193) block. This performs an initialization.
QERR	You can find additional information under the QRET_VAL parameter.	BOOL	-	O	VQ	-	1: Error 0: OK

Configuration

You can find additional information about configuration in section "Configuration of REMOTE elements" (Page 274)

Example

Section "CFC Charts with REMOTE Elements" (Page 270)

8.3.10.5 RC_IF_REMOTE_PE (FB 843)

Note

These REMOTE blocks are only required for communication between automation systems from different projects.

Description

Block RC_IF_REMOTE_PE is a REMOTE interface block that is used to reference a parameter element (PE) in another Route Control project in another AS. One of these blocks must be inserted in a CFC chart and configured accordingly for each remote parameter element.

Organization Block

This block can be inserted into any organization block. Please note that all REMOTE elements of a connection (i.e. with an identical SNDRCVDB) must be inserted into the same runtime group as the associated RC_IF_REMOTE_SND block.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
LOC_PE	ID of the parameter element in the local AS	INT	-	I	U	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
REM_PE	ID of the parameter element in the remote AS	INT	-	I	U	-	You can find additional information under "Valid ID Ranges for CE, SE, LE, and PE" (Page 605).
SNDRVCDB	Number of the data block in the local AS used for data exchange between the local and remote elements	INT	-	I	VQ	-	You can find additional information under "Valid SNDRCVDB Block Numbers for Remote Elements" (Page 606).
ALT_VAL	Alternate value entered in the element in case of communication problems with the remote AS or with the remote element. You can find additional information under the QRET_VAL parameter. Any feedback of type Real is allowed.	REAL	-	I	VQ	-	-

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
TypeName	PE subtype of the remote element. This parameter is required for an S7 import to Route Control Configuration.	STRING [24]	"VOLUME"	I	VQ	-	-
QLOC_ID	ID of local parameter element	INT	-	O	VQ	-	-
QCOMM_ID	Serial number of the element in the central send data block (you can find additional information under SNDRCVDB)	INT	-	O	VQ	-	-
QRET_VAL Permitted values 8431-8436	Return value for block	WORD	-	O	VQ	-	**8431**: The PE ID entered is too small. **8432**: The PE ID entered is too large. **8433**: The PE ID of the peer element is too small. **8434**: The PE ID of the peer element is too large. **8435**: The number of the send/receive block (SNDRVCDB) is too small and is therefore outside the permitted range. **8436**: The number of the send/receive block (SNDRVCDB) is too large and is therefore outside the permitted range.

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
QRET_VAL Permitted values 8437-8439	Return value for block	WORD	-	O	VQ	-	**8437**: You are attempting to transfer data from more control elements than is allowed. The total number of all CEs, SEs and PEs that can be linked remotely cannot exceed 1,024. **8438**: Timeout or receive error in the send/receive program. The substitute value (ALT_VAL) is used instead. **8439**: The number of elements to be transferred does not match in the two peer automation systems. Solution: Trigger a positive edge at the NEW_GEN input at the RC_IF_REMOTE_SEND (FB 831) (Page 193) block. This performs an initialization.
QERR	You can find additional information under the QRET_VAL parameter.	BOOL	-	O	VQ	-	1: Error 0: OK
QSPVALUE	Setpoint sent to the remote parameter element	REAL	-	O	VQ	-	-
QACTV	Actual value of the remote parameter element	REAL	-	O	VQ	-	-
QINDEX	If this is an external parameter element, the index value is output here.	BYTE	-	O	UQ	-	0: No external PE Greater than 0: External PE, You can find additional information about the range of values under External Parameter Elements (Index) (Page 607).
QEXT	External: This is an external parameter element of the route. The parameter-element setpoint was configured indirectly (by means of the index). Internal: The parameter-element setpoint was configured directly.	BOOL	-	O	UQ	-	0: Internal parameter element 1: External parameter element

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
QSUMMED	This is a summation parameter element.	BOOL	-	O	VQ	-	0: Not a summation parameter element 1: Summation parameter element
QROUTE	ID of the route that is actively using this parameter element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID (FUNC_ID) of the route that is actively using this parameter element	INT	-	O	UQ	-	-
QMODE_NO	Mode level (MODE) of the route that is actively using this parameter element	INT	-	O	UQ	-	-

Configuration

You can find additional information about configuration in section "Configuration of REMOTE elements" (Page 274)

Example

Section "CFC Charts with REMOTE Elements" (Page 270)

8.3.10.6 RC_IF_REMOTE_SEND (FB 831)

Note

This block is only required for communication between automation systems from different projects.

Description

This block provides the interface for assigning parameters to the cross-coupling connection between Route Control automation systems on the sending end of available REMOTE elements. This block is the counterpart to the RC_IF_REMOTE_RECV (FB 833) (Page 196) block in the peer AS.

Organization Block

This block can be inserted into any organization block. Please note that all REMOTE elements of a connection (i.e. with an identical SNDRCVDB) must be inserted into the same runtime group as the associated RC_IF_REMOTE_SEND block.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
CON_ID	Local communication ID for accessing the peer AS (from NetPro connection configuration)	WORD	-	I	VQ	-	-
SNDRCVDB	Number of the data block to be used for communication and data exchange with the peer AS	INT	91	I	VQ	-	-
NEW_GEN	Positive edge triggers a request for a new communication ID for all REMOTE element blocks.	BOOL	-	I	VQ	-	0 --> 1: Trigger request
RES_HIS	Resets the fault memory	BOOL	-	I	UQ	-	0: Fault memory is retained. 1: Fault memory is reset on every positive edge .
SND_TIME	Time interval in seconds between two send requests to the peer automation systems	INT	2	I	UQ	-	-
ERR_SND	Maximum time in seconds for send request; after timeout, a "Timeout for Send" error message is displayed and the send request is repeated. Default value: 30 s	INT	30	I	UQ	-	-
ERR_RCV	Maximum time in seconds for data receive; after timeout, a "Timeout for Receive" error message is displayed and the send request is repeated. Default value: 30 s	INT	30	I	UQ	-	-
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
QERR	Indicates whether or not a block error is pending	BOOL	-	O	VQ	-	1: An error has occurred in the block. 0: No pending errors in the block. You can find additional information under S_STATUS, R_STATUS, C_STATUS.
S_STATUS	The return value of the internal BSEND call is passed through to the outside.	INT	-	O	VQ	-	You can find additional information about return values under the BSEND block.

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
S_HISTORY	Diagnosis: last error of the internal BSEND call; the memory is reset by a positive edge at the RES_HIS input.	INT	-	O	UQ	-	-
R_STATUS	The return value of the internal BRCV call is passed through to the outside.	INT	-	O	VQ	-	You can find additional information about return values under the BRCV block.
R_HISTORY	Diagnosis: last error of the internal BRCV call; the memory is reset by a positive edge at the RES_HIS input.	INT	-	O	UQ	-	You can find additional information about return values under the BRCV block.
C_STATUS	Return value for block	INT	-	O	VQ	-	0: No error 100: Error timeout for receive (RCV) 101: Error timeout for send (SND)
C_HISTORY	Diagnosis: last error of the block You can find additional information under parameter C_STATUS	INT	-	O	UQ	-	-
QNEW_GEN	Initialization of communication ID for all remote blocks has begun.	BOOL	-	O	VQ	-	0: Initialization not requested 1: Initialization requested
QGEN_ACT	Initialization of communication ID for all REMOTE blocks is active.	BOOL	-	O	VQ	-	0: Initialization in progress 1: Initialization not active
QSND_TIM	Diagnosis: Current time in seconds since last BSEND initiation	INT	-	O	UQ	-	-
QRCV_TIM	Diagnosis: Current time in seconds since last data receive	INT	-	O	UQ	-	-

Configuration

You can find additional information about configuration in section "Configuration of REMOTE elements" (Page 274)

Example

Section "CFC Charts with REMOTE Elements" (Page 270)

8.3.10.7 RC_IF_REMOTE_RECV (FB 833)

Note

This block is only required for communication between automation systems from different projects.

Description

The RC_IF_REMOTE_RECV block is the interface for assigning parameters to the cross-coupling connection between Route Control automation systems on the receiving end of available REMOTE elements. This block is the counterpart to the RC_IF_REMOTE_SEND (FB 831) (Page 193) block in the peer AS.

Organization Block

This block can be inserted into any organization block.

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
CON_ID	Local communication ID for accessing the peer AS (from NetPro connection configuration)	WORD	-	I	VQ	-	-
SNDRCVDB	Number of the data block to be used for communication and data exchange with the peer AS	INT	91	I	VQ	-	-
RES_HIS	Resets the fault memory	BOOL	-	I	UQ	-	0: Fault memory is retained. 1: Fault memory is reset on every positive edge .
SND_TIME	Time interval in seconds between two send requests to the peer AS	INT	2	O	UQ	-	-
ERR_SND	Maximum time in seconds for send request. After timeout, a "Timeout for Send" error message is displayed and the send request is repeated.	INT	30	O	UQ	-	-

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
ERR_RCV	Maximum time in seconds for data receive. After timeout, a "Timeout for Receive" error message is displayed and the send request is repeated. Default value: 30 s	INT	30	O	UQ	-	-
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
QERR	Positive edge triggers a request for a new communication ID for all REMOTE element blocks.	BOOL	-	O	VQ	-	-
S_STATUS	The return value of the internal BSEND call is passed through to the outside.	INT	-	O	VQ	-	You can find additional information about return values under the BSEND block.
S_HISTORY	Diagnosis: Last error of the internal BSEND call. The memory is reset by a positive edge at the RES_HIS input.	INT	-	O	UQ	-	-
R_STATUS	The return value of the internal BRCV call is passed through to the outside.	INT	-	O	VQ	-	You can find additional information about return values under the BRCV block.
R_HISTORY	Diagnosis: Last error of the internal BRCV call. The memory is reset by a positive edge at the RES_HIS input.	INT	-	O	UQ	-	You can find additional information about return values under the BRCV block.
C_STATUS	Return value for block	INT	-	O	VQ	-	0: No error 100: Error timeout for receive (RCV) 101: Error timeout for send (SND)
C_HISTORY	Diagnosis: last error of the block You can find additional information under parameter C_STATUS)	INT	-	O	UQ	-	-
QSND_TIM	Diagnosis: Current time in seconds since last BSEND initiation	INT	-	O	UQ	-	-
QRCV_TIM	Diagnosis: Current time in seconds since last data receive	INT	-	O	UQ	-	-

Configuration

You can find additional information about configuration in section "Configuration of REMOTE elements" (Page 274)

Example

Section "CFC Charts with REMOTE Elements" (Page 270)

8.4 Kernel Blocks

8.4.1 Overview of kernel blocks

Kernel Blocks

The following are kernel blocks for Route Control:

- Blocks for processing routes
- Blocks for processing elements
- Blocks for connecting to the Route Control server
- Blocks for connecting to other Route Control automation systems (cross-coupling)

For each kernel block description, you will find a brief explanation of what the block is used for. Because the kernel blocks are not interface blocks for interconnecting library blocks, a description of inputs and outputs is not provided here.

8.4.2 Data Blocks

8.4.2.1 RC_CE_FIELD (DB 99)

Description

This block contains the data records for control elements.

8.4.2.2 RC_CFG (DB 100)

Description

This block is an internal, AS-centralized routing-system configuration block. Direct access, as was possible in Route Control V5, is no longer required or permitted! In V6, block FB 850 RC_IF_CFG acts as an interface.

8.4.2.3 RC_DATA_TG34_36 (DB 405)

Description

This block is required for the general request that occurs when the Route Control server is restarted.

8.4.2.4 RC_FIFO1 (DB 870)

Description

This block acts as a circular buffer in the AS for Route Control server telegrams.

8.4.2.5 RC_FIFO1_SE (DB 874)

Description

This block acts as a send buffer in the AS for Route Control server telegrams.

8.4.2.6 RC_FIFO4 (DB 890)

Description

This block acts as a circular buffer in the AS for Route Control server telegrams.

8.4.2.7 RC_FIFO4_SE (DB 894)

Description

This block acts as a send buffer in the AS for Route Control server telegrams.

8.4.2.8 RC_IDB_SEND_FIFO1 (DB 590)

Description

This block is the instance data block for FB 890, RC_SEND_FIFO1.

8.4.2.9 RC_IDB_SEND_FIFO4 (DB 593)

Description

This block is the instance data block for FB 891, RC_SEND_FIFO4.

8.4.2.10 RC_LE_FIELD (DB 96)

Description

This block contains the data records for link elements.

8.4.2.11 RC_PE_FIELD (DB 97)

Description

This block contains the data records for parameter elements.

8.4.2.12 RC_REMOTE1..5 (DB 91 to 95)

Description

This block is an internal block with a send/receive area for elements in another AS (remote elements).

8.4.2.13 RC_ROUTE1 (DB 101 to 400)

Description

Internal data structures: Each one of these blocks contains data for a route. DB 101 corresponds to the route with ID 1, DB 102 corresponds to route ID 2, etc.

If it is known which IDs are not being used in the entire routing system, then the corresponding data blocks can be deleted to free up memory in the AS.

8.4.2.14 RC_SE_FIELD (DB 98)

Description

This block contains the data records for sensor elements.

8.4.2.15 RC_SYS_DB (DB 10)

Description

Internal data structure

8.4.2.16 RC_TG34_TG36_DB (DB 404)

Description

This block is required in the context of connecting the AS and the Route Control server.

8.4.2.17 RC_XC_1 (DB 751)

Description

These are instance blocks for FB 880, RC_XC_FB.

8.4.2.18 RC_XC_JOB (DB 705)

Description

Internal data structure used in the context of AS-AS communication (cross-coupling).

8.4.2.19 RC_XC_JOB_START (DB 450)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.2.20 RC_XC_PCU (DB 704)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.2.21 RC_XC_PUTX_1..31 (DB 451 to 481)

Description

Internal data area used in the context of AS-AS communication (cross-coupling).

8.4.3 User-defined types

8.4.3.1 RC_ANY_UDT (UDT 506)

Description

This is an internal routing-system block.

8.4.3.2 RC_CE_FIELD_UDT (UDT 99)

Description

Internal data structure

8.4.3.3 RC_EXT_PE_ACTV (UDT 103)

Description

Internal data structure for processing external parameter elements.

8.4.3.4 RC_FIFO__UDT (UDT 121)

Description

Internal data structure

8.4.3.5 RC_LE_FIELD_UDT (UDT 96)

Description

Internal data structure

8.4.3.6 RC_PE_FIELD_UDT (UDT 97)

Description

Internal data structure

8.4.3.7 RC_RE_INFO_UDT (UDT 109)

Description

Internal data structure

8.4.3.8 RC_RE_UDT (UDT 100)

Description

Internal data structure

8.4.3.9 RC_REM_CESEPE (UDT 104)

Description

Internal data structure for elements in another AS (remote elements)

8.4.3.10 RC_REQUEST_BUFFER_UDT (UDT 111)

Description

Internal data structure

8.4.3.11 RC_ROUTE_CFG (UDT 105)

Description

Internal data structure

8.4.3.12 RC_ROUTE_CM_UDT (UDT 110)

Description

Internal data structure

8.4.3.13 RC_ROUTE_TB_UDT (UDT 102)

Description

Internal data structure

8.4.3.14 RC_SE_FIELD_UDT (UDT 98)

Description

Internal data structure

8.4.3.15 RC_SEPU__UDT (UDT 122)

Description

Internal data structure

8.4.3.16 RC_SYS_UDT (UDT 120)

Description

Internal data structure

8.4.3.17 RC_XC_JOB_UDT (UDT 705)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

8.4.3.18 RC_XC_PCU_UDT (UDT 704)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

8.4.3.19 RC_XC_PUT_DB_UDT (UDT 452)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

8.4.3.20 RC_XC_PUT_SD_UDT (UDT 684)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

8.4.3.21 RC_XC_PUT_UDT (UDT 683)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

8.4.3.22 RC_XC_PUTX_UDT (UDT 451)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling).

8.4.3.23 RC_XC_UDT (UDT 101)

Description

Internal data structure used in the context of AS-AS communication (cross-coupling).

8.4.3.24 RC_XC_AS (UDT 108)

Description

This internal data structure is used in the context of AS-AS communication (cross-coupling) and includes the IDs of the ASs involved in cross-coupling.

8.4.4 Function Blocks (FC)

8.4.4.1 RC_ATTRIB_PTR (FC 860)

Description

This is an internal routing-system block.

8.4.4.2 RC_DB_AREA_COPY (FC 862)

Description

This is an internal block for copying a block from one data block to another.

8.4.4.3 RC_FC_COPY (FC 863)

Description

This block is an internal auxiliary block.

8.4.4.4 RC_FIFO_DEBUG_SEND (FC 891)

Description

This block is an internal system block, which stores the SFB SEND diagnostic messages in the routing system.

8.4.4.5 RC_FIFO_INPUT_FC (FC 890)

Description

This block is required for communication between the AS and the Route Control server. It transfers all telegrams from the AS to the Route Control server to a circular buffer (FIFO).

8.4.4.6 RC_FIFO_SEND (FC 803)

Description

This block sends telegrams to the Route Control server by means of BSEND.

8.4.4.7 RC_KERNEL_CALL (FC 804)

Description

This internal block contains all Route Control kernel block calls required to process the route lists (DB 101 and higher).

8.4.4.8 RC_PE_COMMON (FC 810)

Description

This block is inserted in a user-defined block and called there. It serves as the interface between the user block and the internal data of a routing-system parameter element. It transfers signals between the user block and the data register of a parameter element (PE).

A parameter element specifies a setpoint. The actual value of the parameter element is only used for visualization on the Route Control Center. A setpoint/actual-value comparison is not performed. The setpoints are provided in various data types (DINT, INT, REAL).

If the parameter element is involved in the route, the setpoint is output according to the interconnection in the route. The parameter-element feedback is not evaluated in the route.

Note

You can not use this block directly. Rather, you have to integrate it in a user block. Consequently, "IF" is not part of its name.

You can find additional information in the section "Example of a User-Defined Type" (Page 168).

Inputs and Outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	-	Assigned automatically by the RC Wizard
FACTOR	Scaling factor for output values QVALUE_I and QVALUE_D: QVALUE_D=RND(FACTOR*QVALUE_R) QVALUE_I=INT(RND(FACTOR*QVALUE_R))	REAL	1.0	I	VQ	-	-
DIS_ACTV	Internal application of current (actual) value can be prevented DIS_ACTV is only evaluated for an external PE. If it is set, the current return value of the external parameter element is not updated with the corresponding index EXT_1_O to EXT_24_O) on the FB 800 "RC_IF_ROUTE".	BOOL	-	I	VQ	-	1: Value is prevented from being output. The current return value of the external parameter element is not updated with the corresponding index (EXT_1_O to EXT_24_O) on the FB 800 "RC_IF_ROUTE". 0: Value is output
ACT_VAL	Return value from the process, e.g., from an EPAR_REAL	REAL	-	I	VQ	-	-
DEF_VAL	Alternate value that can be configured and that is output if no route is operating with this parameter element	REAL	0.0	I	VQ	-	-
EN_DEF	Allow use of alternate value.	BOOL	FALSE	I	VQ	-	1: Output of the alternate value is activated. 0: Output of the alternate value is not activated.
QID	ID assigned by the RC Wizard and used by this route	INT	-	O	VQ	-	-

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
QRET_VAL	Return value for block	WORD	-	O	VQ	-	**0**: No error **8102**: Incorrect or invalid element ID **8103**: External parameter elements only: The index is outside the permissible range (1 to 24). **8104**: External parameter elements only: The route ID is outside the permitted range (1..maximum number of routes). The maximum number of routes is specified using the NoRoutes input on FB 850 RC_IF_CFG.
QVALUE_I	Setpoint as a 16-bit integer	INT	-	O	VQ	-	INT value of real value generated according to the formula QVALUE_I = INT(QVALUE_D)
QVALUE_D	Setpoint as a 32-bit integer	DINT	-	O	VQ	-	INT value of real value generated according to the formula QVALUE_D = RND(FACTOR*QVALUE_R)
QVALUE_R	Setpoint as a 32-bit floating-point number	REAL	-	O	VQ	-	Real setpoint that is output to the process
QINDEX	Value of parameter element is indirectly referenced using an index. The value pending on the input corresponding to this index on the RC_IF_ROUTE is output. Indirect referencing is used if the parameter-element setpoint is not yet known at the time of configuration and is created, for example, during runtime by means of a batch parameter. You can find additional information under the QEXT parameter.	BYTE	-	O	UQ	-	0: Internal parameter element 1 ... 24: Index of the external-parameter-element setpoint (you can find additional information under RC_IF_ROUTE).

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
QEXT	Use external setpoint	BOOL	-	O	UQ	-	1: The parameter element uses an external (indirectly referenced) setpoint. 0: The parameter element uses an internal, directly configured setpoint. You can find additional information under the QINDEX parameter.
QSUMMED	Summed parameter element Sum means that all of the parameter elements involved in the route are added (summed), and the result is provided as a setpoint to all of the parameter elements. Only parameter-element setpoints of the same type (for example, volumes or weight) are added.	BOOL	-	O	UQ	-	1: Parameter element (setpoint) is a sum. 0: Parameter element (setpoint) is not a sum.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	-

Configuration

Step	Procedure
1	Create a user-defined block that calls RC_PE_COMMON, transfers parameters and evaluates return values.
2	Insert the user-defined block in a CFC chart.
3	Interconnect the user-defined block to technological blocks, e.g., PCS 7 standard library blocks

Step	Procedure
4	Start the Route Control Wizard The element ID is entered automatically.
5	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Note

To activate this parameter element in routes, you still have to create a user-defined subtype in Route Control Engineering with appropriate commands.

8.4.4.9 RC_CALL_KILLER (FC 814)

Description

This is an internal routing-system block.

8.4.4.10 RC_LE_DGRAMM (FC 825)

Description

This internal block generates update message frames for the link elements.

8.4.4.11 RC_LOAD_AR1 (FC 861)

Description

Internal auxiliary block

8.4.4.12 RC_MASTER_CREATE_ERR (FC 851)

Description

This block is required to generate alarm messages for a route.

8.4.4.13 RC_MAT (FC 836)

Description

This block is an internal auxiliary block for executing material functions.

8.4.4.14 RC_ROUTE_CE_ERR (FC 812)

Description

This block is required to send update telegrams for the control elements to the Route Control server.

8.4.4.15 RC_ROUTE_PE_DGRAM (FC 822)

Description

This block is required to send update telegrams for the parameter elements to the Route Control server.

8.4.4.16 RC_ROUTE_SE_ERR (FC 813)

Description

This block is used to send update telegrams for the sensor elements to the Route Control server.

8.4.4.17 RC_TG34_03 (FC 811)

Description

This block combines particular telegrams and sends them to the Route Control server.

8.4.4.18 RC_UPD_CESEPE (FC 823)

Description

Internal block for processing element data

8.4.4.19 RC_UPD_CESEPE_EX (FC 824)

Description

Internal block for processing element data

8.4.4.20 RC_XC_CALL (FC 805)

Description

This block is an internal block used in the context of cross-coupling among automation systems.

8.4.4.21 RC_XC_JOB_USER (FC 885)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.4.22 RC_XC_PUTX_RECV (FC 882)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.4.23 RC_XC_PUTX_SEND (FC 881)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.4.24 RC_XFER_LE (FC 826)

Description

This block is used in the context of cross-coupling for link element data.

8.4.4.25 RC_XFER_MON_FLT (FC 829)

Description

This block is an internal block for transferring status monitoring and fault-tolerance times from FB 800 RC_IF_ROUTE to route lists RC_ROUTE1 to RC_ROUTE300 (DB 101 to DB 400).

8.4.5 Function Blocks (FB)

8.4.5.1 RC_CALL_DIAG (FB 851)

Description

This is an internal block for diagnostic processing.

8.4.5.2 RC_CLOCK (FB 899)

Description

This block is the interface between the realtime clock of the AS and the routing system.

8.4.5.3 RC_MASTER_BUFFER (FB 856)

Description

This block is an internal block for managing a data buffer during a route request.

8.4.5.4 RC_MASTER_FUNC (FB 852)

Description

This block is an internal auxiliary block for a master route.

8.4.5.5 RC_MASTER_MSG (FB 857)

Description

This block is required to issue alarm messages for a route.

8.4.5.6 RC_MASTER_TIMES (FB 859)

Description

This block is an internal auxiliary block for generating time functions for a master route.

8.4.5.7 RC_MASTER_XC_SND (FB 858)

Description

This block is an internal auxiliary block for communication between a master route and the associated slave routes in another AS.

8.4.5.8 RC_ROUTE (FB 801)

Description

This RC_ROUTE block is the internal counterpart to RC_IF_ROUTE and performs route processing.

8.4.5.9 RC_TG_36 (FB 813)

Description

This block is an internal block in the context of telegram processing (sending to the Route Control server) of the routing system.

8.4.5.10 RC_ROUTE_GET_EXT_PE (FB 818)

Description

This block is used in connection with external parameter elements of a route.

8.4.5.11 RC_ROUTE_MAT (FB 819)

Description

This block is used in the context of material processing for a route.

8.4.5.12 RC_ROUTE_RCE_OFF (FB 804)

Description

This block deactivates the elements of a route in accordance with its properties, e.g., switch-off delays.

8.4.5.13 RC_ROUTE_RCE_ON (FB 803)

Description

This block activates the elements of a route in accordance with its properties, e.g., switch-on delays.

8.4.5.14 RC_ROUTE_STATE_OS (FB 807)

Description

This block checks to see if there are any update telegrams for a route to be sent to the Route Control server.

8.4.5.15 RC_ROUTE_STATES (FB 809)

Description

This block is an internal block, which controls a route list status chart.

8.4.5.16 RC_ROUTE_TELEGR (FB 808)

Description

This block sends the update telegrams of a route to the Route Control server.

8.4.5.17 RC_ROUTE_TIME (FB 805)

Description

This block is responsible for managing all times used within the routing system.

8.4.5.18 RC_ROUTE_XC_PE_ACTV (FB 817)

Description

This block is used in the context of cross-coupling of parameter element data.

8.4.5.19 RC_ROUTE_XC_REC (FB 802)

Description

This block works together with the RC_ROUTE block and receives cross-coupling data from peer automation systems.

8.4.5.20 RC_ROUTE_XC_SEND (FB 806)

Description

The block sends data to peer automation systems involved in the route.

8.4.5.21 RC_ROUTE_XC_SND_ORDER (FB 816)

Description

This block is used to transfer the request data of a route to the peer AS involved in the route.

8.4.5.22 RC_CE_COMMON (FB 827)

Description

This block is inserted in a user-defined block and is called there. It serves as the interface between the user block and the internal data of a routing-system control element. It transfers signals between the user block and the data register of a control element (CE).

If the control element is involved in the route, the element is then activated according to the interconnection in the route. The element feedback is evaluated in the route simultaneously.

Note

You can not use this block directly. Rather, you have to integrate it in a user block. Consequently, "IF" is not part of its name.

You can find additional information in the section
"Example of a User-Defined Type" (Page 168).

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
ACTIVE	Specifies whether the upstream element has left the idle-state position.	BOOL	-	I	VQ	-	1: No idle-state position 0: Idle-state position
MAN_AUT	Control type of upstream element: Automatic or manual	BOOL	-	I	VQ	-	0: Upstream element is in manual mode. 1: Upstream element is in automatic mode.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	-	1: Element will not be taken into consideration in the next route search. 0: Element will be taken into consideration in the route search.
ERROR	Indicates whether an upstream element is in error status.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
...	...	...	...	...	...	...	...
EV_ID3	Event ID for alarm instance #3	DWORD	-	I	UQ	-	-
FB_00	Feedback bit #0	BOOL	-	I	VQ	-	0, 1: Meaning depends on upstream element.
...	...	...	...	...	...	...	...
FB_12	Feedback bit #12	BOOL	-	I	VQ	-	0, 1: Meaning depends on upstream element.
ID	Unique element ID within the AS	INT	-	I	U	-	Assigned automatically by the RC Wizard
LOCK	Specifies whether an upstream element is locked. You can find additional information about this in "LOCK Input on Element Blocks" (Page 72).	BOOL	-	I	VQ	-	1: Upstream element is locked and will not be taken into consideration in the next route search. 0: Upstream element is not locked and will be taken into consideration in the route search.
MONITOR	Feedback-signal monitoring	BOOL	TRUE	I	VQ	-	1: Monitoring of feedback signals is active. 0:Feedback-signal monitoring is deactivated; feedback is being simulated.

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
PEND_OOS	"Pending out of Service"	BOOL	-	I	VQ	-	1: A request is pending to take this element out of service for maintenance. Element will not be taken into consideration in the next route search. 0: Maintenance is not pending. Element will be taken into consideration in the next route search.
QID	ID assigned by the RC Wizard and used by this route	INT	-	O	VQ	-	-
QBA_EN	Specifies whether an element can be used within the context of a batch. You can find additional information in the *SIMATIC BATCH* documentation.	BOOL	-	O	VQ	-	1: Element will be used as part of BATCH. 0: Element will not be used as part of BATCH.
QOCCUPIED	Indicates whether the element is occupied by a batch You can find additional information in the *SIMATIC BATCH* documentation.	BOOL	-	O	VQ	-	1: Element is occupied by a batch. 0: Element is not occupied by a batch.
QRET_VAL	Return value of the element	WORD	-	O	VQ	-	0: No error 8271: Incorrect or invalid element ID
Q_C_00	Activation command Bit #0	BOOL	-	O	VQ	-	0, 1: Meaning depends on upstream element.
...	...	...	...	...	...	...	...
Q_C_15	Activation command Bit #15	BOOL	-	O	VQ	-	0, 1: Meaning depends on upstream element.
QMAINT	Element in maintenance	BOOL	-	O	UQ	-	1: Element is "in maintenance". 0: Element is available.
QERR	Indicates whether a block error is pending	BOOL	-	O	VQ	-	1: The block is signaling an error (you can find additional information under QRET_VAL). 0: No error

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QSTEP_NO	Element is occupied by a step of BATCH with this number. This number is transferred in the route block and passed by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QBA_NA	Element is occupied by a batch with this name from BATCH. This name is transferred in the route block and passed by Route Control to the elements of a route.	STRING [32]	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID of route that activates this element	INT	-	O	UQ	-	-
QMODE_NO	Mode level of route that activates this element	INT	-	O	UQ	-	-
QSIMU	Element in simulation	BOOL	-	O	UQ	-	1: Feedback will be simulated. 0: The return value of the upstream element will be applied.

Configuration

Step	Procedure
1	Create a user-defined block that calls RC_CE_COMMON, transfers parameters and evaluates return values
2	Insert the user-defined block in a CFC chart.
3	Interconnect the user-defined block to other blocks, such as standard library blocks, SC blocks or the PTE library.
4	Interconnect the user-defined block to technological blocks, such as PCS 7 standard library blocks.
5	Start the Route Control Wizard The element ID is entered automatically.
6	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

Note

To activate this control element in routes, you still have to transfer the user-defined subtype to the Route Control configuration tool (Route Control Wizard) and furnish the subtype with appropriate commands.

Example

- You can find an example based on the use of RC_CE_COMMON in the section "Example for User-Defined Type" (Page 168)
- You can find an example of how to create a user-defined block in "USER_CE" (STL source code) in the "EXAMPLE_USER_CE" block container of the Route Control block library.

8.4.5.23 RC_SE_COMMON (FB 847)

Description

This block is the interface block between a sensor and the routing system.

It is inserted in a user-defined block and is called there. It serves as the interface between a sensor and the data register of a routing-system sensor element (SE). If the sensor is involved in the route then the feedback is evaluated according to the interconnection in the route.

You can find additional information in "Route Control Configuration".

Note

You can not use this block directly. Rather, you have to integrate it in a user block. Consequently, "IF" is not part of its name.

You can find additional information in the section "Example of a User-Defined Type" (Page 168).

Inputs and outputs

Parameter	Meaning	Type	Default	Type	Attr.	OCM	Permitted values
ID	Unique element ID within the AS	INT	-	I	U	-	Assigned automatically by the RC Wizard
FB_00	Return value bit #0	BOOL	-	I	VQ	-	0, 1
...	...	...	...	...	...	...	...
FB_12	Return value bit #12	BOOL	-	I	VQ	-	0, 1
FB_13 to 15	Can not be used; required as system-internal FBs						

Parameter	Meaning	Type	Default	Typ e	Attr.	OCM	Permitted values
ERROR	Indicates whether an up-stream element is in error sta-tus.	BOOL	-	I	VQ	-	1: Upstream element is faulty. 0: Upstream element is not faulty.
DISABLED	Indicates whether element is available	BOOL	-	I	VQ	-	1: Element will not be taken into considera-tion in the next route search. 0: Element will be tak-en into consideration in the route search.
EV_ID1	Event ID for alarm instance #1	DWORD	-	I	UQ	-	-
EV_ID2	Event ID for alarm instance #2	DWORD	-	I	UQ	-	-
QID	ID assigned by the RC Wiz-ard and used by this route	INT	-	O	VQ	-	-
QRET_VAL	Return value of the element	WORD	-	O	VQ	-	0: No error 8571: Incorrect or in-valid element ID
QERR	Indicates whether a block er-ror is pending	BOOL	-	O	VQ	-	1: The block is signal-ing an error (you can find additional infor-mation under QRET_VAL). 0: No error
QBA_ID	Element is occupied by a batch with this ID in BATCH. This ID will be transferred in the route block and passed through by Route Control to the elements of a route.	DWORD	-	O	VQ	-	-
QROUTE	ID of route that activates this element	INT	-	O	UQ	-	-
QFUNC_ID	Function ID of route that acti-vates this element	INT	-	O	UQ	-	-

Configuration

Step	Procedure
1	Create a user-defined block which calls RC_SE_COMMON internally.
2	Insert the user-defined block in a CFC chart.
3	Interconnect the user-defined block.
4	Start the Route Control Wizard The element ID is entered automatically.
5	Transfer the element ID to Route Control Configuration by performing an S7 import operation.

8.4.5.24 RC_ROUTEMASTER (FB 854)

Description

This block is an internal block, which controls a master route status chart.

8.4.5.25 RC_ROUTEMASTER_TELE99 (FB 855)

Description

This block sends telegrams with the name of the batch and the unit to the Route Control server.

8.4.5.26 RC_ROUTEMASTER_TELEGR (FB 853)

Description

This block sends request frames to the Route Control server.

8.4.5.27 RC_MASTER_MATERIAL (FB 860)

Description

This block is an internal routing-system block for material management of a route in manual or automatic mode.

8.4.5.28 RC_SEND_FIFO1 (FB 890)

Description

This block is an internal block for sending telegrams to the Route Control server (master).

8.4.5.29 RC_SEND_FIFO4 (FB 891)

Description

This block is an internal block for sending telegrams to the Route Control server (standby).

8.4.5.30 RC_TG34_TG36 (FB 812)

Description

This block is required to transfer telegrams to the Route Control server.

8.4.5.31 RC_TIME_DELTA (FB 879)

Description

This block is an internal auxiliary block for determining time intervals.

8.4.5.32 RC_TIME_RCE (FB 810)

Description

This block is a clock pulse generator for activating elements that are switched on with a time delay or that pulsate on and off.

8.4.5.33 RC_XC_DIAG (FB 897)

Description

This internal block is required for AS-AS communication (cross-coupling) diagnostics.

8.4.5.34 RC_XC_FB (FB 880)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.5.35 RC_XC_INIT (FB 896)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.5.36 RC_XC_JOB_FB (FB 882)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.5.37 RC_XC_JOB_TIME_FB (FB 885)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.5.38 RC_XC_PCU_FB (FB 881)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.5.39 RC_XC_REMOTE_RECV (FB 834)

Description

This block is used in the context of AS-AS communication (cross-coupling with a remote process cell).

8.4.5.40 RC_XC_REMOTE_SEND (FB 832)

Description

This block is used in the context of AS-AS communication (cross-coupling with a remote process cell).

8.4.5.41 RC_XC_STAT_FB (FB 883)

Description

This block is used in the context of AS-AS communication (cross-coupling).

8.4.5.42 RC_ZTG (FB 895)

Description

This block is an internal block in the context of time processing of the routing system.

Guide to Configuration 9

9.1 General

9.1.1 Structure of guide sections

Purpose

This guide supplements online help and manuals and facilitates your work with SIMATIC Route Control by providing appropriate examples.

It is intended to be a "common thread" that provides a coherent correlation between various sections of the online help and the manuals.

Areas

The guide is divided into the following chapters:

- The Overview chapter presents the tools and functions of SIMATIC Route Control with respect to particular topics.
- This chapter presents the most important areas to be configured in SIMATIC Route Control.
- A number of typical use cases complete this guide. This chapter provides concrete solution approaches and suggestions, some of which include images of CFC charts and interconnected blocks.

Structure of Sections

The individual sections have the following basic structure:

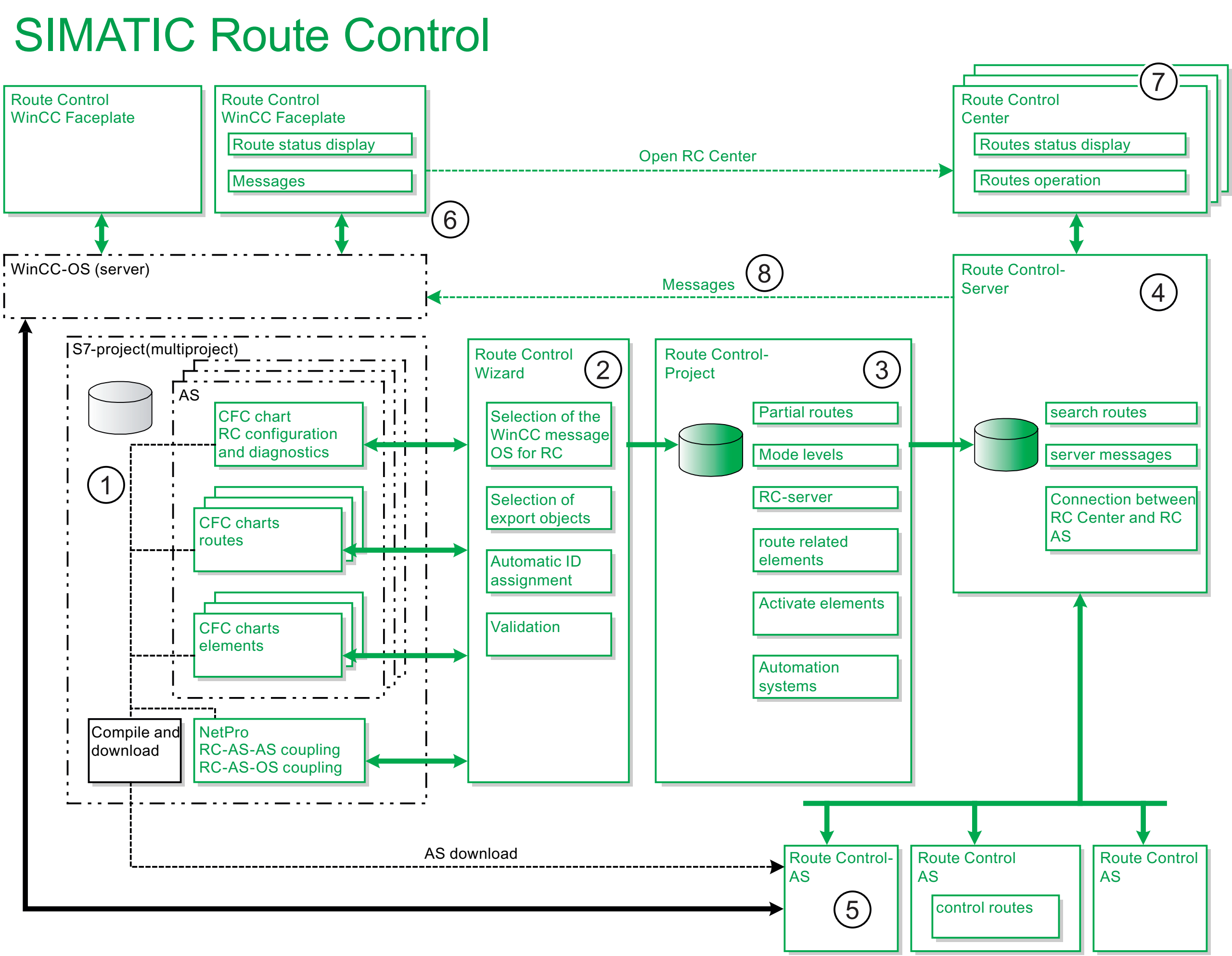
Section	Description
Requirement	Typical areas of application or user tasks from practical applications, followed by examples of proposed solutions.
Overview of the procedure	General configuration procedure and the tools used
Example	Proposed solution for an actual configuration case. The proposed solution is illustrated by a number of figures showing, for example, an interconnection in CFC.
Check List	The most important points to be taken into account during the configuration and the learning objectives of this section

9.1.2 Guide to the SIMATIC Route Control Structure

Requirement

You want a comprehensive overview of the components of SIMATIC Route Control and their interaction.

Layout



No.	Components
1	Configure in the context of an S7 project.
2	Interface between S7 and Route Control configuration (Route Control Wizard)
3	Route Control Configuration
4	Route Control server
5	Route Control automation systems
6	Route Control faceplate

No.	Components
7	Route Control Center
8	Route Control messages

9.1.3 General information about configuration

SIMATIC S7 Project

The SIMATIC S7 project is the central data management/configuration environment.
It is where you configure:

- The plant hierarchy (process cells, units)
- Locations
- Automation systems
- Cross-project AS-AS connections
- PC stations
- CFC Charts
- SFC charts

All other SIMATIC Route Control tools can be started via the SIMATIC Manager menu:

- Route Control Wizard
- Route Control Engineering (configuration interface)

Route Control Wizard

In order to prevent duplicate configurations, the Route Control Wizard supports you in exporting configuration data from the S7 project.

The Route Control Wizard also supports you in importing configuration data (exported from the S7 project) to Route Control Engineering.

Note

You do not have to assign route IDs at the RC_IF_ROUTE blocks manually. If your project has a maximum of 300 route blocks, you can leave the FIXED_ID input with a value of 1 and the ROUTE_ID input with a value of 0 at all route blocks. The Wizard then assigns unique fixed route IDs.
If there are more than 300 route blocks, use the dynamic ID assignment procedure. You can find information about this in
"Guide to Dynamic ID Assignment" (Page 284).

Leave the assignment of the RC_IF_xxx interface block IDs to the wizard too.

The wizard recognizes the automation systems that are relevant for Route Control at the inserted block RC_IF_CFG and creates all NetPro connections for the cross-couplings automatically.

The wizard recognizes the PC stations that are relevant for Route Control at the inserted RC applications and creates the AS-server connections automatically too.

Route Control Engineering

In Route Control Engineering, you add special routing-system objects to your configuration:

- Partial routes
- Materials and material sequences
- Mode tables
- Mode levels

You also insert the elements in partial routes.

In so doing, you also configure the following:

- Element activation
- The mode level
- Special features, such as switch-on delays and fault-tolerance times

9.1.4 General information about servers and clients

Route Control server

The Route Control server's main task is to find possible routes in the configured route network at the request of the AS. It can also be part of a redundant configuration. The search itself can be influenced by the following parameters, for example:

- Locked elements or elements that are already occupied by another material transport
- Elements in manual mode

- Checking of the material sequence
- Locked partial routes

In addition, the Route Control server acts as a connection between the automation systems and the user interfaces (Route Control Center) by displaying objects that are relevant for SIMATIC Route Control.

Route Control Center

The Route Control Center is an application that displays detailed information about a route. In addition to the status of a route, the Route Control Center also displays all elements and their status (setpoint, actual value and mode level). You can perform the following tasks here:

- Actively intervene
- Request the route
- Start the route
- Pause the route
- Stop the route

Depending on the level of authorization, you can also specify other route parameters:

- Source and destination of the material transport
- Material
- Mode table

Route Control Faceplate in PCS 7 OS

The Route Control faceplate is a user interface used for displaying and manipulating the main statuses and functions of a route. A block icon is added to a PCS 7 OS picture and interconnected with an instance of the RC_IF_ROUTE block type using the Route Control Dynamic Wizard. During runtime, the block icon can be used to open the Route Control faceplate. In addition to the route status, the faceplate also displays messages pertaining to a route. Operators can perform the following tasks here:

- Actively intervene
- Request the route
- Start the route
- Pause the route
- Stop the route

You can not select new source or destination locations here.

From this faceplate, you can switch to the BATCH Control Center (if installed), the Route Control Center or the SFC dialog box (if configured).

9.1.5 General information about the automation system

Route Control Automation System

The Route Control automation systems assume the most important part of material transport. Except for the route search, the entire material transport control (that is, control of elements involved in the route) is carried out here in the AS.

Because the elements for a material transport can be spread out over several automation systems, the exchange of setpoint and actual values of these elements, the mode levels, is integrated in SIMATIC Route Control.

You can configure the AS-AS connections with the help of the Route Control Wizard. The user program does not need to ensure cross-AS data transfer. The individual interfaces are as follows:

- RC_IF_ROUTE for a route
- RC_IF_... blocks for the elements for interfacing technological elements from the standard library (each AS has several of these)
- Configuration and diagnostic blocks (RC_IF_CFG, RC_IF_XC_DIAG, RC_IF_XC_LIFE, one per AS)

Interaction of Areas

SIMATIC Manager and the Route Control project represent the basic environment for the Route Control configuration. All relevant information for SIMATIC Route Control is stored together in both project environments (automation systems, servers, elements, and partial routes, for example).

The configuration is partially downloaded to the AS (CFC blocks and Route Control kernel) and partially transferred to PCS 7 OS (messages and tags for picture creation).

The Route Control project is copied to the Route Control server and read in there during startup. During runtime, the Route Control blocks request a route, that is, element lists, in the AS.

The server searches for the route, assigns elements and writes these lists to the automation systems involved. At this point, the AS takes over control of the elements.

Monitoring and operator control of routes can be performed from the Route Control faceplate (via PCS 7 OS channels) and the Route Control Center (via a connection to the Route Control server).

AS Tasks

The AS performs the following tasks:

- It serves as the interface to the process-related elements;
- It controls routes and elements, including cross-coupling, among automation systems;
- It evaluates feedback from the elements.

The following tasks are transparent to the user program when performed:

- Communication between the Route Control automation systems and the Route Control servers
- Route searches
- Compilation of element lists
- Distribution of these lists by the server to all participating Route Control automation systems
- Activation of elements involved in the route

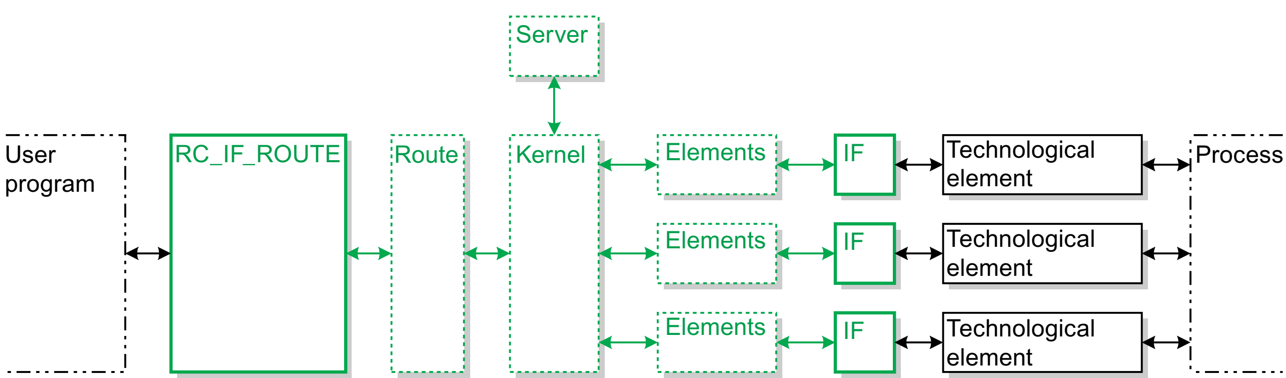
Route Control contains interface blocks for interfacing technological elements, i.e., blocks, from the standard library. Adapt technological blocks from other libraries accordingly before interconnecting them to Route Control interface blocks.

If in a material transport you use elements, which are distributed across several automation systems, Route Control carries out data exchange (which is transparent to the user program) via cross-coupling connections.
Route Control can also incorporate elements from another Route Control project in a route.

9.1.6 General information about the user program

User program

The user program controls a material transport (a route). It is connected directly to the RC_IF_ROUTE block, but not to the elements.
The user program can be based on the SFC sample block supplied or can be user-defined. The user program can also be a transport phase of a recipe system.



In addition to a number of extra parameters that are relevant for the route search, the user program also specifies the source and destination of the material transport and requests the route. The kernel requests the route and receives a list of elements.

Once the route has started, the elements are activated according to their configuration (operating mode and mode level).

The data of the elements are published by means of interface blocks (indicated on the display with IF). The RC_IF_... interface blocks are interconnected to technological blocks, for example, from the standard library. Setpoints are passed to the technological blocks and actual values (feedback) are transferred to the kernel.

Master/Slave Automation System

A material transport can affect elements from several automation systems. The automation system containing the user program and the RC_IF_ROUTE block is called the master AS and the additional automation systems involved in the transport are referred to as slave AS.

Learning Objectives Check List

- You understand the separation between engineering (SIMATIC Manager, Route Control), Route Control server, Route Control AS, and user interfaces (Route Control block icon and faceplate, Route Control Center).
- You know which tasks are covered by each area.

9.1.7 Guide to Setting Up a New Project

Requirement

You have installed PCS 7 and now want to start a new S7 project along with a Route Control project.

Overview of the Procedure

Step	Procedure
1	Install SIMATIC Route Control including the Route Control library.
2	Create a new PCS 7 multiproject.
3	Configure the hardware (HW Config): RC applications and CP 443-1
4	Copy all blocks from the "System Blocks\Blocks" program folder of the Route Control library to your project's master-data library. Important: DB and UDT must be copied to the block containers of all Route Control ASs manually.
5	Configure the plant hierarchy.
6	Configuring the locations
7	Before copying charts: Create a reserved area for DB and FC with the CFC editor in the master data library. You can find additional information in the section "Adapting the Block Ranges in CFC" (Page 309)
8	Create a CFC chart with the RC_IF_CFG block or Copy the chart from the RC library
9	Configure the routes (RC_IF_ROUTE) and elements (RC_IF_MOTOR, etc.).
10	Optional: Delete any data blocks you do not need. You can find additional information in the section "Optimizing Memory Requirements in the AS" (Page 74)
11	Export and import the configuration from SIMATIC Manager into Route Control Engineering with the Route Control Wizard

Step	Procedure
12	Compile and download the charts and NetPro connections to the automation systems. Please also note the information in "Downloading User Blocks to the AS" (Page 72)
13	Download the PC station.
14	Configure the partial routes and insert the elements in partial routes in Route Control Engineering.
15	Download the Route Control server and activate it in the Route Control Center.

Note

A master data library can only exist in a multiproject.
You should also create a single project in a multiproject.

Project Engineering Checklist

- The S7 project is available.
- The global settings have been made (block ranges).
- CFC charts are available, for example, for the blocks below:
  - RC_IF_CFG
  - RC_IF_XC_DIAG
  - RC_IF_XC_LIFE
  - RC_IF_ROUTE
  - RC_IF_MOTOR
- The Route Control project is available.
- The blocks have been compiled and downloaded.

9.1.8 Guide to Predefined Element Types

Requirement

You want to know which element types are already predefined and how you can add your own element types.

Predefined Element Types

Both the Route Control library and the configuration environment contain predefined element types for the following four groups:

- Control elements (and subtypes)
- Parameter elements (and subtypes)

- Sensor elements
- Link elements

Additional information

- You can find the list of interface blocks for elements in the section
"Route Control Blocks" (Page 97)
- You will find a description of how to create and transfer user-defined block types in the section
"User-defined type (Page 168)

Learning Objectives Check List

- You are familiar with the four main groups of element types.
- You are familiar with the subtypes.
- You can create your own type, use it in a CFC chart and add it to the Route Control configuration.

See also

General information about block descriptions (Page 98)

9.1.9 Guide to External Parameter Elements

Requirement

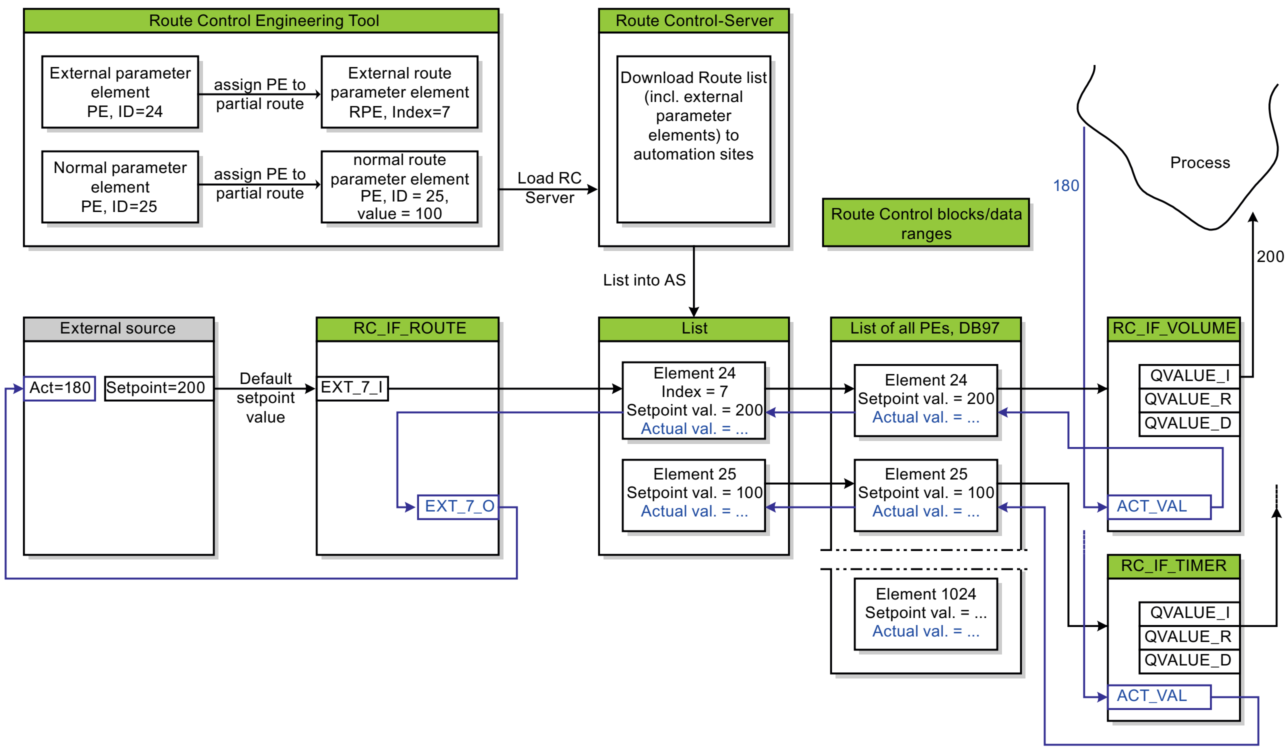
Certain setpoints are still unknown at the time the parameter elements are configured. For example, material quantities that must be weighed are typically supplied as batch parameters from a recipe system and depend on the size of the batch. Another example would be level sensors whose actual value is compared with a level setpoint. Filling is to be stopped when a particular desired volume, which is, in turn, not known until runtime, has been reached.

Overview of the procedure

In such cases, "external parameter elements" are inserted in a partial route. External parameter elements (ext. PEs for short) are different from internal PEs in that the configured setpoint does not represent the direct setpoint for the process, but instead acts as an index for the inputs EXT_..._I, where ... stands for index 1 to 24. This value can be specified in the properties dialog of an interconnected parameter element in a partial route.

Upon activation of the mode level in which this parameter element is inserted in the partial route during runtime, the route transfers the value of the corresponding EXT_..._I input as a setpoint to the data record of a parameter element. (This can be seen in the RC_IF_VOLUME or RC_IF_TIMER interface block.) In return, the actual value of the parameter element is transferred to the outputs of RC_IF_ROUTE EXT_..._O, where it can be received by the user program. ... corresponds to the index.

Example



Check list

Learning objectives

- You know what external parameter elements are, what they are used for and how they differ from internal parameter elements.
- You know how external parameter elements are configured (RC Engineering tool) and how data exchange takes place between the user program and the route (CFC with RC_IF_ROUTE and possibly RC_IF_TIMER or RC_IF_VOLUME).

Configuration

1. The "external" identifier was set when the element was inserted in a partial route (interconnected parameter element).
2. The index value has been specified (interconnected parameter element).
3. The RC_IF_ROUTE inputs are interconnected to the source that specifies the external setpoint during runtime.

9.1.10 Guide to material sequences during runtime

Requirement

During runtime, the route search must take into account the predecessor material used and the material to be transported with the subsequent route.

Overview of the Procedure

Step	Procedure
1	Configure the materials, material groups, the assignment of materials to material groups, and the permitted successor relationship between materials.
2	Configure the partial routes that contain at least one link element. Link elements are memory cells for recording the most recently transported material.
3	Specify the new material in the MATERIAL input of the RC_IF_ROUTE block. MATERIAL is an integer (the ID from your configuration). The material is specified by the user program.
4	Download these project data onto the Route Control server.
5	Carry out a route request with this material. Depending on whether or not the material was permitted as a successor, the route will or will not be found via the partial routes with the relevant link elements.

Note

If a material group is permitted as a successor group, then all the materials assigned to this group can be also used as successor materials.

Internally, the user program and the routing system work with lists of materials, rather than material groups.

Example

In addition to the configuration dialog described above, you will also find a sequence diagram in the section
"Material Sequence Diagram for RC_IF_ROUTE" (Page 459)

Learning Objectives Check List

- You are familiar with each step required during configuration and during runtime to influence the route search via predecessor and successor materials.

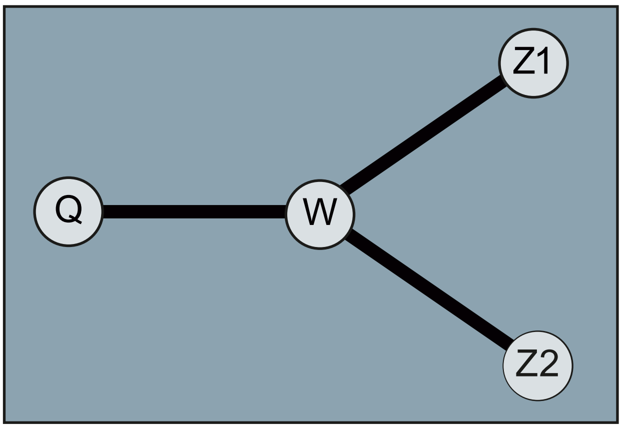
9.1.11 Guidelines on concurrent routes

Requirement

You want to remove material from multiple source containers or fill multiple destination containers simultaneously.

You want to switch over to another source or destination container during transport.

Example:



This task involves route control for two routes:

- Route 1 from Q to Z1
- Route 2 from Q to Z2

3 partial routes are configured (Q >> W, W >> Z1, W >> Z2)

Within the context of Route Control, this means that you "require" one or more partial routes (Q>>W) in several routes at the same time. However, a partial route is normally unavailable for a new route search if it is already being used in a route; in other words, the second route "cannot be found".

(Unavailable partial routes can be identified by the fact that either they themselves or their elements have been assigned a function ID other than 0.)

To solve this problem, Route Control provides what are known as concurrent routes.

Operating principle

A route or material transport is planned for each source or destination container (see example).

These routes have the same function ID (FUNC_ID = x for both routes), which means that the route search for the second and each additional material transport does not result in an error due to elements having already been assigned.

The function ID is entered at the FUNC_ID input of FB800/RC_IF_ROUTE (automatically) or in the route properties of the RCC (manually).

The following specifications apply to use of the function ID:

0	The system uses the route ID as the function ID.
1..300	Assigned/used by the system
301..32000	Can be used by the user

Typically, a user program controls both material transports. Thus, it can decide when a switchover is necessary or when each material transport must be terminated.

Note

If a route with a function ID of 0 is requested, this is caught by the AS program (Route Control system) and the function ID is replaced by the route ID (default action), since a function ID of 0 would cause the elements in the Route Control server to be made available.

Activation of elements

Normally, shared partial routes also contain elements that are activated by means of the mode level. (Link elements (LE) are the exception here; see below.)

Depending on the type of element, the following special features should be noted:

Control elements (CE):

All concurrent paths should also control the elements in the "shared" partial routes in the same way. Conflicting types of control (e.g. Route1 switches Valve1 to "OPEN", while Route2 switches Valve1 to "CLOSED") result in an error in the "second" route controlling the element (i.e. Route2). Route2 will remain in this state even if Route1 ceases to control the element.

Parameter elements (PE):

Route1 also "takes precedence" in this case, but a different setpoint specified by Route2 does not result in an error; instead, the "first" setpoint is also applied to Route2. If the mode level that controls the PE is deactivated in Route1, the setpoint from Route2 is adopted, provided that its mode level is active.

Sensor elements (SE):

In the case of sensor elements, the feedback from the element is compared with the configuration ("when is the SE executed") for the active mode level. If the SE is configured differently in two routes, the route/mode level whose feedback matches the configuration is executed immediately, while the other route/mode level starts the operation monitoring time and triggers a route error when this has elapsed.

Link elements (LE):

These are not related to the mode level, but instead are updated when one of the possible activation functions for the material is initiated. The link elements configured in the concurrent routes contain the material that was up to date when the most recent "Set material" function was executed.

Learning Objectives Check List

- You are familiar with the concept of concurrent routes.
- You know how certain parameters should be assigned during runtime (FUNC_ID = x for both routes).

9.1.12 Guide to the block icon and faceplate

User Task

You want to interconnect the block icon and the faceplate to a route block to display information about the route in a PCS 7 OS picture during runtime.

Requirements

- You have created a CFC chart with an RC_IF_ROUTE block.
- You have performed PCS 7 OS compilation so that tags are available.

Overview of Procedure

Installation of the Route Control Engineering component has provided you with a Route Control Dynamic Wizard and a block icon.

Step	Procedure
1	Copy the block icon to a PCS 7 OS picture.
2	Start the Route Control Dynamic Wizard This wizard guides you through a number of steps in order to interconnect the block icon to an instance of block type RC_IF_ROUTE. Optional: Preassign the name of an SFC chart to parameter SFC_PATH. Enter the name of the SFC chart which controls this route. During runtime you will be able to open an SFC dialog box from the Route Control faceplate indicating the current status of the SFC. This is particularly useful for diagnostic purposes.

Note

The elements or their interface blocks do not have their own faceplates for PCS 7 OS because the process-related elements, for example, from the standard library, already contain such faceplates. For diagnostic purposes, you have the Route Control Center and the CFC Editor online view.

Example

- Section "Starting the Dynamic Wizard" (Page 337)

Configuration Check List

1. You have placed a block icon and interconnected it to a route (RC_IF_ROUTE).
2. You have supplied the SFC_PATH parameter correctly.

9.2 NetPro Examples

9.2.1 Overview of the configuration in NetPro

General

Note

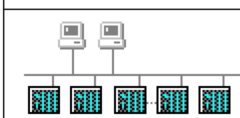
The Route Control Wizard enters the connections required for Route Control and ensures that connection ID assignments are consistent and explicit to save you from having to enter these connections yourself.

Below are a few examples you can use to check entries made by the wizard.

If you make any changes to NetPro (for example, for automation systems not relevant for SIMATIC Route Control), you must rerun the Route Control Wizard afterward to check for consistency.

Number of ASs

In general, when configuring NetPro you must take into account whether SIMATIC Route Control is operating with only one automation system or with more than one automation system.

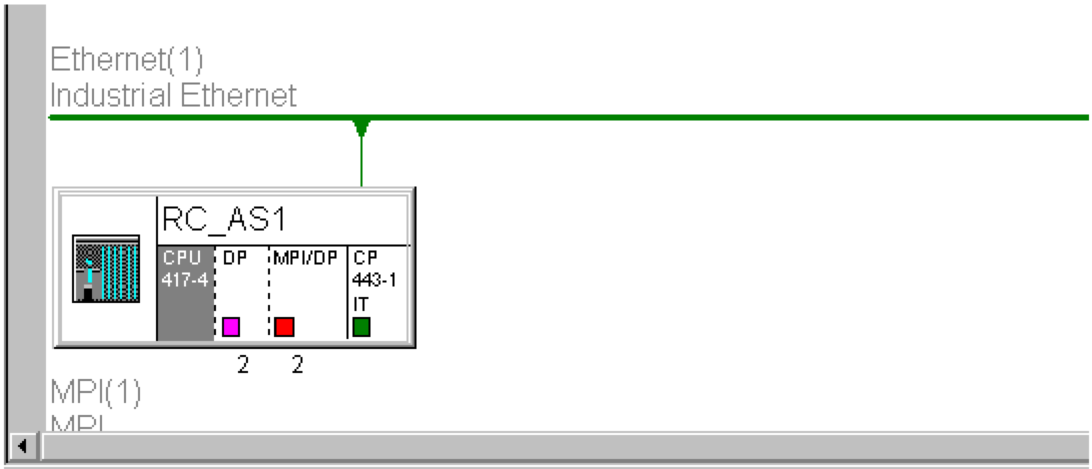
Number of ASs	Information in Section
	"Configuring with an AS" (Page 241)
	"Configuring the First of Two ASs" (Page 242) and "Configuring the Second of Two ASs" (Page 243)

Additional information

- Section "Configuring H-Machines" (Page 243)

9.2.2 Configuring with an AS

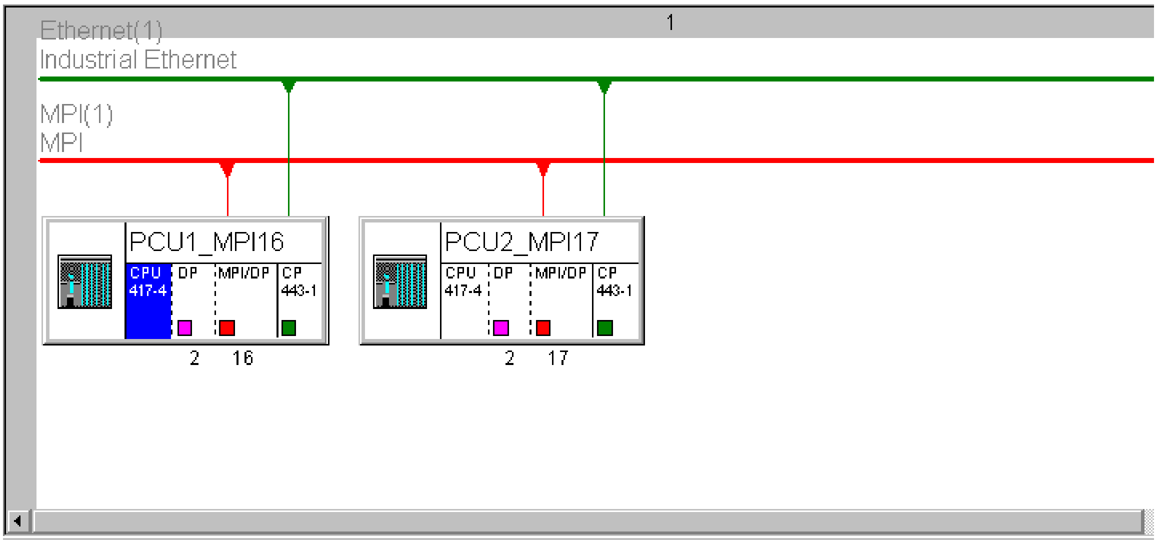
Configuration



Lokal ID	Partner	Type	Active Connection Partner	Subnet	Partner Adress
1	RC-SERVER	S7- connecti..	no	Ethernet(1) (IE)	...
2	RC-STANDBY	S7- connecti..	no	Ethernet(1) (IE)	...

9.2.3 Configuring the first of two ASs

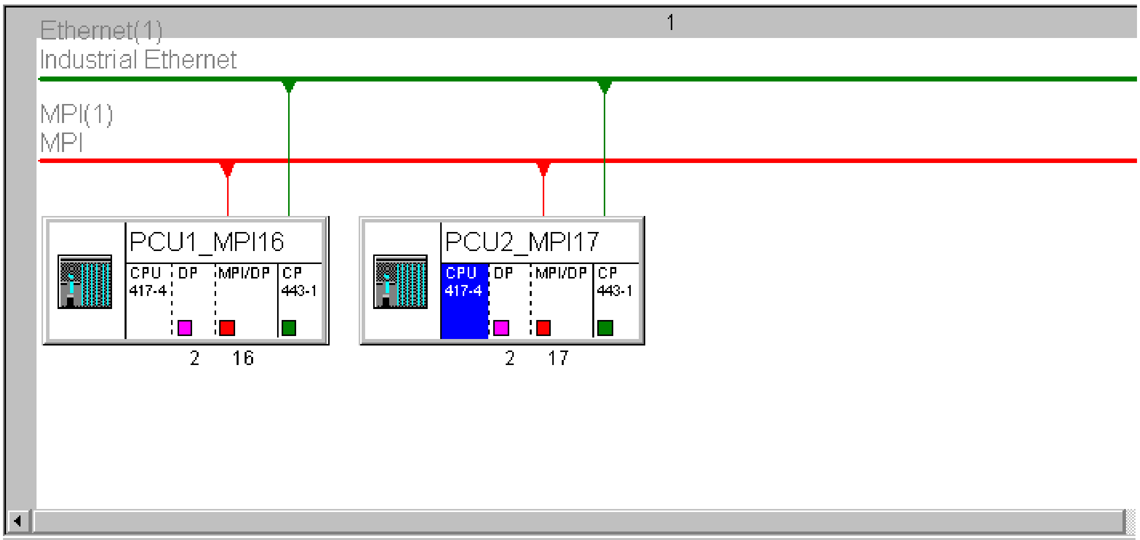
Configuration



Lokal ID	Partner ID	Partner	Type	Aktive	Send operating mode	Subnet	Partner Sc	Local address
1		RC-SERVER	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-CF
2		RC-STANDBY	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-CF
3	3	PCU2_MPI17 / CPU 417-4	S7-connection	yes	no	Ethernet(1) (IE)	CP 443-1	00-AB-BA-AF-FE-CF
50		TO REMOTE-SLAVE	S7-connection	yes	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-CF

9.2.4 Configuring the second of two ASs

Configuration



Lokal ID	Partner ID	Partner	Type	Aktive	Send operating mode	Subnet	Partner Sc	Lokal Adress
1		RC-SERVER	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-DA
2		RC-STANDBY	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-DA
3	3	PCU1_MPI16 / CPU 417-4	S7-connection	no	no	Ethernet(1) (IE)	CP 443-1	00-AB-BA-AF-FE-DA
50		FROM REMOTE MASTER	S7-connection	no	no	Ethernet(1) (IE)		00-AB-BA-AF-FE-DA

9.2.5 Configuring H machines

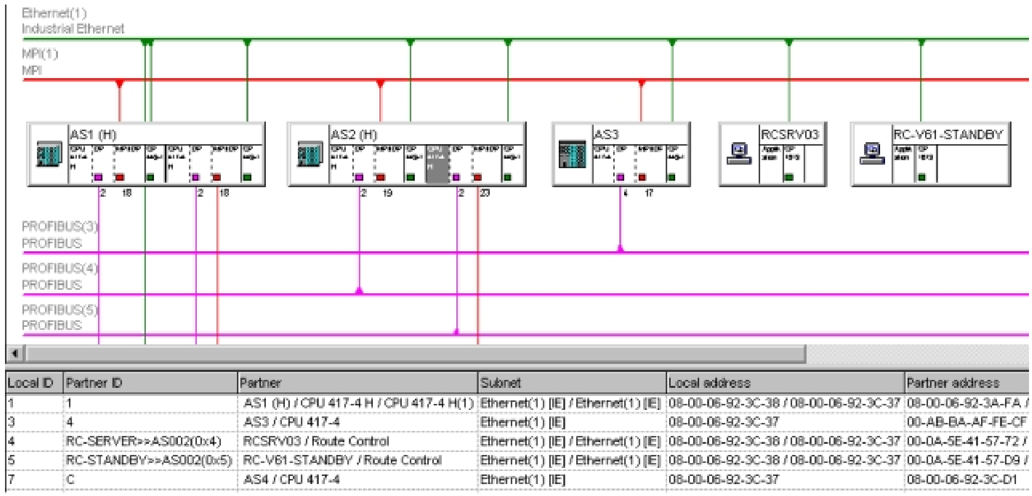
Introduction

As of SIMATIC Route Control V6.1, H-machines (417-4H) are also supported. Material transports can also be performed by different types of automation system (H-machines, non-H AS). The Route Control Wizard also assists you in configuring the AS-AS connections when H-machines are used.
You can find additional information in
"Communication with H-Machines" (Page 306).

Overview of Procedure

Step	Procedure
1	Configure the automation system in NetPro and HW Config.
2	Start the Route Control Wizard to create the communication links.
3	Download to the AS.
4	Open Route Control Engineering and download to the Route Control server
5	Perform an automatic restart of the Route Control server.

When an H-machine fails and the system switches to the second CPU, the Route Control server performs a general request for reasons of safety.



9.3 SIMATIC Manager

9.3.1 S7 project

9.3.1.1 Route Control applications in HW Config

Route Control Applications

As of V6.1 SP1, special Route Control applications are provided in the hardware configuration (HW Config). Similar to BATCH and PCS 7 OS, these applications represent active Route Control processes on a server or client station.

Configure the following applications, which you will find in HW Config in the PCS7_V80 catalog under Route Control:

Route Control application	For station
Route Control application	Master station (server)
Route Control application (stby)	Standby station (server)
Route Control application client	Client station, on which a Route Control Center is to run

The Route Control Wizard will now automatically detect the Route Control server and client stations, based on the configured applications. You no longer have to select one of the standard applications, as you did in V6.1.

Additional information

- Section "Hardware Configuration HW Config" (Page 313)

9.3.1.2 Guide to configuring the AS-AS and AS-Server connections

Requirement

You want to configure the connections between the automation systems involved in Route Control and the servers.
A distinction must be made between the following connection types:

- AS-AS connection (cross-coupling)
- AS-server connection (server coupling)

Overview of the procedure

The following connections are possible:

- AS-AS connections within a Route Control project, which are used to exchange data by means of PUT jobs
- AS-AS connections across projects, which are used to exchange data by means of BSEND/BRCV jobs
- AS-server connections, in which the peers also exchange data by means of BSEND/BRCV jobs

The connection data for AS-AS connections (cross-coupling) and AS-Route Control server connections are specified in NetPro. The Route Control Wizard supports you in this. It ensures that the connection IDs are uniquely assigned and provides a framework that prevents errors and simplifies diagnostics.

Example: An Overview of the Project Engineering of an AS-AS Connection in a Route Control Project (PUT)

Step	Procedure
1	The Route Control Wizard creates the NetPro connection. The wizard also provides values for parameters AS_ID_01 to AS_ID_32 and ASConn1 to 32 at RC_IF_CFG.
2	Configure the automation system with regard to Route Control
3	Transfer data to the Route Control project via the Export/Import Wizard

Example: An Overview of the Project Engineering of an AS-AS Connection in a Route Control Project (BSEND/BRCV)

These connections cannot be created in the Route Control Wizard. You must therefore create a connection in NetPro for each peer automation system.

Step	Procedure
1	Create a NetPro connection for each peer automation system (S7 connection to an unspecified peer). The local communication ID in NetPro must match the ID on the peer.
2	Insert special communication blocks (RC_IF_REMOTE_SEND and RC_IF_REMOTE_RECV) in a CFC chart for processing in the automation system program
3	Project engineer the local communication IDs from NetPro in these two blocks

You can find examples in:

- "Overview of REMOTE Blocks" (Page 183)
- "CFC Charts with REMOTE Elements" (Page 270)

Example: An Overview of the Project Engineering of an AS-Server Connection (Standalone, BSEND/BRCV)

Step	Procedure
1	Configure the AS-server communication link (NetPro)
2	Program the communication link (Route Control Wizard)
3	Transfer data to the Route Control project (Export/Import Wizard)
4	Route Control project: Assign the TCP/IP address

Example: An Overview of the Project Engineering of an AS-Server Connection (Redundant Route Control Server, BSEND/BRCV)

Step	Procedure
1	Proceed as for the AS-server connection (standalone)
2	Route Control project: Add a second Route Control application (standby)
3	Route Control project: Assign the TCP/IP address for standby

Learning Objectives Check List

- You are now aware of the following three variants:
  AS-AS within a Route Control project
  AS-AS across Route Control projects
  AS-server connections
- You know the type of communication used in each case.
- You know which tasks can be performed by the wizard and which tasks you must perform yourself.

- You have configured the connections yourself in NetPro or you have had them configured by the Route Control Wizard.
- You have set the properties of the Route Control server or servers in the Route Control Wizard and exported them to Route Control Project Engineering, where you have also assigned the TCP/IP address.

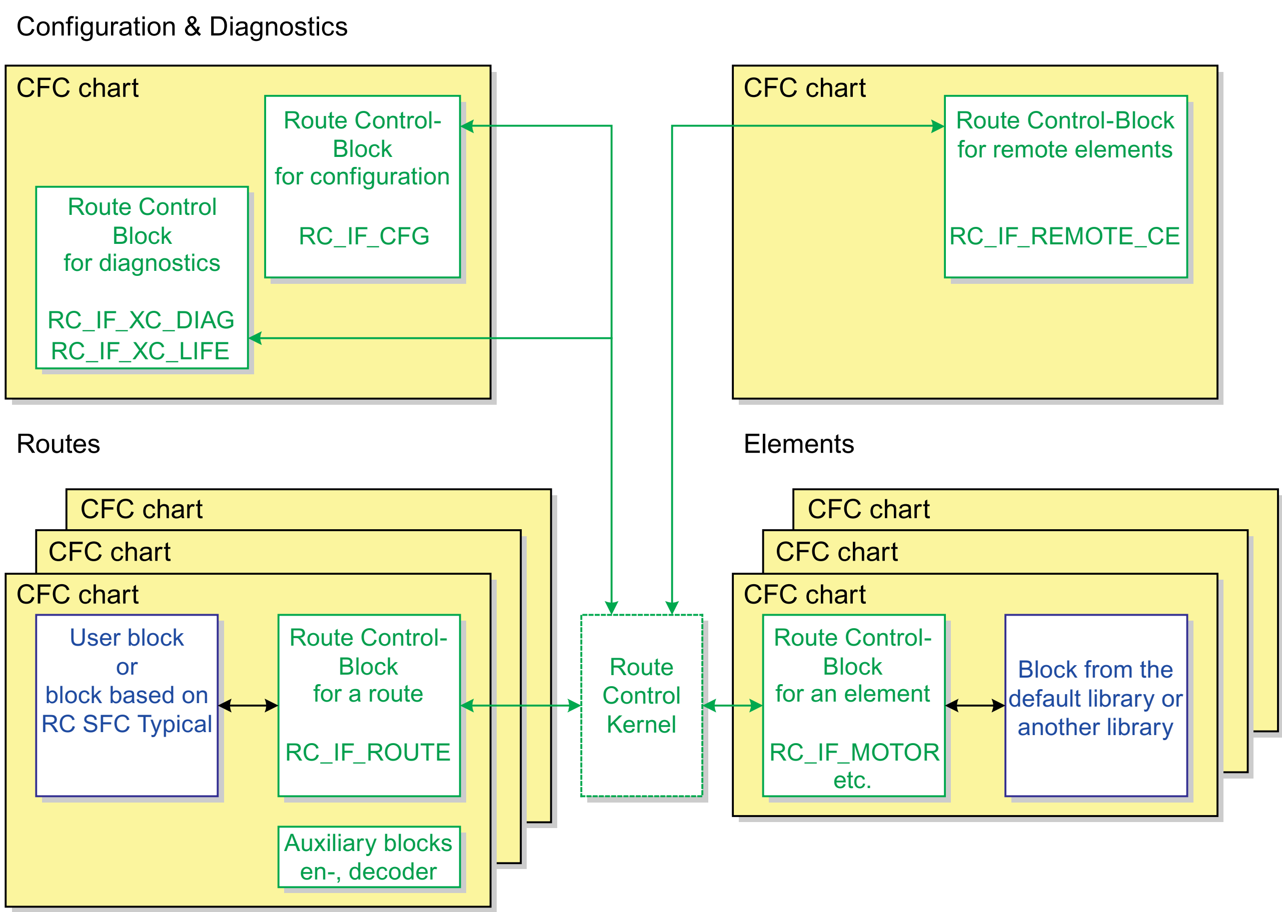
9.3.1.3 CFC overview

CFC overview

The routing-system blocks can be divided into five areas:

- Route Control configuration and diagnostics (RC_IF_CFG, RC_IF_XC_DIAG, RC_IF_XC_LIFE, one per AS)
- Route Control route blocks (RC_IF_ROUTE, n per AS)
- Route Control element blocks (RC_IF_..., n per AS)
- Route Control remote elements (RC_IF_REMOTE_CE, etc., up to n per AS, as required)
- Route Control kernel blocks (RC_... (without _IF_ in the name), kernel, 1 per AS)

The figure below illustrates the interaction of the most important blocks:



Additional information

- Section "Guide to CFC Charts" (Page 248)
- Section "Overview of CFC Examples" (Page 249)

9.3.1.4 Guide to CFC charts

User Task

In addition to the relevant centralized configurations for a Route Control AS, you want to create the CFC charts for a route and the elements.

Overview of Procedure

Step	Procedure
1	Configure a CFC chart with one RC_IF_CFG type block per AS. You also have the option of positioning two additional blocks for diagnostic purposes: RC_IF_XC_DIAG RC_IF_XC_LIFE These two blocks are then required for diagnostics if cross-coupling is used in Route Control, i.e., if the Route Control project contains more than one AS.
2	One instance of block type RC_IF_ROUTE is required per material transport (or route). We recommend that you create a separate CFC chart for each route to include the user program and an optional RC_IF_DECODER and RC_IF_ENCODER, as well as the RC_IF_ROUTE.
3	Creating separate CFC charts for the elements; this is because, in addition to the Route Control interface block (such as an RC_IF_MOTOR), the process-related block from the standard library (e.g., the MOTOR block) and other auxiliary blocks are also inserted in the CFC charts.

Examples

- Section "Overview of CFC Examples" (Page 249)

Learning Objectives Check List

- For each automation system, you have inserted one centralized CFC chart in which a block of type RC_IF_CFG has been placed and configured.
- You have created one (or more) CFC chart(s) and placed blocks of type RC_IF_ROUTE for route activation by the user program.
- You have created one (or more) CFC charts and placed blocks of type RC_IF_VALVE, RC_IF_MOTOR, or a similar type to activate process-related elements.

9.3.1.5 Overview of CFC examples

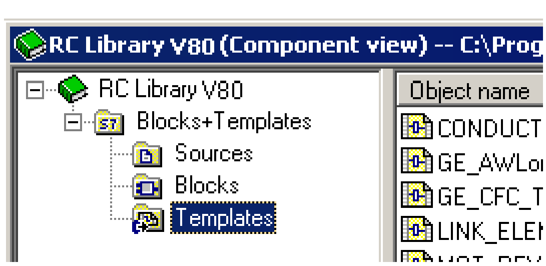
Overview of CFC examples

You will find the following Route Control CFC examples in the "Guide" section:

Templates

- CFC Configuration of One Automation System (Page 252) (RC_IF_CFG)
- CFC Configuration of Multiple Automation Systems (Page 253) (RC_IF_CFG + RC_IF_XC_DIAG + RC_IF_XC_LIFE)
- CFC Control Element (Page 256)
- CFC Motor with Two Statuses (Page 257) (RC_IF_MOTOR + MOTOR)
- CFC Motor with Two Statuses and No Feedback (Page 258) (RC_IF_MOTOR + MOTOR)
- CFC Motor with Interlocking Block (Page 259) (RC_IF_MOTOR + MOTOR + ILOCK)
- CFC Dual-Speed Motor (Page 260) (RC_IF_MOT_SPED + MOT_SPED)
- CFC Bidirectional Motor (Page 261) (RC_IF_MOT_REV + MOT_REV)
- CFC Valve with Dual Feedback Signals (Page 263) (RC_IF_VALVE + VALVE)
- CFC Valve with Interlocking Block (Page 264) (RC_IF_VALVE + VALVE + ILOCK)
- CFC Valve with Feedback (Page 262) (RC_IF_VALVE + VALVE)
- CFC Valve with No Feedback Signal (Page 265) (RC_IF_VALVE + VALVE)
- CFC Motor-Actuated Valve (Page 266) (RC_IF_VAL_MOT + VAL_MOT)
- CFC Sensor Element (Page 268)
- CFC Sensor, Binary (Page 268) (RC_IF_SENSOR)
- CFC Conductivity (Page 269) (RC_IF_CONDUCT)
- CFC Parameter Element (Page 269) (RC_IF_TIMER)
- CFC Link Element (Page 270) (RC_IF_LE)
- CFC Route (Page 254) (RC_IF_ROUTE)
- Guide to CFC Charts (Page 248)

You can find the SIMATIC Route Control interface blocks used in the examples in the Route Control library under **User Interface Blocks**:



9.3.1.6 Guide to the Route Control SFC type

User Task

You want to use a standardized basic framework as the basis for your user program for controlling a route.

Overview of Procedure

Step	Procedure
1	Copy the Route Control SFC type from the Route Control library to your own project.
2	Adapt the type to meet your requirements. The Route Control SFC type already includes a number of steps that are identical for all route-control processes: • Assigning "static" parameters * (source, destination, mode table, material, route ID, times) • Requesting the route • Starting the route • Controlling the material transport (specification of mode-level feedback evaluation) • Specifying another material and external setpoints • Holding the route • Ending the route

* with respect to the duration of a material transport

Additional information

- Section "SFC Overview" (Page 279)

Check List

- You are familiar with the Route Control SFC type and know how to use it as a basis for your own SFC user programs.
- You are familiar with each status or branch of the SFC type and the actions that can be typically carried out in each one.
- You know the data that are exchanged between the user program (SFC) and the route.

9.3.2 CFC Configuration

9.3.2.1 Guide to configuration of the automation systems

User task

You want to prepare and configure an automation system for SIMATIC Route Control. You specify whether the configuration should have only one automation system or more than one automation system.

Overview of the Procedure

Step	Procedure
1	Create a CFC chart for each AS (Route Control configuration chart)
2	Insert the blocks that are absolutely essential for operating Route Control in an AS and which have to be parameterized into this chart. If you are only using one automation system in your project, just one block will be enough for configuration: RC_IF_CFG (FB 850) (Page 172) If you are using two or more automation systems in your project, we recommend that you also include the following two blocks: RC_IF_XC_DIAG (FB 884) (Page 178) RC_IF_XC_LIFE (FC 884) (Page 182) These two blocks are used for diagnosing data communication between automation systems. You can insert both blocks in the same CFC chart as the RC_IF_CFG block.

Note

When you configure the RC_IF_CFG block, the Route Control Wizard helps you with the assignment of an AS ID and a communication ID for cross-coupling between automation systems.

An instance of the RC_IF_CFG block enables the Route Control Wizard to "recognize" a Route Control automation system.

Additional Information

- Section "CFC Configuration of One Automation System" (Page 252)
- Section "CFC Configuration of One of Multiple Automation Systems" (Page 253)

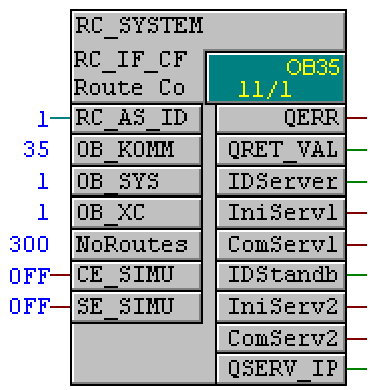
Project-Engineering Checklist

- Add a new CFC chart for each automation system.
- Add the RC_IF_CFG block for each automation system.

- If your project has more than one AS: Insert RC_IF_DIAG and RC_IF_LIFE.
- Start the Route Control Wizard. The wizard automatically assigns the AS ID and communication IDs, and creates the connections required in NetPro.

9.3.2.2 Guide to CFC configuration of one automation system

CFC chart

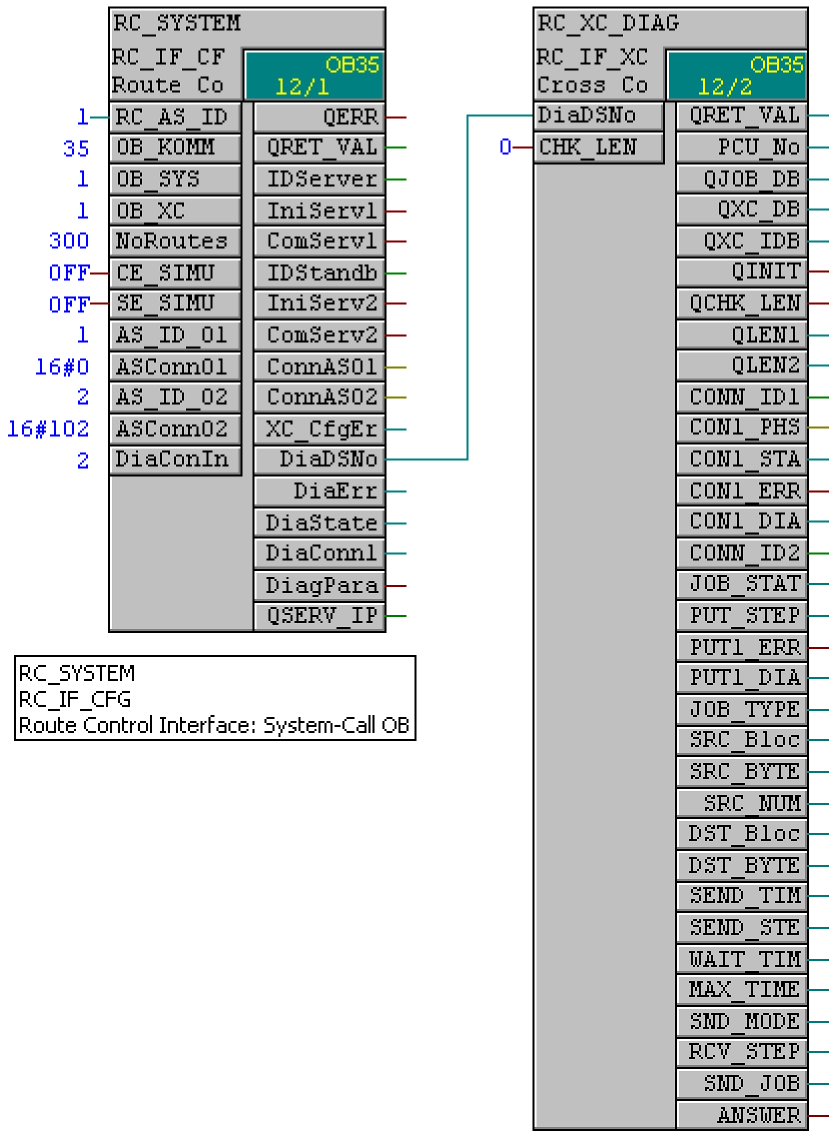


Description of Block

RC_IF_CFG (FB 850) (Page 172)

9.3.2.3 Guide to CFC configuration of one of multiple automation systems

CFC chart



Description of Blocks

RC_IF_CFG (FB 850) (Page 172)

RC_IF_XC_DIAG (FB 884) (Page 178)

9.3.3 CFC Routes

9.3.3.1 Guide to the CFC route

User Task

You want to insert and configure a route in an S7 project.

Overview of Procedure

Step	Procedure
1	Insert a block of type RC_IF_ROUTE for each route (material transport).
2	Configure the parameters.
3	Adjust the parameters of RC_IF_CFG if required.
4	Insert the user block in the CFC The user block can be developed based on a sample SFC supplied by Route Control. You can find additional information in "SFC Overview" (Page 279).

Additional information

- Section "Dynamic ID Assignment" (Page 284)

Example

- Section "SFC Schematic" (Page 280)

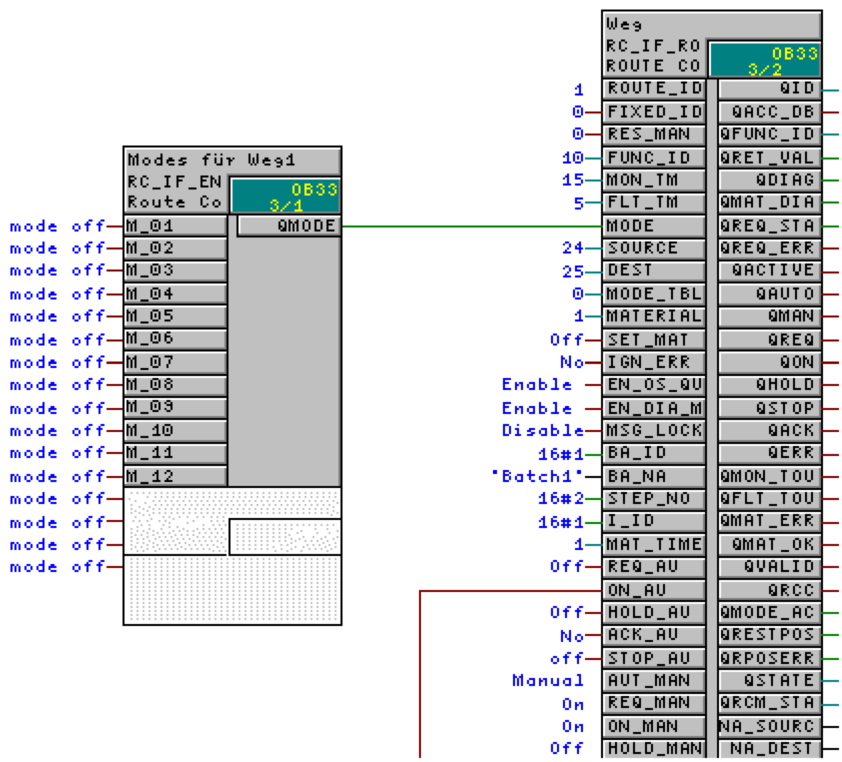
Configuration Check List

1. CFC chart has been created.
2. The RC_IF_ROUTE block has been inserted.
3. An ID has been configured (or assigned by the Route Control Wizard).
4. Parameters have been configured for fixed or dynamic ID assignment.
5. The NoRoutes parameter in RC_IF_CFG has been adjusted (to equal the highest assigned ID in the RC_IF_ROUTE blocks).
6. RC_IF_ROUTE has been interconnected to the user program.
7. Routes have been incorporated in the Route Control configuration using Route Control Wizard's export procedure.

9.3.3.2 Guide to CFC encoder

CFC chart

The RC_IF_ENCODER block is connected upstream of the RC_IF_ROUTE block.



Description of Blocks

- Section: "RC_IF_ENCODER (FC 800)" (Page 128)
- Section: "RC_IF_ROUTE (FB 800)" (Page 101)

9.3.3.3 Guide to CFC decoder

CFC chart

The CFC chart is structured in the same way as for the CFC encoder (Page 255), but the decoder is connected downstream (and to the right) of RC_IF_ROUTE and connected to its QMODE_AS output.

Description of Blocks

- Section: "RC_IF_ROUTE (FB 800)" (Page 101)
- Section: "RC_IF_DECODER (FC 801)" (Page 129)

9.3.4 CFC Control Elements

9.3.4.1 Guide to the CFC control element

User Task

You want to control a process-related element such as a MOTOR, a VALVE or another object from the standard library, sensor and parameter elements from SIMATIC Route Control.

Overview of Procedure

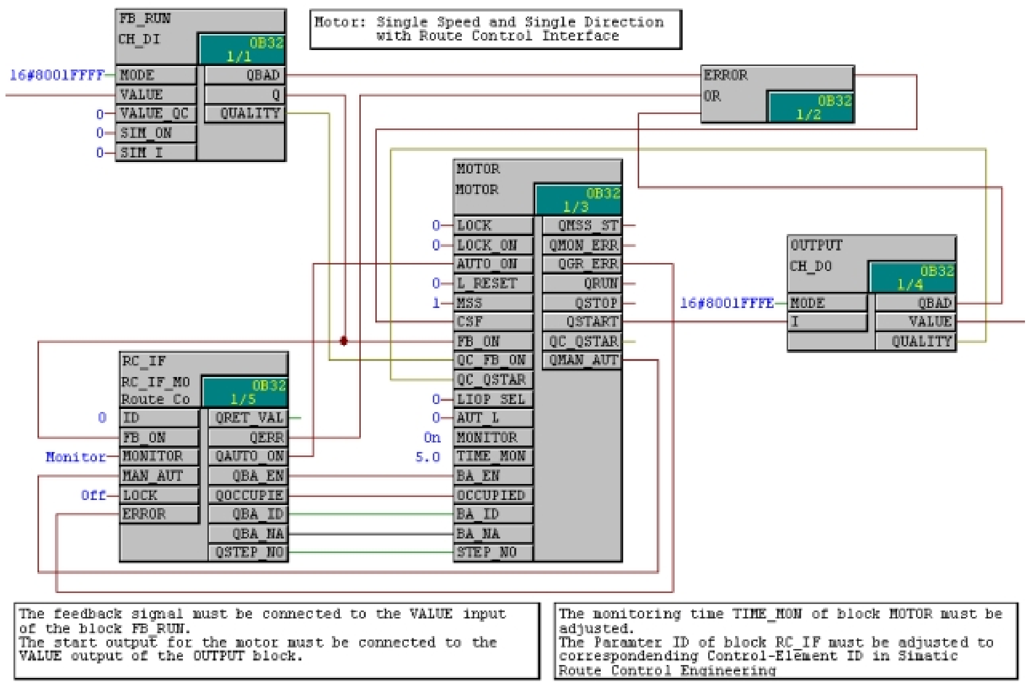
Step	Procedure
1	Placing the standard library block in a CFC chart
2	Placing the corresponding Route Control interface block in the CFC chart
3	Connecting the corresponding inputs and outputs
4	Exporting the elements to the Route Control configuration
5	Configuring partial routes with these elements
6	Using these elements to control routes

Examples

- Section "CFC Motor with Two Statuses" (Page 257)
- Section "CFC Motor with Two Statuses with No Feedback" (Page 258)
- Section "CFC Motor with Interlocking Block" (Page 259)
- Section "CFC Dual-Speed Motor" (Page 260)
- Section "CFC Bidirectional Motor" (Page 261)
- Section "CFC Valve with Feedback" (Page 262)
- Section "CFC Valve with Dual Feedback Signals" (Page 263)
- Section "CFC Valve with Interlocking Block" (Page 264)
- Section "CFC Valve with No Feedback Signal" (Page 265)
- Section "CFC Motor-Actuated Valve" (Page 266)

9.3.4.2 Guide to CFC motor with two statuses

CFC chart

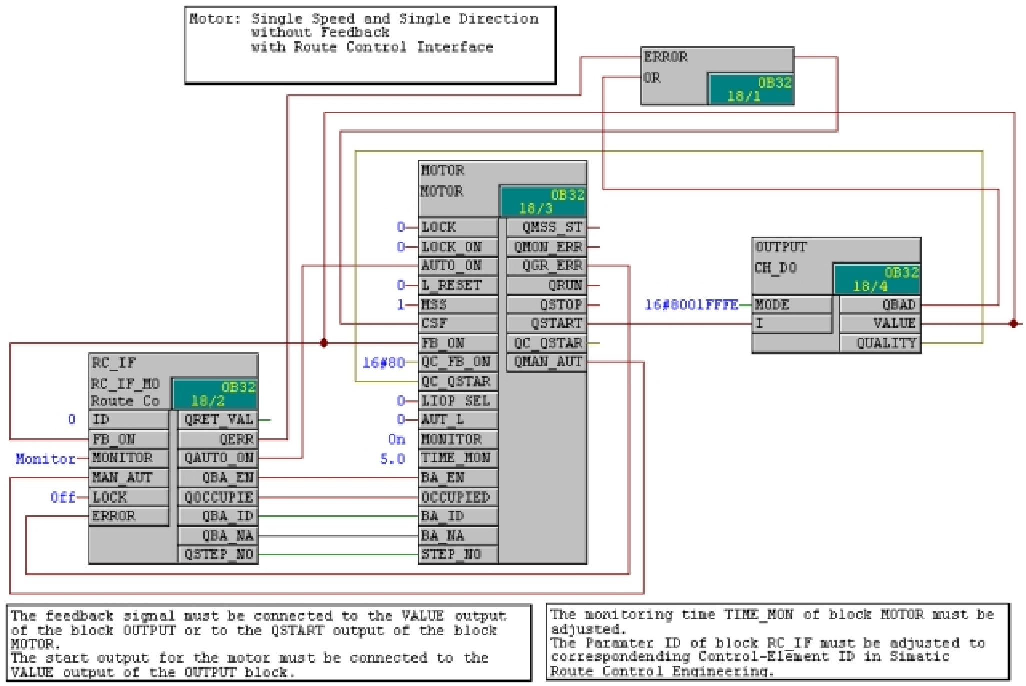


Description of Block

RC_IF_MOTOR (FB 822) (Page 138)

9.3.4.3 Guide to CFC motor with two statuses with no feedback

CFC chart

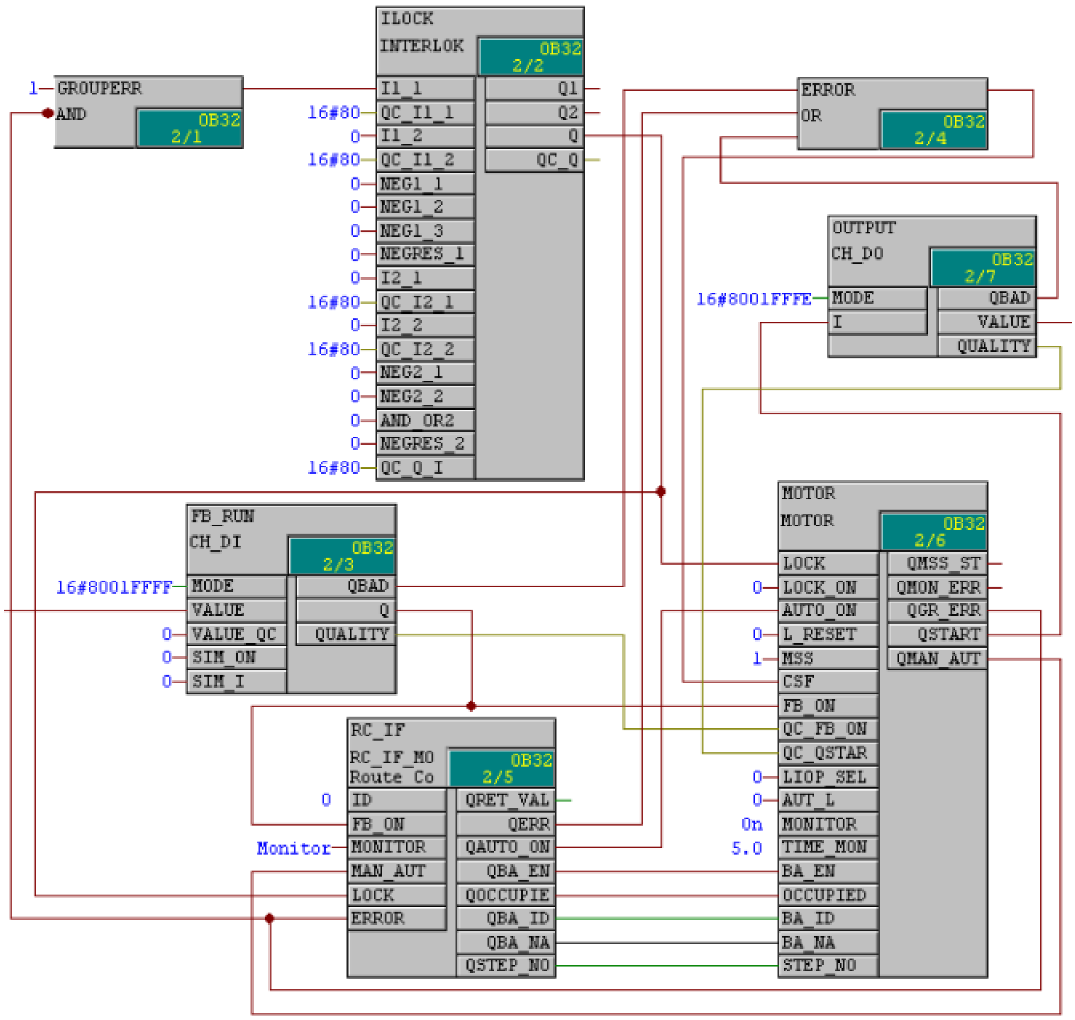


Description of Block

RC_IF_MOTOR (FB 822) (Page 138)

9.3.4.4 Guide to CFC motor with interlocking block

CFC chart

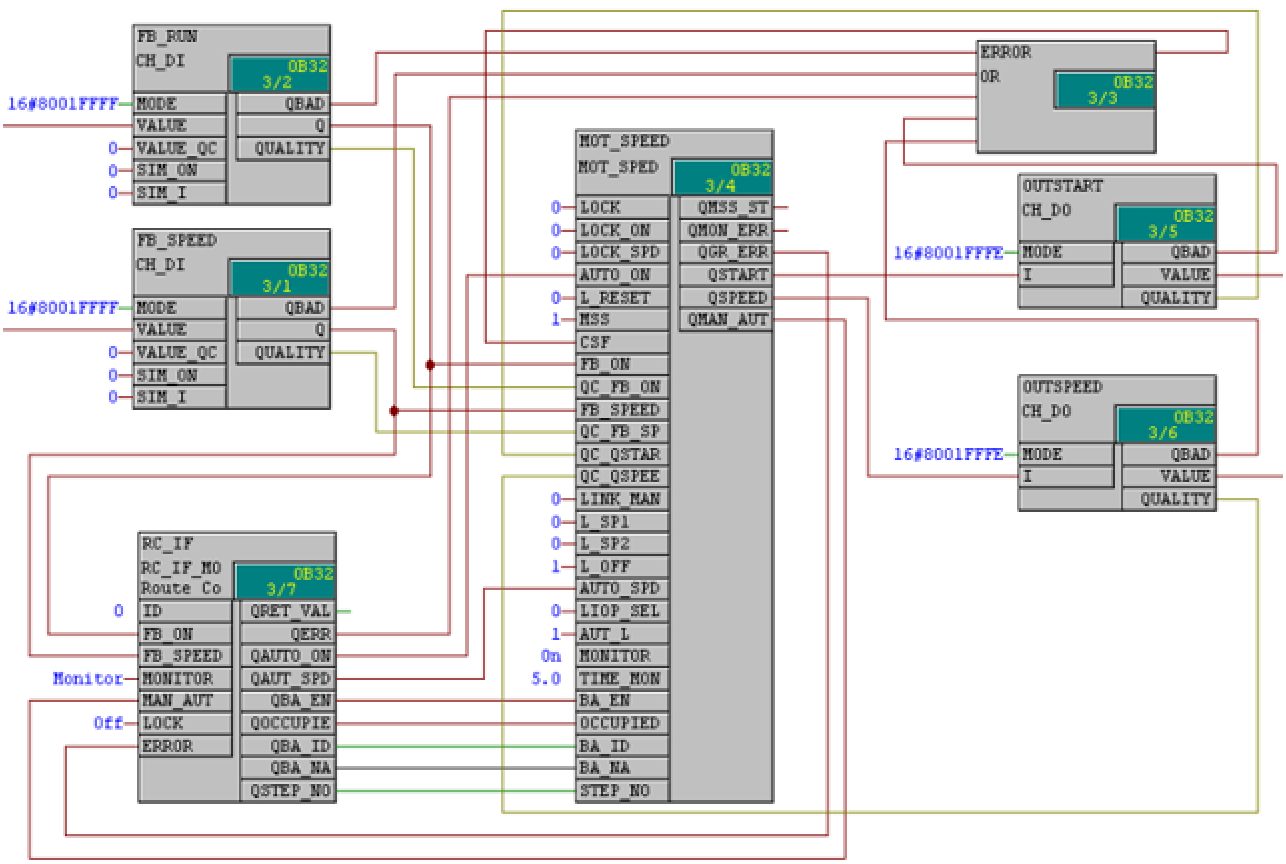


Description of Block

RC_IF_MOTOR (FB 822) (Page 138)

9.3.4.5 Guide to CFC dual-speed motor

CFC chart

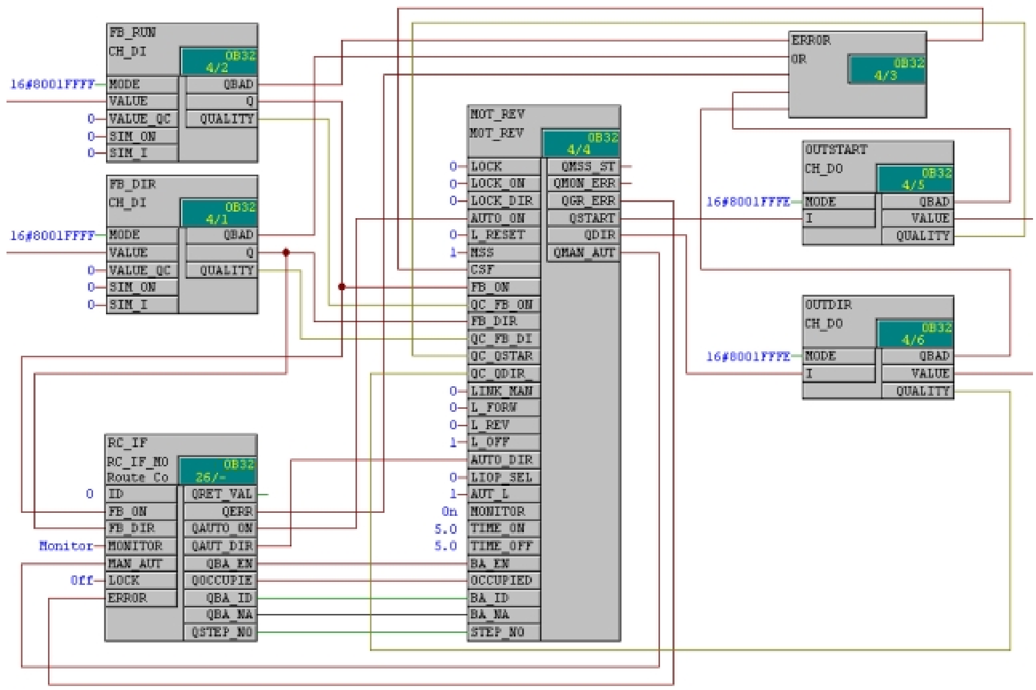


Description of Block

RC_IF_MOT_SPED (FB 824) (Page 146)

9.3.4.6 Guide to CFC bidirectional motor

CFC chart

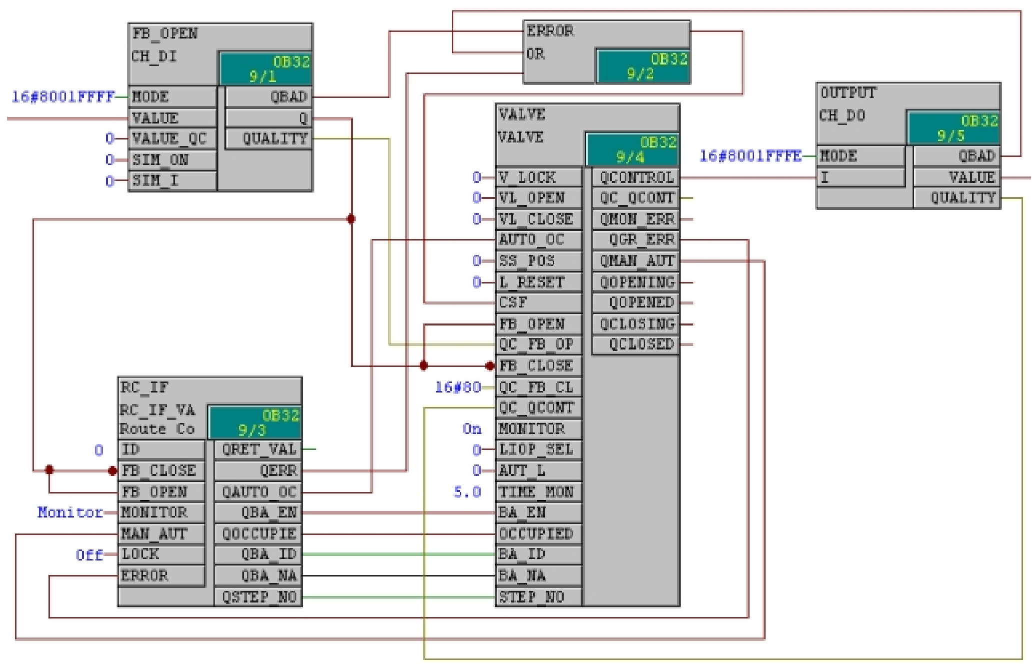


Description of Block

RC_IF_MOT_REV (FB 823) (Page 142)

9.3.4.7 Guide to CFC valve with feedback

CFC chart

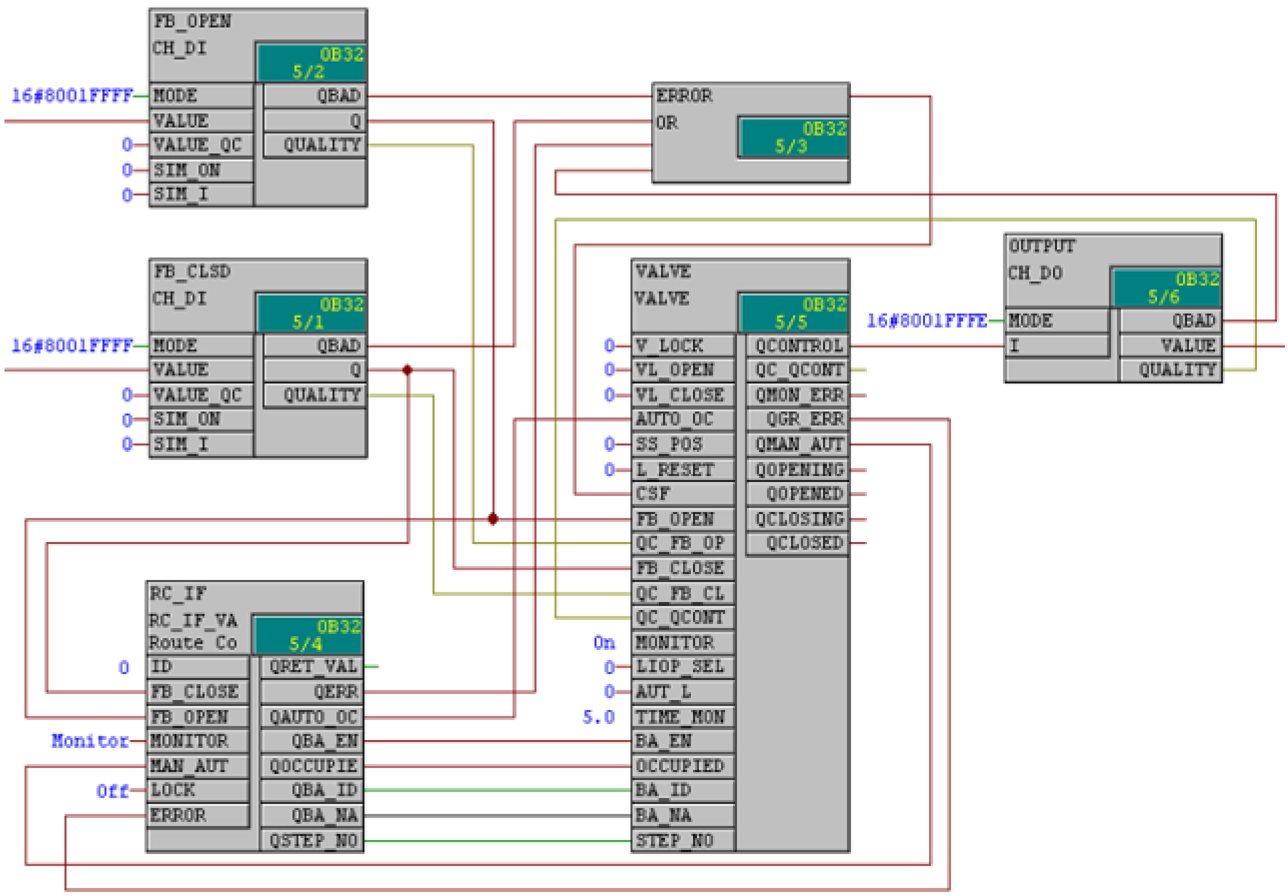


Description of Block

RC_IF_VALVE (FB 826) (Page 131)

9.3.4.8 Guide to CFC valve with dual feedback signals

CFC chart

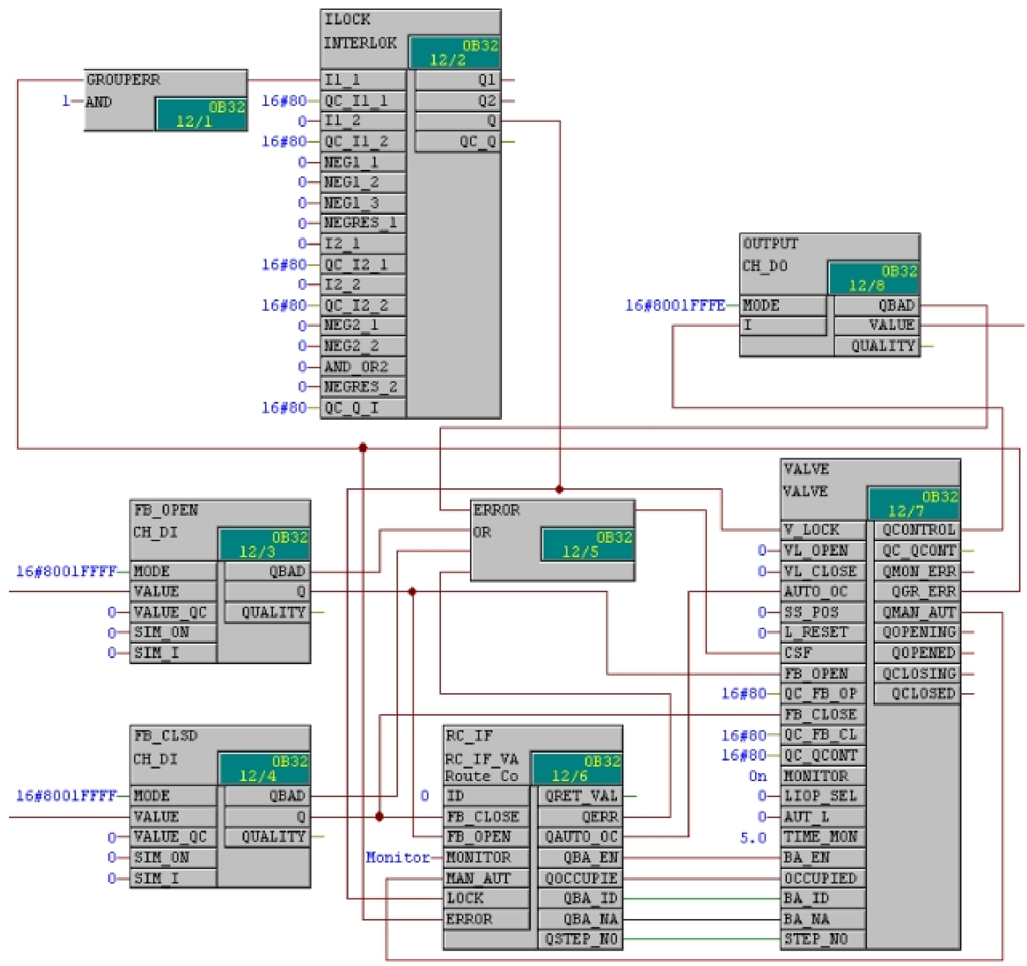


Description of Block

RC_IF_VALVE (FB 826) (Page 131)

9.3.4.9 Guide to CFC valve with interlocking block

CFC chart

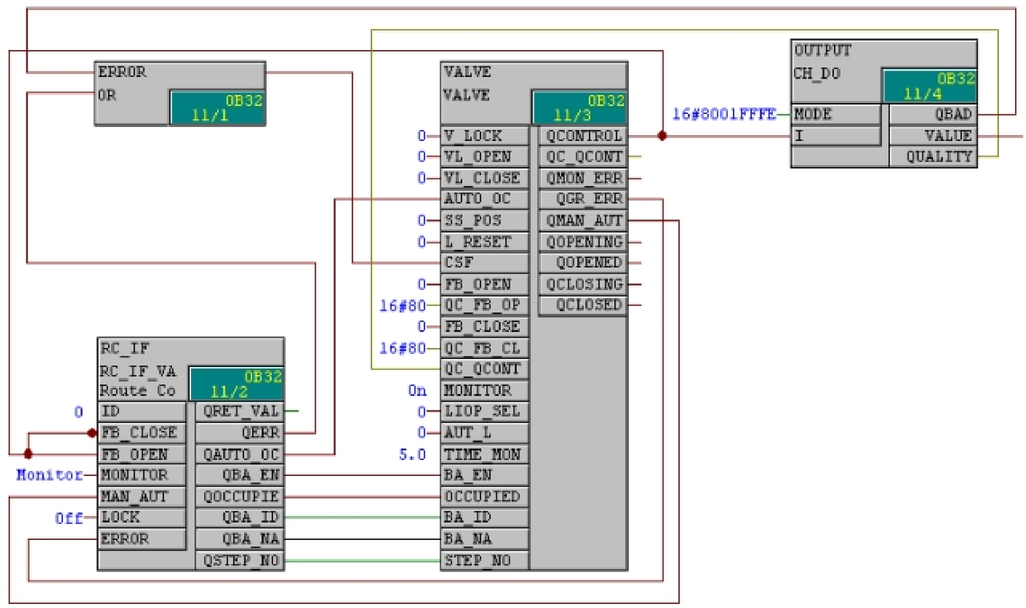


Description of Block

RC_IF_VALVE (FB 826) (Page 131)

9.3.4.10 Guide to CFC valve with no feedback signal

CFC chart

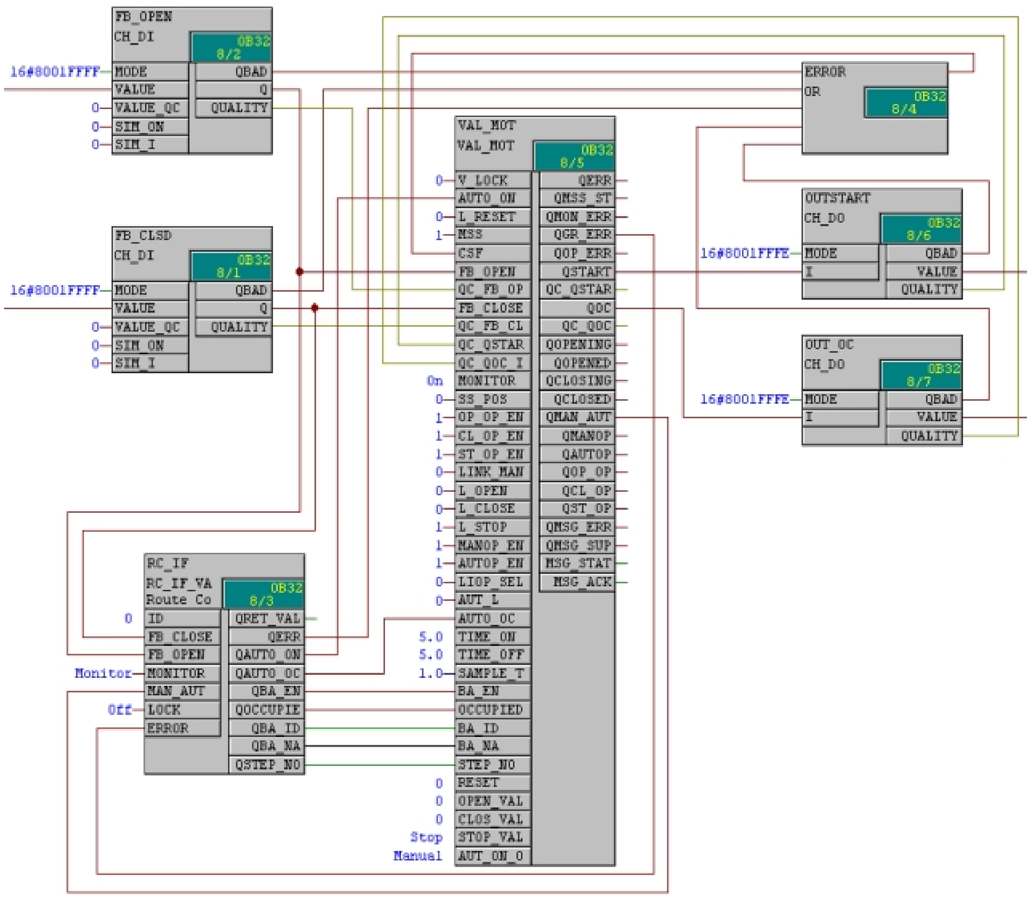


Description of Block

RC_IF_VALVE (FB 826) (Page 131)

9.3.4.11 Guide to CFC motor-actuated valve

CFC chart



Description of Block

RC_IF_VAL_MOT (FB 825) (Page 134)

9.3.4.12 Route Control and the Advanced Process Library (APL)

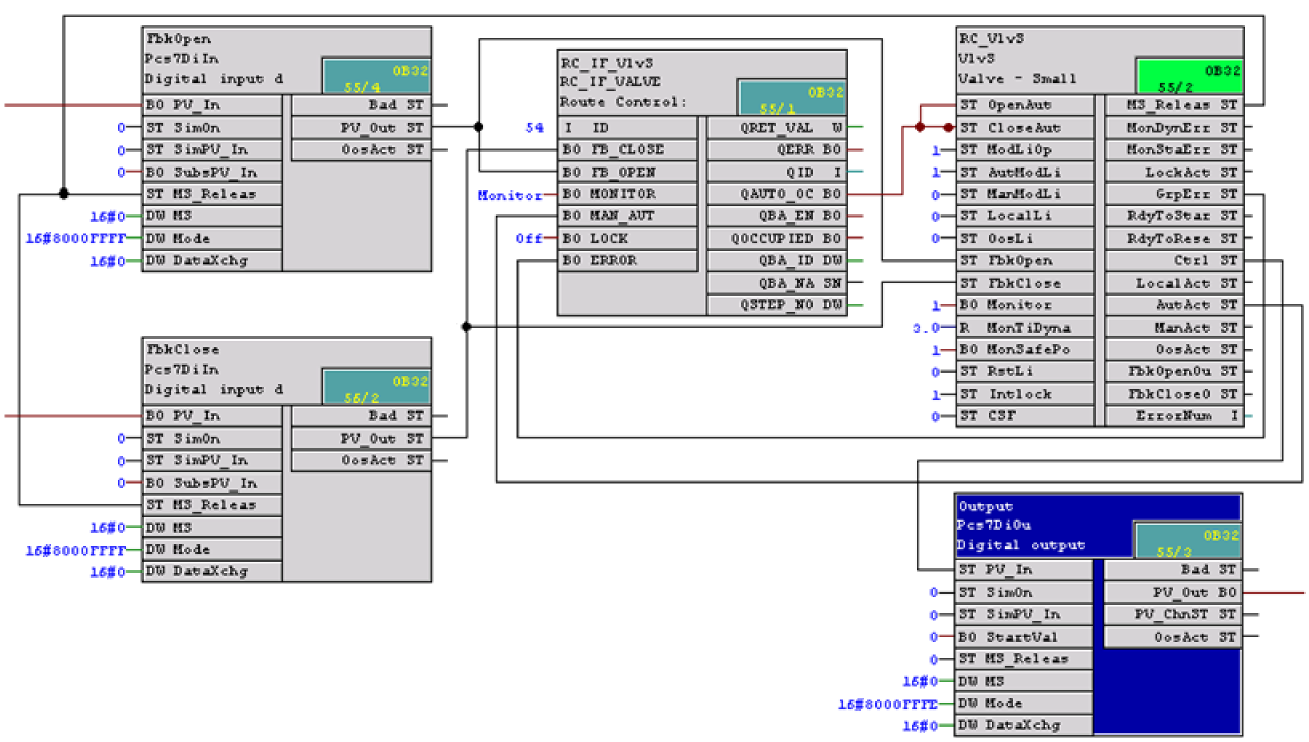
Introduction

Instead of the blocks used in the preceding chapters from the standard library, you can also use block from the APL together with Route Control . Interconnection follows a similar pattern.

Example for the interconnection with the APL block VlvS (Valve-Small)

> **Note**
>
> APL blocks must be executed in **switch mode** (bit "Feature.4":= 1), not in pushbutton mode! (bit "Feature.4":= 0)

CFC chart



Description of Block

RC_IF_VALVE (FB 826) (Page 131)

9.3.5 CFC Sensor Elements

9.3.5.1 Guide to CFC sensor element

User Task

You want to evaluate process-related feedback for a level sensor or conductivity sensor in SIMATIC Route Control.

Overview of Procedure

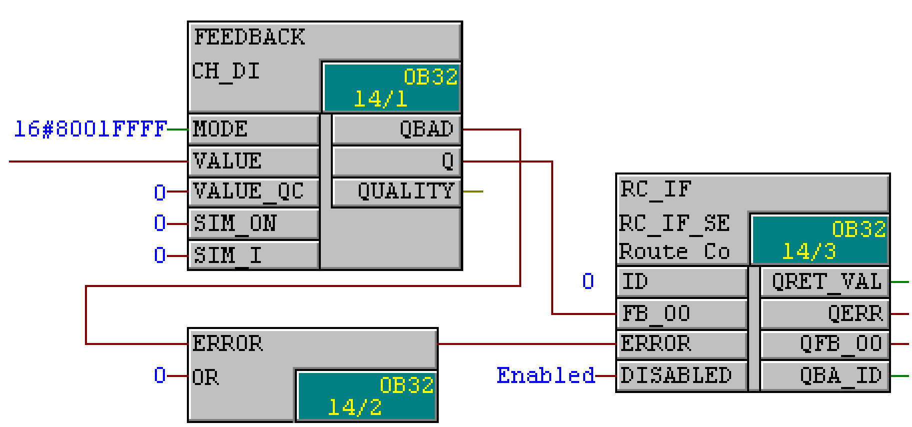
Step	Procedure
1	Placing the corresponding SIMATIC Route Control interface block in the CFC chart
2	Connecting the corresponding inputs and outputs
3	Exporting the elements to the Route Control configuration
4	Configuring partial routes with these elements
5	Evaluating these elements indirectly via a mode level

Examples

- Section "CFC Sensor, Binary" (Page 268)
- Section "CFC Conductivity" (Page 269)

9.3.5.2 Guide to CFC Sensor, Binary

CFC chart

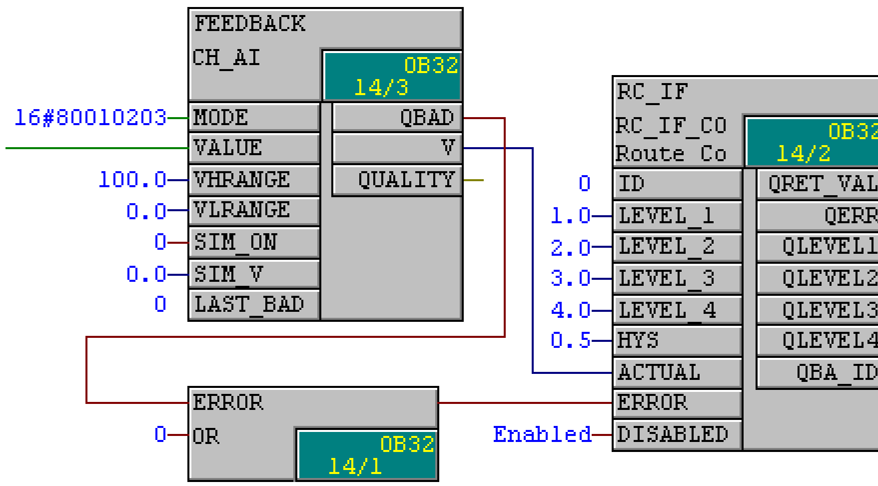


Description of Block

RC_IF_SENSOR (FB 845) (Page 154)

9.3.5.3 Guide to CFC conductivity

CFC chart



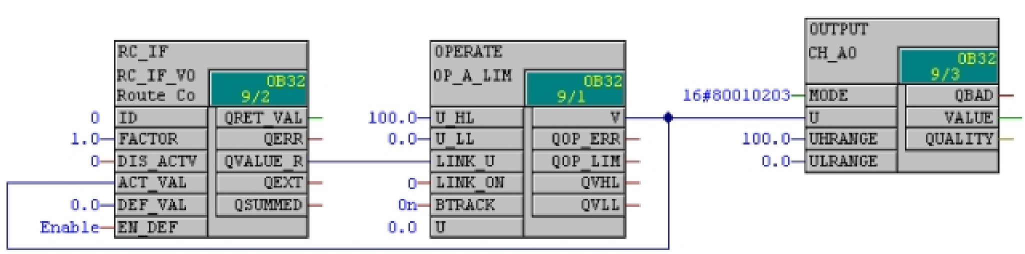
Description of Block

- "RC_IF_CONDUCT (FB 846)" (Page 156)

9.3.6 CFC Parameter Element

9.3.6.1 Guide to CFC parameter element

CFC chart



Description of Blocks

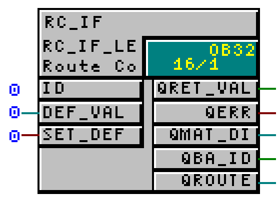
RC_IF_VOLUME (FC 808) (Page 163)

RC_IF_TIMER (FC 809) (Page 164)

9.3.7 CFC Link Element

9.3.7.1 Guide to the CFC link element

CFC chart



Description of Block

RC_IF_LE (FB 828) (Page 166)

9.3.8 REMOTE Elements

9.3.8.1 CFC Charts with REMOTE Elements

Application

REMOTE elements are used where two production areas "come into contact". Each production area belongs to a different S7 project/multiproject and, therefore, to a different Route Control project. From the perspective of a control system, certain elements, such as a valve, are associated with both areas because they act as a link between them.

Note

The remote use of an element V of PCell B is possible only from ONE PCell A.

Additional use from another PCell C could lead to double allocation of the element!

Synchronization between the two Route Control projects is performed for cross-process cell routes. Multiple usage of an element in two or more process cells (local and remote) is therefore not possible.

For synchronization, when a route is requested or started, a check is made as to whether one of the elements (CE, PE, SE) used in this route is already used in a different process cell in a route. In this case, the route is terminated with errors.

Note

The final test of whether remote elements included in the route are available can only occur at the start of the route.
This can result in the the route request being achieved, but the route then being ended because of unavailable elements.

To register the use, occupied identifiers must be stored in the individual element data records. In the case of "concurrent routes" (same FuncID), the occupied identifier is stored as a counter. The maximum values of the counters are limited, which means the number of routes that can be concurrently used by an element is reduced. ("local elements: max. 63 uses, "remote" elements: max. 15 uses)

Note

REMOTE elements are only required for cross-project communication between automation systems.

Please also note the information in
"Configuring Locations" (Page 328).

Basic Principle

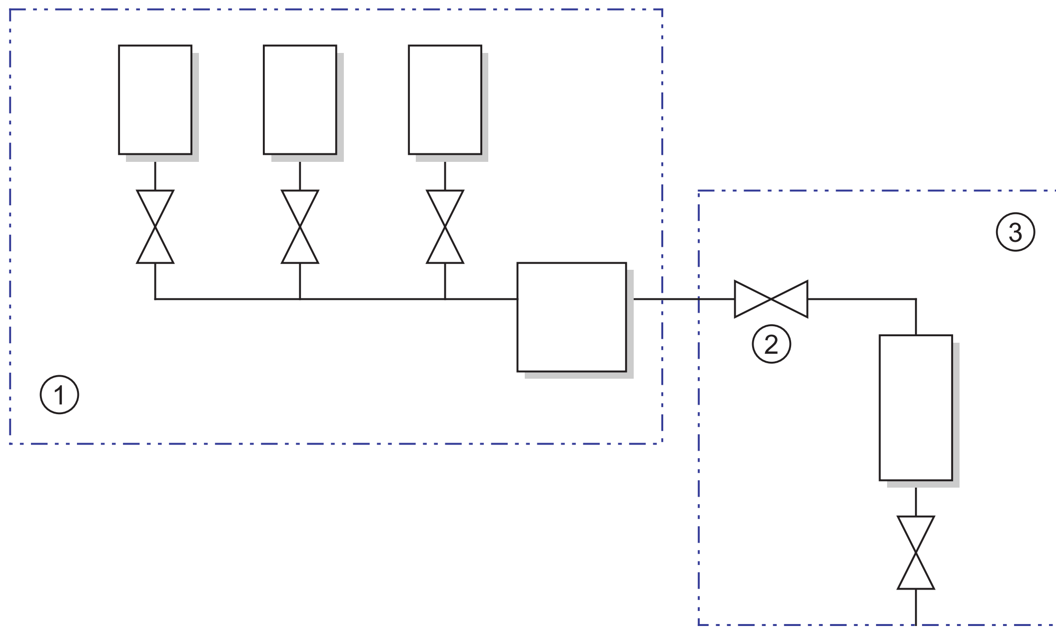
In the example below, Route Control project A contains a REMOTE control element which is designed to activate valve V in an AS of project B.

Note

Because communication via REMOTE elements places a load on cross-coupling (and thus on the entire system), it is only intended for use in a limited number of elements.

Diagram

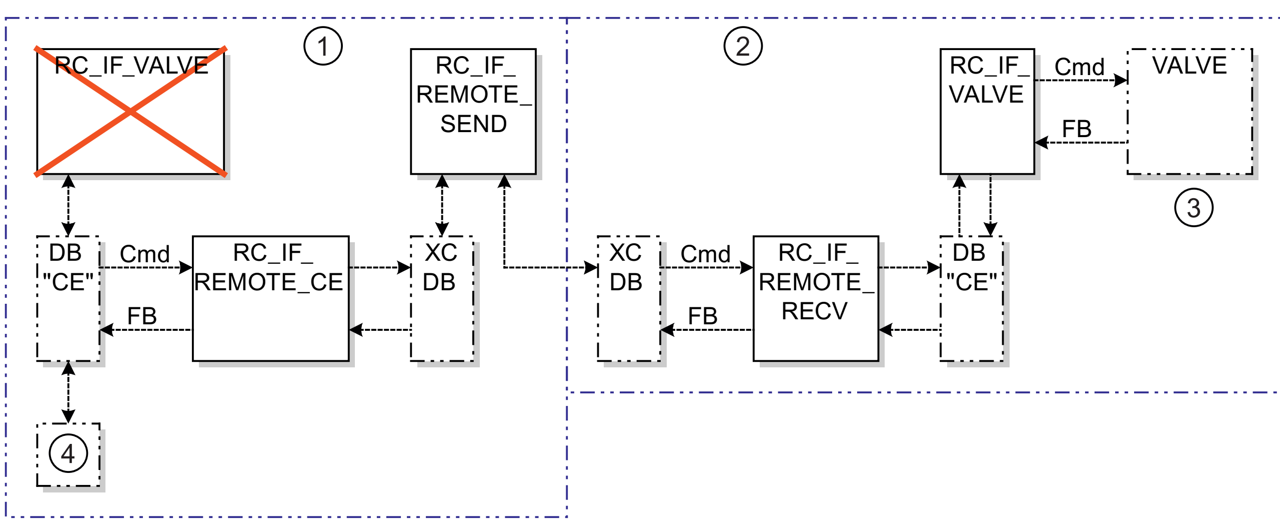
The figure below shows how the example is structured:



1	Route Control project A (master AS)
2	Valve V
3	Route Control project B (slave AS)

Basic Structure of a CFC Chart

The figure below shows the interaction of blocks in the CFC charts:



1	Route Control project A
2	Route Control project B

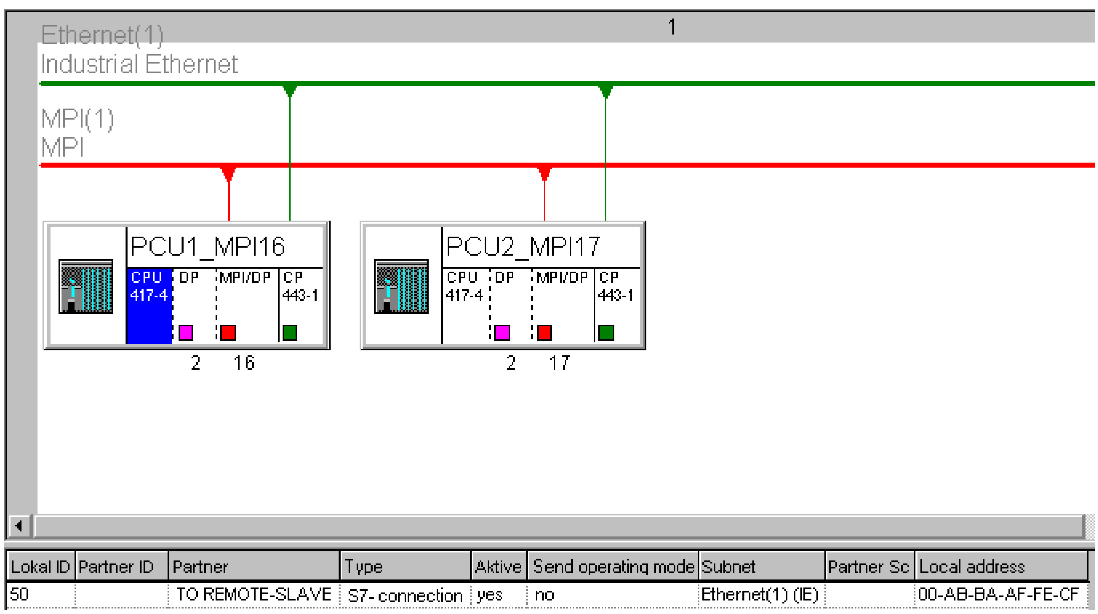
3	Valve V
4	Route

Additional information

- Section "Configuring REMOTE Elements" (Page 274)
- Section "Overview of REMOTE Blocks" (Page 183)

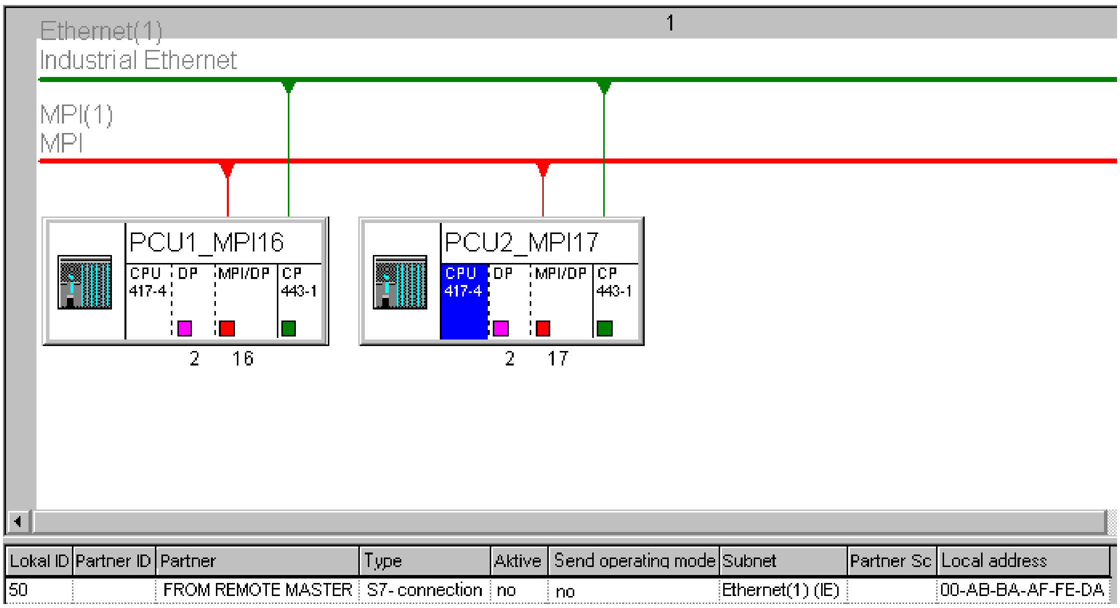
9.3.8.2 S7 connection of a local AS in NetPro

Example of an S7 Connection in the Local AS



9.3.8.3 S7 connection for a peer AS in NetPro

Example of an S7 Connection in the Peer AS



9.3.8.4 Configuring REMOTE Elements

Definitions

The AS containing the element to be activated is referred to below as a slave AS or peer AS.

The AS that wants to activate this element is referred to as a master AS or local AS.

Requirements

A valve is to be activated as an example.

The appropriate interface block, in this case the RC_IF_VALVE control element, is inserted in the slave AS and interconnected to the valve.

The element ID of the interface block is known.
It was either configured as a fixed ID or assigned by the wizard.

Notes on configuration

When configuring the connections, bear in mind the following:

- "Active connection establishment" is selected for only **one** of the connections.
- The local IDs are identical in both projects.

- The partner address and connection resource (TSAP) are entered under the address details.
- Identical S7 subnet IDs ("Ethernet" properties) are set in both projects.

Overview of the procedure

Step	Procedure
1	Establish the NetPro connections.
2	Insert an RC_IF_REMOTE_RECV block in the CFC chart of the slave AS.
3	Configure the CON_ID, SNDRCVDB block inputs
4	Insert an RC_IF_REMOTE_SEND block in the CFC chart of the master AS.
5	Configure the CON_ID, SNDRCVDB block inputs Use the same values as at the receive block in the slave AS.
6	Insert an RC_IF_REMOTE block in the CFC chart of the master AS In the example: RC_IF_REMOTE_CE
7	Configure the REM_CE, SNDRCVDB, ALT_VAL, TypeName block inputs.
8	During runtime: Set NEW_GEN to 1 at the send block in the master AS.
9	Control the route.

When configuring the blocks in the CFC charts, position all blocks participating in remote processing on the same sequence level. The blocks RC_IF_REMOTE_SEND (FB831) and RC_IF_REMOTE_RECV (FB833) and the element proxy blocks RC_IF_REMOTE_CE/_PE/_SE are affected.

Use the sequence level of the OB35 with a speed of 100ms to achieve short response times when remote elements are requested.

In the event of data transfer errors, error messages are output at the STATUS outputs of the blocks RC_IF_REMOTE_SEND (FB831) and RC_IF_REMOTE_RECV (FB833). These may originate directly from the system blocks BSEND/BRCV used for data transfer. Their meaning can be found in the description of these blocks.

NetPro

In NetPro, establish an unspecified connection to the MAC address of the peer AS and, in turn, an unspecified connection to the local AS with the same connection ID in the peer AS.

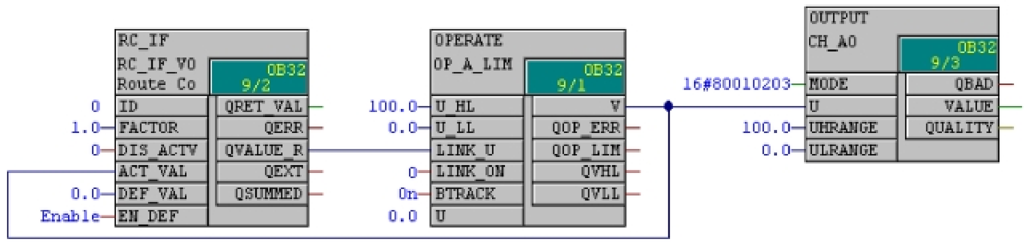
You can find additional information about the local AS in
"S7 Connection of a Local AS in NetPro" (Page 273)

You can find additional information about the peer AS in
"S7 Connection of a Peer AS in NetPro" (Page 274)

Note

In addition, check the address details of the connections in NetPro.
Use the same connection resources.

An example is given in the figure below:



Procedure for Configuring the Slave AS

1. Insert an RC_IF_REMOTE_RECV block in a CFC chart in the slave AS. One of these blocks is required for each logical connection to a master AS from which elements are to be referenced.
2. Configure the connection ID which specifies the connection to the master AS at the CON_ID input. You can see the connection ID in NetPro.
   You also need this ID for configuring the associated send block in the master AS.
3. Configure the number of the data block which is to be used for data transfer at the SNDRCVDB input.
   You also need this number for configurations in the master AS.
   You will find information on valid ID numbers in
   "Valid SNDRCVDB block numbers for remote elements" (Page 606).
4. No additional configurations are required on the actual element, in the example RC_IF_VALVE.
   For configuration of the REM_CE input in the master AS you only need the element ID of this block.
   This ID has either been configured as a fixed ID or assigned by the wizard.

Procedure for Configuring the Master AS

1. Insert an RC_IF_REMOTE_SEND block in a CFC chart in the master AS. One of these blocks is required for each logical connection to a slave AS in which elements are to be referenced.
2. Configure the connection ID which specifies the connection to the slave AS at the CON_ID input.
   Specify the same ID as at the associated receive block of the slave AS.
3. Configure the number of the data block to be used for data transfer at the SNDRCVDB input.
   Specify the same number as at the associated receive block of the slave AS.
4. Insert the appropriate REMOTE interface block.
   In the example, the remote element RC_IF_VALVE is a control element (CE).
   For this reason you should use RC_IF_REMOTE_CE.
5. Configure the local ID of the block at the LOC_CE input.
   If you leave the value 0 unchanged, the wizard will assign an ID.
6. Configure the ID of the removed interface block at the REM_CE input.
   In the example, this is the ID of the block RC_IF_VALVE in the slave AS.

7. At the SNDRCVDB input, configure the same DB number as at the send block.
8. Configure the alternate value that is to be used if communication is interrupted at the ALT_VAL input.
9. Configure the subtype of the removed element at the TypeName input, in the example: 'VALVE'

Note

Use the RC_IF_REMOTE_SE block to activate a sensor element and the RC_IF_REMOTE_PE block to activate a parameter element.

The inputs for the local and remote element IDs are LOC_SE and REM_SE for the sensor element and LOC_PE and REM_PE for the parameter element.

Special points to consider when configuring remote connections

With cross-process cell routes, a route may occasionally be rejected with the message "Element(s) or partial route(s) already being used", although none of the elements to be used are being used in a different route.

With remote elements, the information whether an element is assigned or not must be requested and received from the remote process cell via a coupling. If the requesting partner does not receive a response within a certain amount of time, this **also** results in the above-mentioned message as, due to the missing information, **no** statement can be made about the assignment of the element(s). This behavior can occur more or less frequently on account of the different loading of the coupling path.

This behavior can be improved by increasing the input parameter SND_TIME at the send block RC_IF_REMOTE_SEND of the respective coupling path. This approach also increases the time for the response. The disadvantage of this solution is that the data throughput between the remote partners is reduced due to the longer send interval.

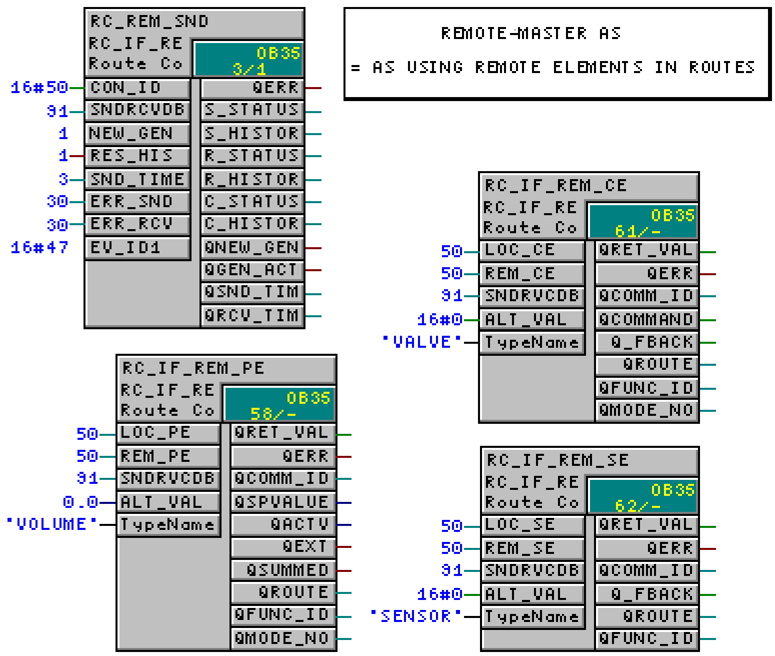
Additional information

- You can find information about the REMOTE blocks in the section "Overview of REMOTE blocks" (Page 183).
- You can find information about the CFC charts in the slave AS in "REMOTE elements in the CFC chart of a peer AS" (Page 279).
- You can find information about the CFC charts in the master AS in "REMOTE elements in the CFC chart of a local AS" (Page 278).

9.3.8.5 REMOTE elements in the CFC chart of a local AS

CFC chart

The element blocks in the local AS serve as proxies for elements in the other automation system.

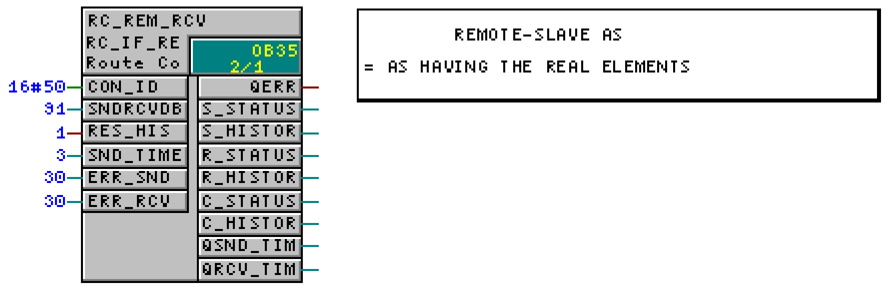


Description of Blocks

- RC_IF_REMOTE_SEND (FB 831) (Page 193)
- RC_IF_REMOTE_CE (FB 821) (Page 185)
- RC_IF_REMOTE_SE (FB 842) (Page 187)
- RC_IF_REMOTE_PE (FB 843) (Page 190)

9.3.8.6 REMOTE elements in the CFC chart of a peer AS

CFC chart



Description of Block

- RC_IF_REMOTE_RECV (FB 833) (Page 196)

9.3.9 Route Control SFC

9.3.9.1 SFC overview

Overview

The Route Control library contains the RC_IF_SFC SFC block as a sample for activating the RC_IF_ROUTE route block.

You can find a brief overview of how to insert the SFC block in:

- "SFC Block Schematic" (Page 280)

Overview of Procedure

Follow the steps below to adapt the sample SFC to your requirements and use it in your own project:

Step	Procedure
1	Copy the sample SFC from the Route Control library to your own S7 project.
2	Modify this copy in accordance with your requirements, thereby creating a user-specific sample SFC.
3	Create as many copies of the user-specific sample SFC as you need (in general, one SFC per RC_IF_ROUTE).
4	Interconnect this SFC instance to the RC_IF_ROUTE blocks in the individual CFC charts.

Note

If an SFC package is not installed on the computer and you open the Route Control library, an error message will appear.

Reason: This is because the Route Control library contains an SFC block (SFC Typical).

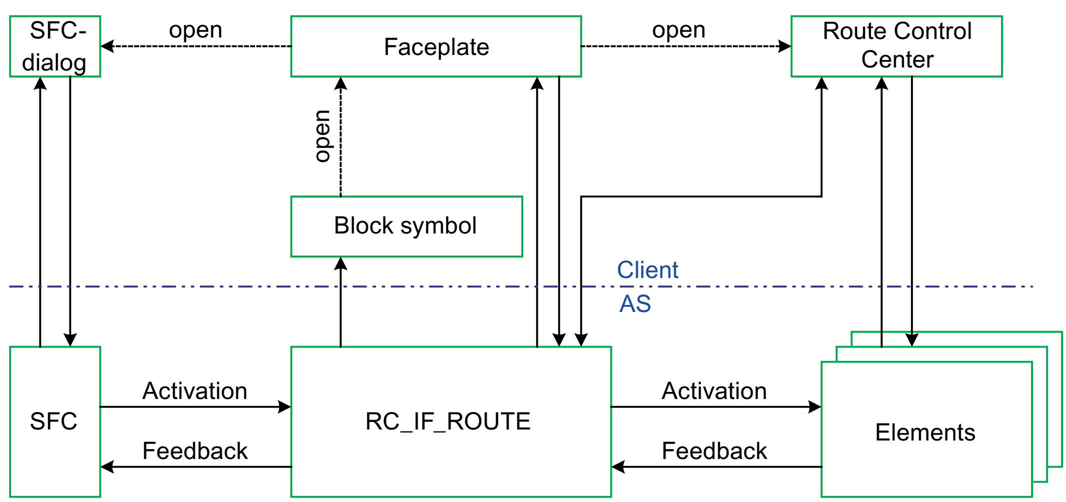
An overview of the relationship between SFC, route and faceplates in "Relationship of SFC and Route with Operator Dialogs" (Page 280).

The SFC block provided with the Route Control library is a sample that you have to copy and adapt according to your requirements. If these mode levels are not used for the material transport, steps to activate mode levels (or stepping conditions that request values) should be removed from the chains.

9.3.9.2 Relationship of SFC and route with operator dialogs

Data Flow

The figure below illustrates the relationship between an SFC block, a route block and the operator and display dialog boxes.

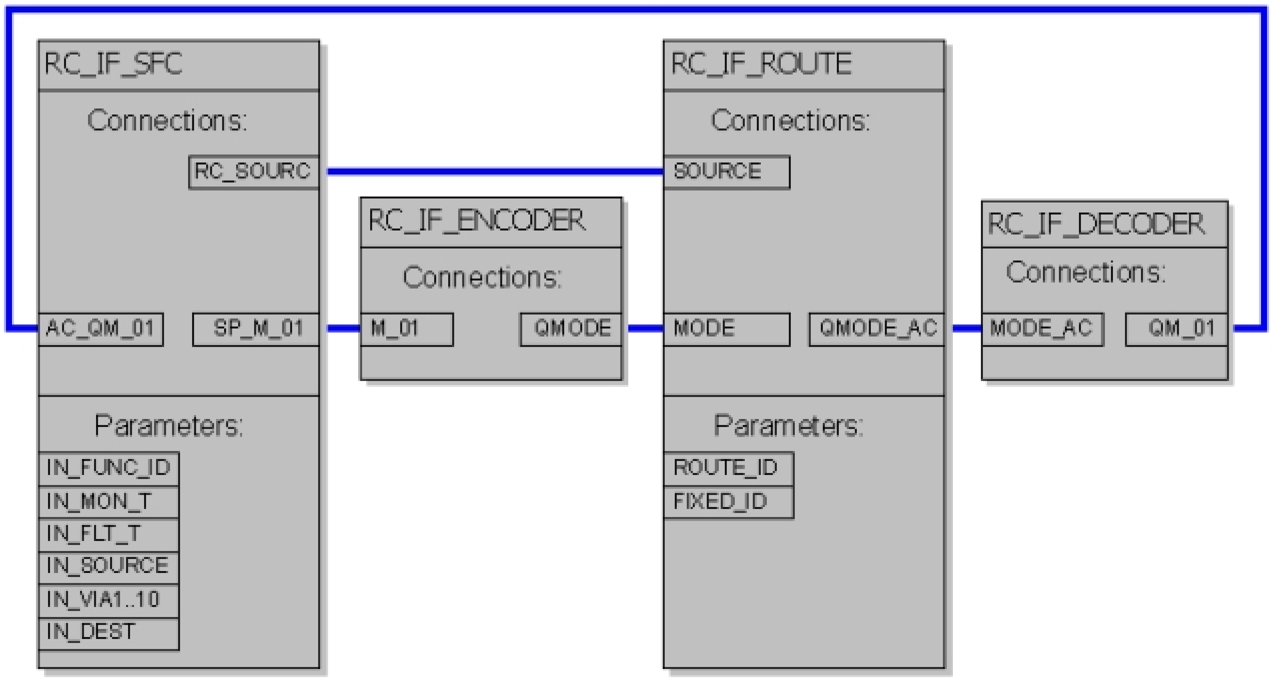


9.3.9.3 SFC block schematic

SFC Block Schematic

The SFC block is used to activate a route.

The figure below shows the principle SFC block connections along with the RC_IF_ENCODER and RC_IF_DECODER auxiliary blocks. The complete interconnection is generated automatically by the SFC dialog box as soon as you have configured the necessary connections in CFC.



Additional information

- Section "Full Interconnection of the SFC Block" (Page 284)

9.3.9.4 S88 status

S88 Status

S88 statuses can be seen as individual tabs in the SFC block:

You can find the status transition diagram in "Route Status" (Page 480).

Note

with respect to the route, the STOPPING, ABORTING and COMPLETING statuses are handled in the same way by the SFC. In each case, the route is terminated.

9.3.9.5 Start conditions for HOLDING in SFC

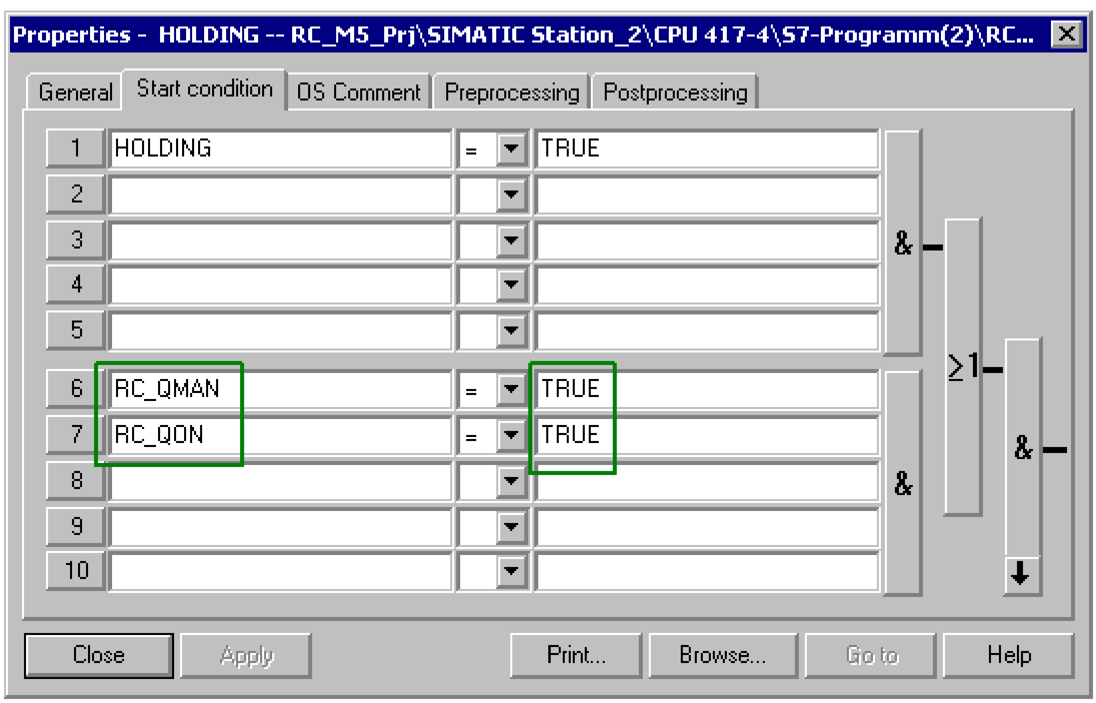
Problem

A route can be switched to manual mode through the Route Control Center. In this mode, the automatic mode signals from the SFC block are no longer evaluated until the user switches back to automatic mode.

The automatic mode (SFC) would remain in the **RUNNING** status, however, which would result in an error. For this reason, Route Control offers the option of switching to Holding status in such a case.

Functionality

- The HOLDING branch of the SFC block evaluates the two signals RC_QMAN and RC_QON.
  RC_QMAN means that the route is being controlled manually.
  RC_QON indicates that the route is actually running.
  The SFC switches to HOLDING whenever a running route is controlled manually.
- The HOLDING register must be positioned to the left of the RUNNING register so that it has a higher priority and can take over from the RUNNING branch.



9.3.9.6 SFC mode levels

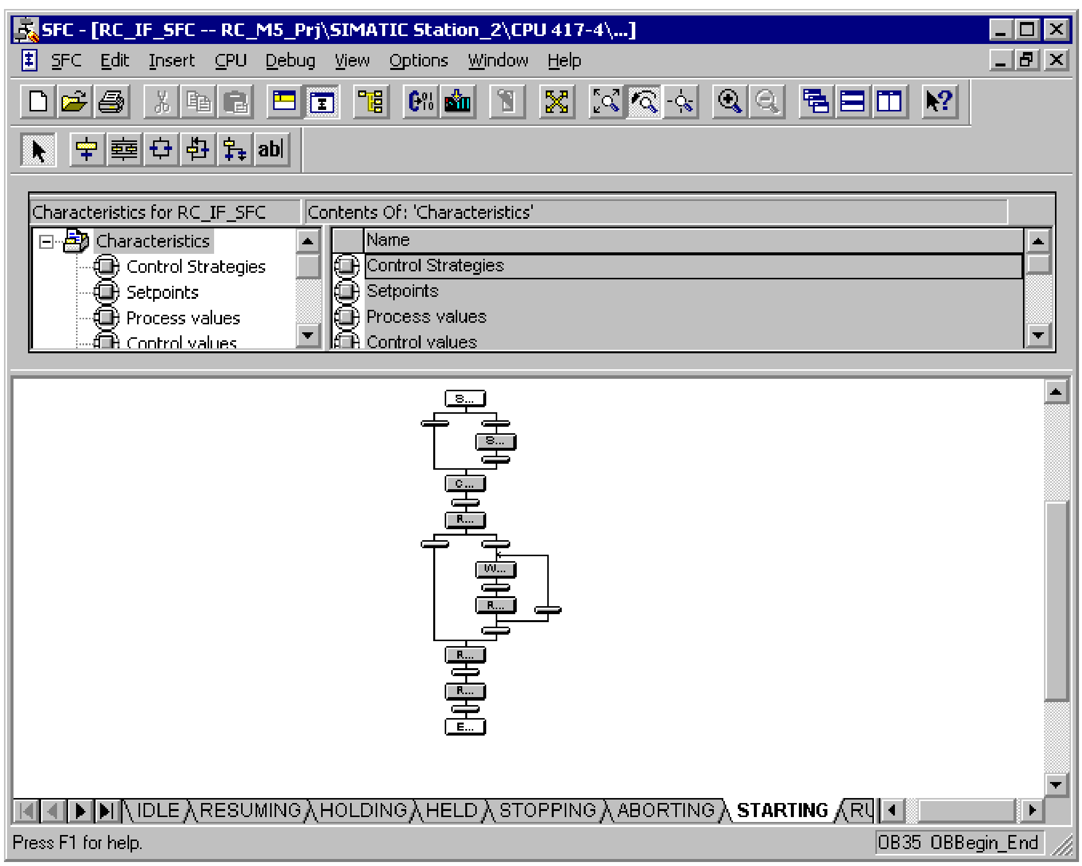
Mode levels

The mode levels for material transports must be synchronized for the following blocks:

- SFC block that activates the route (program in the SFC)
- SFC block and route block (interconnection in CFC)
- Mode table and mode levels in the Route Control Engineering project

9.3.9.7 SFC editor

SFC editor



9.3.9.8 Full Interconnection of the SFC block

SFC Interconnection

You can find the full interconnection of the RC_IF_SFC SFC block in the ROUTE_SFC sample chart in the Route Control library (RC Library) templates.

9.3.10 Dynamic ID Assignment

9.3.10.1 Guide to Dynamic ID Assignment

Introduction

In Route Control, a maximum of 300 routes can be started simultaneously. If you want to insert more than 300 RC_IF_ROUTE route blocks in your project, the number of available route IDs will not suffice. You do not have to permanently assign the route IDs. The dynamic ID assignment procedure was developed to deal with this situation.

You can always start a route with a fixed route ID.
A route with a dynamic route ID can only be started if a dynamic ID is available in the pool of the AS in which this route is inserted.

User Task

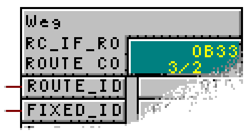
You want to configure the route blocks and specify the fixed and dynamic route IDs for each AS and transfer them to the Route Control project.

Overview of Procedure

Step	Procedure
1	Specify the number and values of route IDs that are to form the pool of dynamic route IDs in each AS.
2	Specify the number of route blocks in each AS that are also to be provided with dynamic route IDs from the pool.
3	Specify the route blocks with fixed route IDs in each AS.
4	Insert and configure the route blocks.
5	Transfer the routes and route IDs to the Route Control configuration using the Route Control Wizard.
6	Download the automation systems.
7	Download and activate the Route Control servers.

Step	Procedure
8	Start a route with a dynamic route ID. The AS in question finds an available ID from its pool and writes it to the ROUTE_ID input of the route block. The route is controlled like a fixed ID.
9	Ending the route The reserved ID is enabled again.

Configuring the ROUTE_ID and FIXED_ID Inputs



The following combinations of values are available and permissible:

#	ROUTE_ID	FIXED_ID	Meaning
A	1 ... 300	0	When it is started, this route receives a dynamic route ID taken from its AS pool. The route ID configured at this block is added to the pool of dynamic route IDs in a separate AS. This route can receive another ID during runtime.
B	0	0	When it is started, this route receives a dynamic route ID taken from its AS pool. Since the route ID 0 is configured at this block, no other ID is added to the pool by this block.
C	1 ... 300	1	This route has a fixed route ID.
D	0	1	The wizard assigns a fixed route ID to this route. **Notice**: If the wizard does not find any available route IDs when processing a block configured in this way, it configures the block in question as in scenario B!

Note

Never configure all route blocks in an AS as in scenario B, because the pool of dynamic IDs in this AS would then have no IDs.
This would mean that it would never be possible to start a route with a dynamic ID in this AS. You should, therefore, configure a sufficient number of route blocks as in scenario A in each AS in which you wish to use dynamic IDs.

The wizard checks whether IDs have been assigned more than once.

Route IDs do not have to be configured consecutively.

If you have fewer than 300 route blocks in your Route Control project, you can simplify the configuration process by configuring all route blocks as in scenario D.

Additional information

- Section "Example for Dynamic ID Assignment" (Page 286)

Learning Objectives Check List

- You are familiar with the concept of dynamic ID assignment and how it differs from fixed ID assignment.
- You know the necessary steps for configuration.
- You know how the ID is determined during runtime.

9.3.10.2 Example for Dynamic ID Assignment

Purpose

In this example, you wish to insert a total of 310 route blocks in your Route Control project.
It must be possible to activate 290 of these routes simultaneously at any time.
The remaining 20 blocks are inserted in the same AS.
They are to share the 10 available route IDs remaining.

How do the inputs of the RC_IF_ROUTE route blocks have to be configured?

Solution

Input	Block no. 1 to 290	Block no. 291 to 300	Block no. 301 to 310
ROUTE_ID	1 ... 290	291 ... 300	0
FIXED_ID	1	0	0

Explanation

The first 290 blocks receive fixed route IDs.

IDs 291 to 300 form the pool of dynamic IDs in the AS in which the remaining 20 blocks are inserted.

The 20 routes 291 to 310 share the 10 dynamic IDs 291 to 300.

A maximum of 10 such routes may run simultaneously.

Configuration Check List

1. You have specified the relevant automation systems for Route Control.
2. You know the maximum number of material transports that can take place simultaneously during runtime.
3. You have allocated material transports to automation systems, for example, to ensure an even load.

4. You have defined which routes are to run with fixed IDs and which with dynamic IDs.
   Note:
   We recommend assigning a fixed IDs to routes running simultaneously. Routes that do not take place simultaneously may share an ID. Shared IDs are not necessary if sufficient IDs are available for fixed assignment.
5. You have inserted RC_IF_ROUTE blocks in CFC charts and have assigned the appropriate ROUTE_ID or FIXED_ID input parameters.
6. You have used the Route Control Wizard to transfer the IDs, ranges and AS assignment to the Route Control project.
7. These specifications are downloaded from the Route Control server to the AS during runtime. The AS can then use this information to search for an available ID.

9.4 Route Control Wizard

9.4.1 Guide to the Route Control Wizard

Requirement

- You want to configure the AS-AS and AS-server connection data relevant for Route Control.
- You want to simplify project engineering in the following ways:
  - Element IDs that have not yet been configured (=0) are to be assigned automatically
  - Element IDs that have already been configured (<>0) are to be checked for validity and corrected, if necessary
  - Elements that have already been configured in the CFC charts are to be transferred to Route Control Engineering
- The plant hierarchy from the S7 project must also be available in the Route Control project.
- The locations configured in SIMATIC Manager should be transferred to Route Control Engineering.
- The routes (ID + dynamic/fixed property) must also be checked and transferred to the Route Control project.
- The message server (PCS 7 OS) that is to receive messages during runtime from the Route Control server(s) must be specified.

Overview of the Procedure

The Route Control Wizard helps you specifically with these tasks by providing appropriate user interfaces and selection dialog boxes. It guides you through a number of dialog boxes, in which you can make the relevant settings, corrections, and selections.

Start the Route Control Wizard in SIMATIC Manager by selecting the menu command **Options > SIMATIC > Route Control > Wizard**.
You can perform the following tasks here:

#	Task
1	Check and automatically correct element IDs. If this is not possible, you can/must correct the ID manually.
2	Select the connection data and provide parameter inputs to the instances of block type RC_IF_CFG (central configuration of a Route Control AS).
3	Select and transfer the Route Control server properties to the Route Control project.
4	Select and transfer elements from the CFC charts of the S7 project to the Route Control project.
5	Transfer route instances (RC_IF_ROUTE block) and, if available, route IDs to the Route Control project.
6	Transfer the plant hierarchy.
7	Transfer the locations.

Example Route Control Wizard Dialogs

You can find the individual steps with the corresponding Route Control Wizard dialog boxes in the section
"Selecting Actions". (Page 348)

Project Engineering Checklist

1. You have followed the Route Control Wizard instructions and dialog boxes and have selected the objects to be checked and exported.
2. The wizard has suggested different IDs for elements or routes.
   If you have not made any changes, these IDs will be applied.
3. You have selected a message server.
   Route Control messages will be created in this PCS 7 OS.
4. Elements that are selected will be exported automatically.
5. You have received a log providing information about the actions previously selected by you and performed by the wizard, and information about their results.

Additional Information

- Section "Transferring from an S7 Project" (Page 85)

9.4.2 Guide to exporting an S7 project

User Task

Data and objects already contained in an S7 project are to be transferred to the Route Control project. Duplicate configuration and inconsistent data are to be prevented.

Overview of Procedure

You can find the dialog boxes relating to the individual Route Control Wizard steps in "Actions in the Route Control Wizard" (Page 346)

Configuration Check List

1. Prepare the hardware (automation system in HW Config and PCS 7 OS).
2. Prepare (plant hierarchy, insertion, block configuration) the CFC charts: routes and elements.
3. Configuring the locations
4. Call and run the Route Control Wizard and select the options.
5. Perform the selected actions.
6. Check the results (in the log files).

9.4.3 Guide to exporting linking configuration from NetPro

Requirement

You want to have the communication links between automation systems, in which Route Control blocks are operating, configured automatically (assignment of communication IDs).

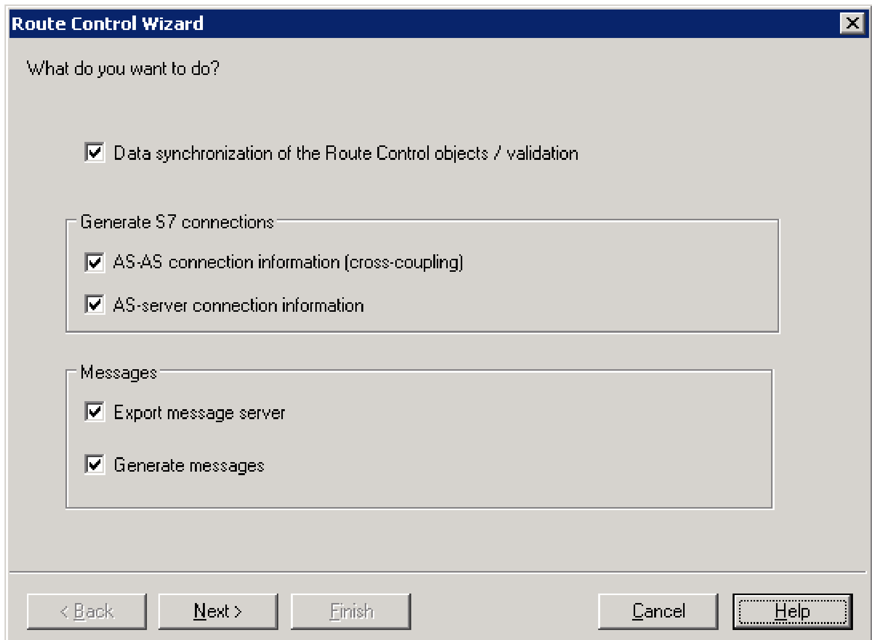
Overview of the procedure

If an AS relevant to Route Control has been added to or removed from the S7 project, proceed as follows:

Step	Procedure
1	Start the Route Control Wizard in SIMATIC Manager by selecting the menu command **Options > SIMATIC > Route Control > Wizard**.
2	Assign or correct the communication IDs (modified NetPro settings).
3	Export from the S7 project and import to the Route Control Engineering project.
4	Download the database to the Route Control server and restart the server The new IDs are made known to the instances that use these IDs.
5	Download the connections from NetPro to the automation system.
6	Restart the AS A restart always has to be performed when changes are made to the NetPro settings.

Example

1. Start the Route Control Wizard.
2. In the selection dialog box, select item "Generate S7 connections\Cross-coupling data exchange" if you have added new automation systems to or removed them from your S7 project. Otherwise, clear this selection.



Note

If only the properties of an AS, for example, a MAC or TCP/IP address, are changed, the S7 connections do not have to be regenerated. Do not make this selection in the Route Control Wizard until the next synchronization.

The MAC or TCP/IP address is transferred to Route Control Engineering using the "Data synchronization of RC objects" action.

Project Engineering Checklist

1. Check to determine whether the cross-coupling connections need to be exported.
2. Add or remove an automation system.
3. Set up the properties, such as the MAC or TCP/IP address, for automation systems that have been added.
4. Call the Route Control Wizard.
5. Select the "Data synchronization of RC objects" action and also, if necessary, "Generate S7 connections\Cross-coupling data exchange".

9.5 Route Control Engineering

9.5.1 Guide to Route Control Engineering

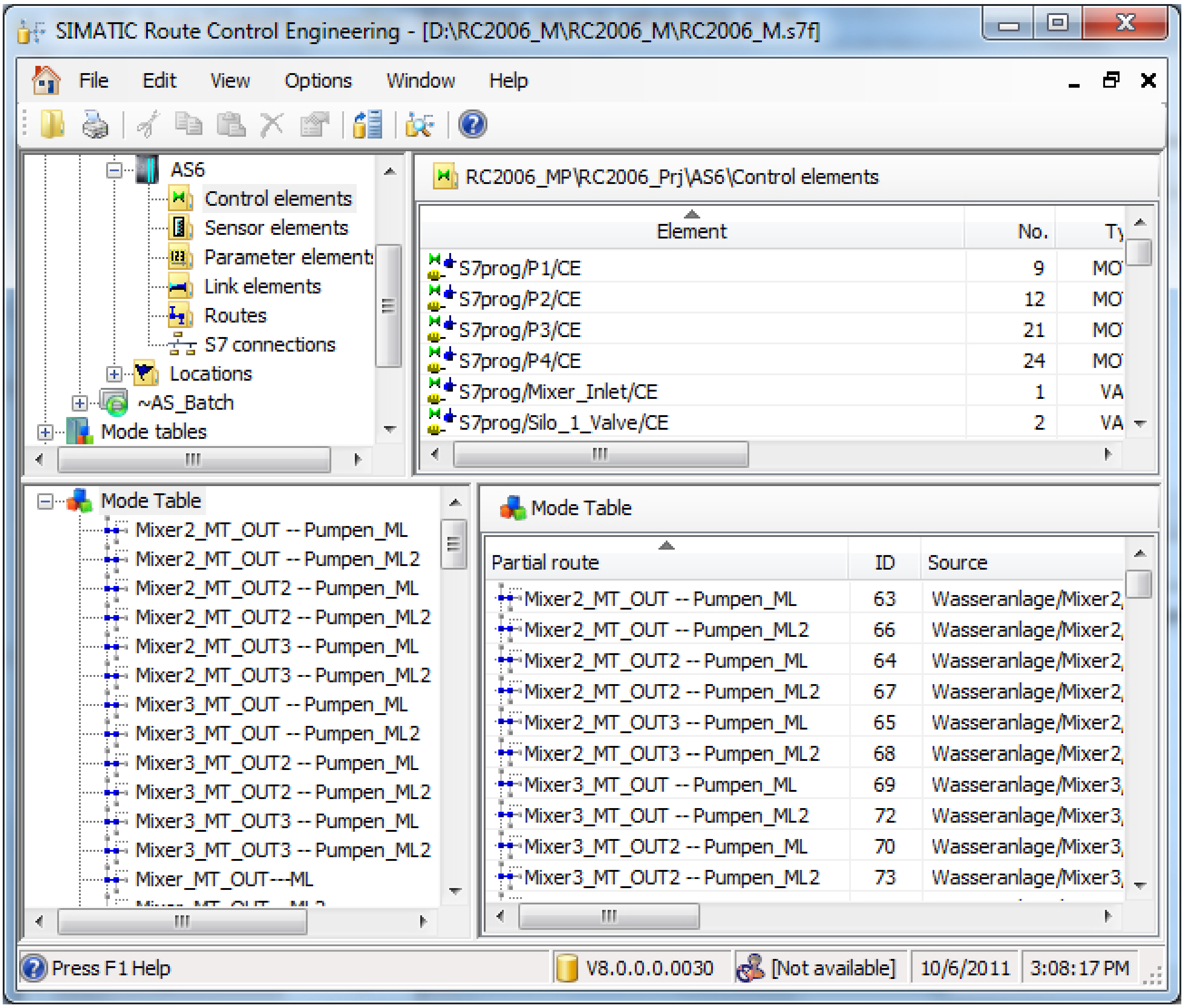
User Task

You wish to obtain an overview of the Route Control configuration environment.

Overview of Procedure

Step	Procedure
1	Start Route Control Engineering using one of the options below: • In SIMATIC Manager, select the menu command **Options > SIMATIC Route Control > Engineering**. • In SIMATIC Manager, double-click the Route Control object in the project folder. • Select the menu command **Start > SIMATIC > ROUTE CONTROL > Engineering** from the Windows start menu. Use the menu command **File > Open** to select an S7 project.
2	Configure the following objects: • Mode tables A mode table is a group of mode levels, to which elements interconnected to partial routes can be assigned. • Partial routes with an indication of their beginning and end (locations) and assignment of elements • Materials, material groups, and permitted material sequences

Example



The upper area contains the process-cell objects and the elements that you interconnect in partial routes. The lower area displays the mode tables, partial routes and inserted elements.

Learning Objectives Check List

- You are familiar with the tasks that you must perform in a Route Control project.
- You know which data you can transfer from an S7 project.

9.5.2 Guide to the offline route search

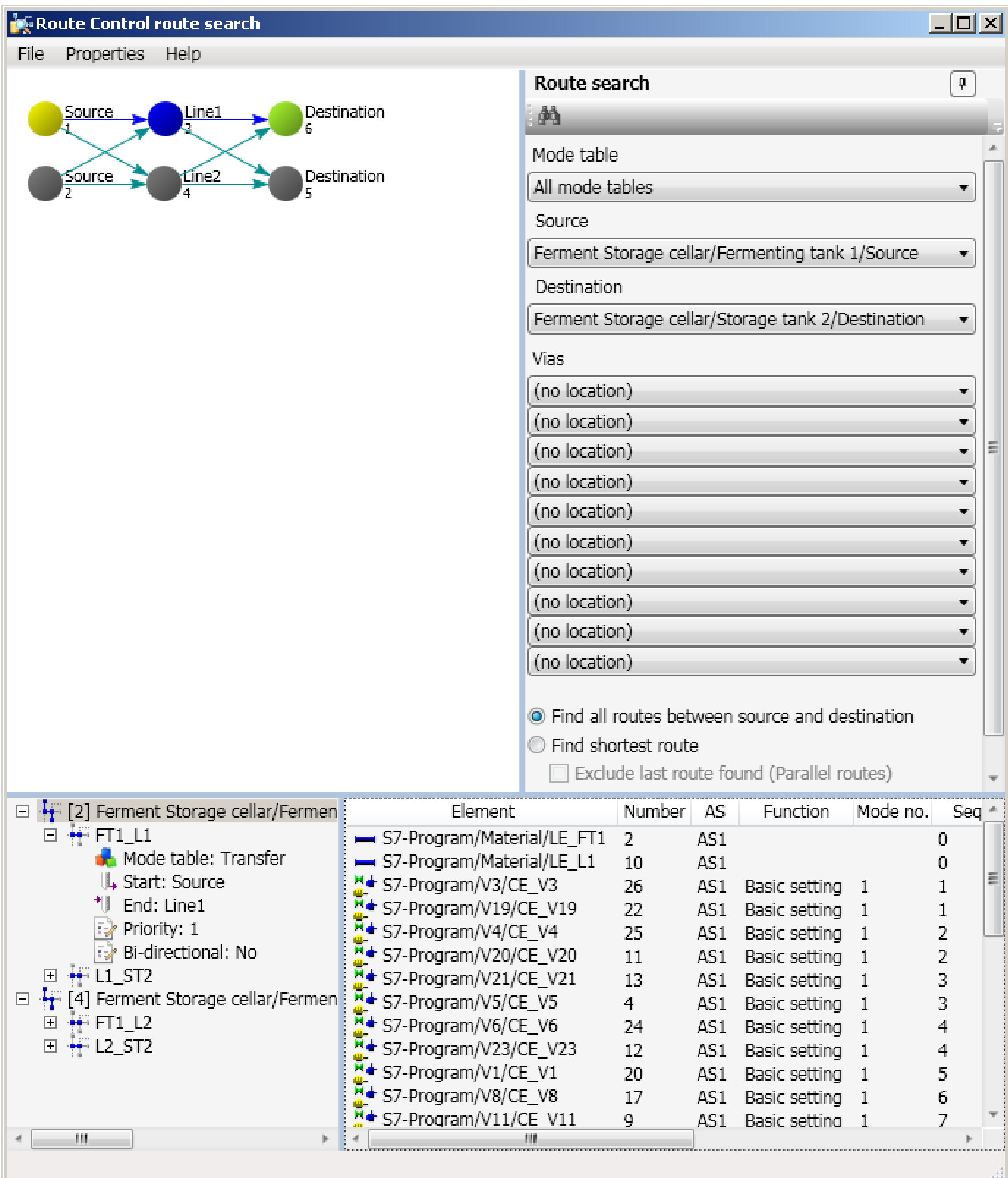
Requirement

You have configured your network into partial routes and want to check the route network for correctness before downloading it onto the Route Control server (and thus enabling it).

Basic Procedure

1. In Route Control Engineering, select the menu command **Options > Verify Route** or click:

The "Route Verification" dialog box opens.



2. Select the search parameters
   Mode table, source, destination and a maximum of 10 vias.

3. Select the type of search.
   – Search shortest route.
     Vias are searched in the order in which they are specified. The priorities of the partial routes are considered in the search
     With this type of search, the last route found can be excluded. In this case, all locations apart from source, destination, vias and the partial routes involved are blocked. The next route found is therefore a parallel route.
   – Shortest route between source, vias and any destination.
     Starting with the specified source, an attempt is made to reach all locations with the destination property with the shortest possible route.
   – Find all routes between source and destination.
     The runtime for this search depends very much on the structure of the graph, that is, the Route Control project structure, and may take hours in difficult cases. Moreover, the number of routes found, for example, with checkerboard patterns or complete graphs, may run into the millions and the search may be terminated before all routes are found. Therefore, specify the number of found routes after which the search should be terminated in the Properties dialog.
   – Find main routes between source and destination.
     This also searches for additional routes with the shortest possible route.
4. Click the button.
   The search is executed. A progress bar appears during the search. Once a route is found, it is shown in the results window.
5. Click on the route in the results window.
   The program displays details of the partial routes involved in the selected route.

Mode tables

You can restrict both the search and the graphic representation to allow only selected partial routes with a selected mode table.

- Then, the only locations displayed in the graphic representation are those which are connected to partial routes that correspond to the selected mode table.
  Since locations are not assigned to mode tables, it is possible that individual locations without connection to a partial route may appear in the graphs, even though a mode table has been selected.
- Only partial routes with the selected mode table are taken into consideration for the route search.

Display of the results

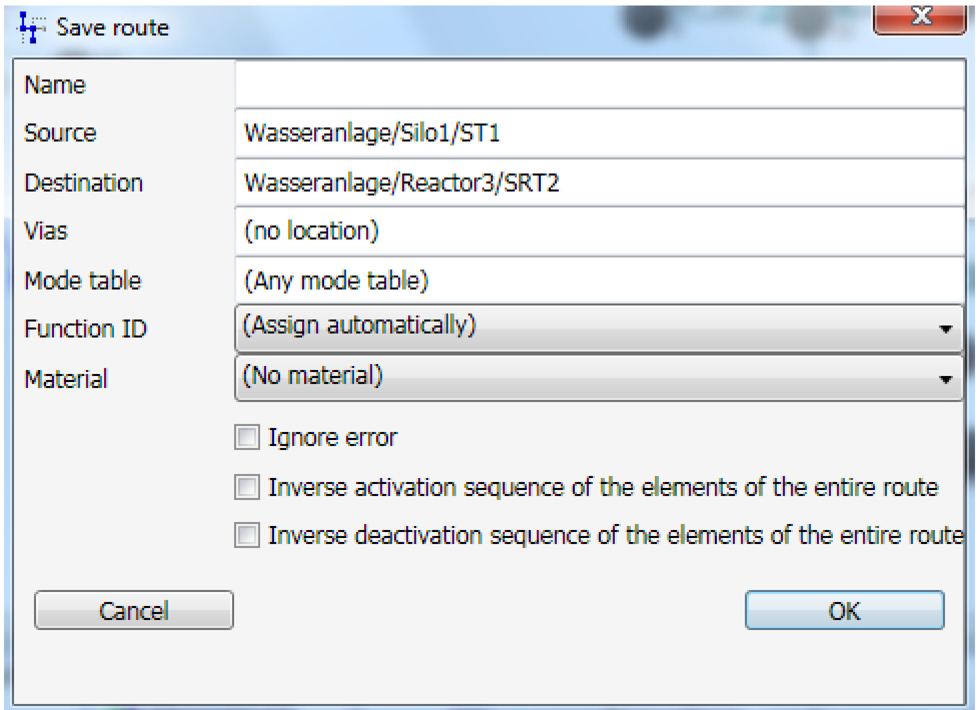
The display of the results is divided into a tree diagram to the left with routes, partial routes and properties, and a list shown on the right containing all the elements they contain.

If you select a route in the tree, all elements of the route are shown in the element list. Similarly, if you select a partial route, only the elements of the partial route appear in the element list.

You can use the shortcut menu of the route to print or save a route.

Save route

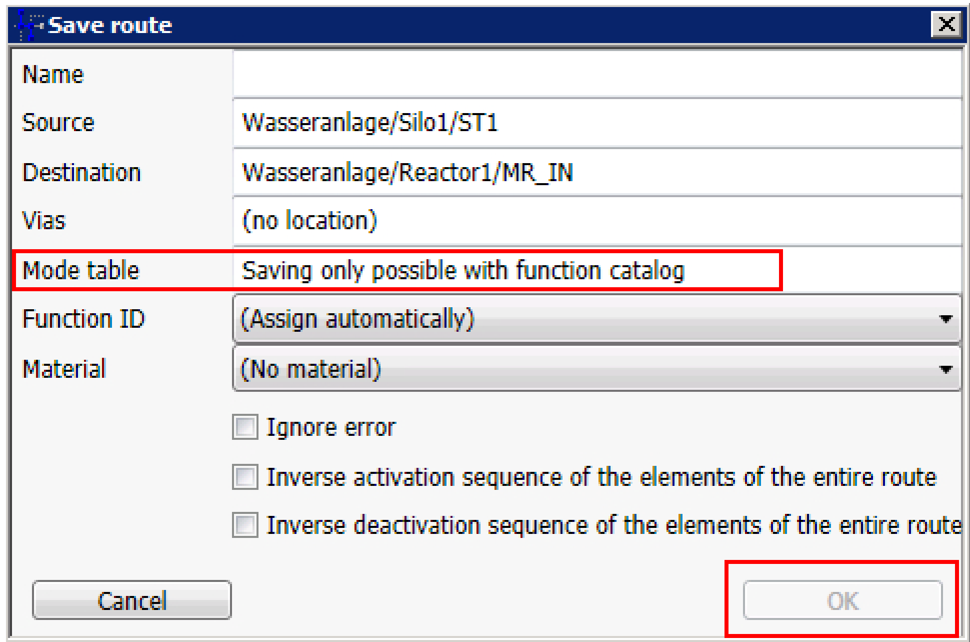
If you save a route, you can specify additional information, such as material, function ID, etc.



Information such as source, destination, vias, and mode table come from the route found. You can change all other information as you wish and then save.

Note

To save you have to enter a mode table so that the route can also be activated online. Without this entry, the text "Saving only possible with mode table" appears in the mode table field and the OK button is not available (see picture below).



Memory and distinguishing criteria

The location IDs of source, destination and via (not symbolic names) are used as memory and distinguishing criteria. All the currently used partial routes and the mode table will be saved.

Note

Loading routes found offline

When downloading the Route Control Server, the routes stored online are deleted and routes stored offline are copied online.

Displaying saved routes

The command File -> Saved routes or CTRL+R opens a dialog with the following lists in the offline route search:

- The first list shows the saved routes and some of their properties.
- When you select a route, the second list displays any available vias.
- The third list shows the used partial routes.

You can use the shortcut menu command "Delete" or press the "Del" key to delete individual routes or all routes.

Note

Why Are Available Via Locations Not Displayed in the Route Control Route Verification Dialog Box Under Via?

Locations can have one or all of the three properties "Source", "Via", and "Destination". If the "Any location" function is used, all locations with the "Destination" property are considered solely as possible destinations. For this reason, locations with both the "Via" and "Destination" properties will not appear in the list of "Via" locations.

Project Engineering Checklist

1. You have configured partial routes.
2. You started the route-search tool and are now checking various source and destination combinations.
   The tool displays all routes/partial routes found.
3. You check whether the correct partial routes have been found and correct your configuration, if necessary.

9.5.3 Guide to the cross-reference list of elements

User Task

You want to find out which partial routes contain a particular element, that is, where the element is being used.

Procedure

1. In the top or bottom window of Route Control Engineering, select the menu command **Cross-reference List** in an element shortcut menu.
   The "Cross-reference List" dialog box opens.
2. Select a partial route and click the "Elements" tab.
   A list of all elements associated with this partial route appears.

Learning Objectives Check List

- You know how to display a list of partial routes that contain a particular element.
- You can also determine the other elements that are interconnected in this partial route.

9.5.4 Guide to the CSV interface

User Task

You want to configure mode tables or partial routes efficiently, with the aid of Microsoft Excel, for example.

Overview of Procedure

Step	Procedure
1	Exporting the objects from the Route Control configuration to a CSV file
2	Modifying and adding to the list
3	Importing the new list from a CSV file to the Route Control configuration

Check List

Follow the individual steps as described in "CSV Interface Overview" (Page 357).

9.6 Route Control server

9.6.1 Guide to the Route Control Server

Requirement

You want to obtain an overview of the Route Control Server and user interfaces.

Component overview

The Route Control runtime environment comprises three components:

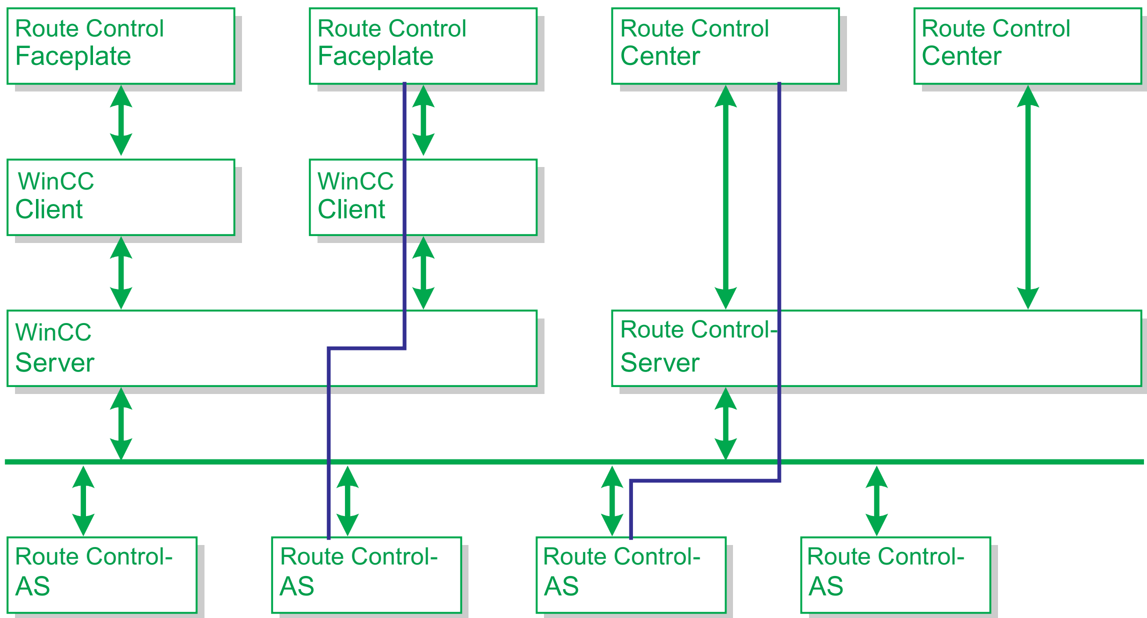
- Route Control Server
- Route Control Center
- Route Control faceplate for PCS 7 OS

Additional information is available in the section "User interface of the servers" (Page 531)

"Overview of servers"

Data communication

The picture below shows how the Route Control faceplate and Route Control Center user interfaces receive data.



Checklist of learning objectives

- You are familiar with the user interfaces of the Route Control Server.
- You are familiar with the user interfaces of the operator stations.
- You know how the servers and operator stations interact and exchange data.

See also

Route Control server dialog (Page 529)

9.6.2 Guide to Starting up the Route Control System

Requirement

You want to start up the Route Control system and learn how to correct or avoid errors.

Overview of the procedure

Step	Action
1	Download configuration data to the Route Control automation systems. The user program and Route Control blocks are in RUN or RUN-P state.
2	Start the Route Control Server by way of Windows Start menu. The server tries to connect to the automation systems during startup. The server deactivates all AS which are unavailable and sets their elements in the server to "disabled" state.

Note

Download the configuration data prior to initial startup of the Route Control Server.

Result

The server loads the configuration data and goes online to all AS during its startup. The Server starts a general query if this operation has failed. This provides the server with current information about the state of the routes and elements. The server is then continuously updated by means of update message frames.

Start response of redundant servers

The server now requests information about the availability and operating state of the partner station during its startup in order to determine whether to start in master or standby mode. The starting server also compares the configuration data if the partner station is operating in master mode. The server does not start up if the offline Route Control databases are inconsistent with project data downloaded to the redundant servers.

Checklist

Requirements

- A configured S7 project is available.
- A configured Route Control project is available.
- The blocks from the S7 project have been compiled and downloaded to the automation system.
- The automation system is running.
- The AS and the Route Control Server are connected.

Route Control startup

1. Start the PCS 7 OS project (process mode) and select a PCS 7 OS picture with a route.
2. The Route Control Server is started.
3. The Route Control Server starts up with a general request.

4. The Route Control Server displays the "ACTIVE" state in the server dialog box.
5. Route requests can be executed in auto mode or in manual mode.

Note

If you want the Route Control Server to wait during startup for the PCS 7 OS to enter process mode on the same computer, you must program the runtime parameters of the project accordingly.

Additional information is available in the section"General functions" (Page 393).

The Route Control Server also shuts down automatically after the PCS 7 OS has exited process mode.

9.6.3 Settings for redundant Route Control servers

Reciprocal monitoring for redundantly designed Route Control servers

With redundantly designed Route Control servers, reciprocal monitoring takes place via the process cell bus during runtime.

Configuring an additional redundancy connection

Configuring an additional redundancy connection can improve the behavior of Route Control servers in the event of an error. The additional redundancy connection can be configured as either a serial connection or an Ethernet connection between the Route Control servers. The type of connection available is dependent on which additional server applications are installed on the PC station at the same time as the Route Control server.

Serial connection or LAN connection?

- In the case of configurations with a PCS 7 OS and a Route Control server, you can select either a serial connection or a LAN connection.
- In the case of configurations with SIMATIC BATCH, however, you must configure a LAN connection.

Configure the additional redundancy connection using the "Simatic Shell > Redundancy Settings..." dialog box, and set the optional connection to the redundant partner according to your server configuration.

Configuration in SIMATIC Manager 10

10.1 General

10.1.1 Overview of configuration

Overview of Configuration Tasks

You must perform a number of steps in order to configure a Route Control project:

- **Configuration in the Context of an S7 Project**

Step	Action	Described in Section
1	Configuring the AS	"Guide to Configuring Automation Systems" (Page 251)
2	Adapting the block ranges in CFC	"Adapting the Block Ranges in CFC" (Page 309)
3	Configuring the automation systems	"Configuration of the AS in CFC" (Page 311)
4	Configuring routes in CFC	"Configuring Routes in CFC" (Page 311)
5	Configuring elements in CFC	"Configuring Elements in CFC" (Page 311) "CFC Charts with REMOTE Elements" (Page 270)
6	Configuring user-defined element types	"Configuring User-Defined Element Types" (Page 312)
7	Configuring the cross-coupling in NetPro	"Overview of the Configuration in NetPro" (Page 240)
8	Configuring the Route Control applications in HW Config	"Route Control Applications in HW Config" (Page 244)
9	Configuring the locations	"Configuring the locations" (Page 328)
10	Route Control Wizard	"Transferring Data From an S7 Project" (Page 343)

Note

Please note the information in "Run Sequence of Route Control Blocks" (Page 307).

- **Configuration in the Context of Route Control Engineering**

Step	Action	Described in Section
1	Transferring from an S7 project	"Transferring Data from an S7 Project" (Page 343)
2	Configuring global project settings	"Overview of Project Settings" (Page 390)
3	Configuring mode tables	"Configuring Mode Tables" (Page 407)
4	Configuring mode levels	"Configuring Mode Levels" (Page 409)
5	Configuring partial routes	"How to Configure Partial Routes" (Page 411)
6	Configuring materials	"Overview of Materials" (Page 458)
7	Configuring Route Control servers	"Configuring Route Control Servers" (Page 307)

Note

In the following, an S7 project always refers to an S7 project within a multiproject.

Additional information

- Section "Guide to Dynamic ID Assignment" (Page 284)

10.1.2 Adding projects to a multiproject

Introduction

If you want to add projects to a multiproject, Route Control checks whether the new data match the existing data. If the Route Control specifications are violated, a dialog box displaying notes on how to correct the errors appears automatically.

Dialog Box Tabs

Depending on the type of error, the dialog box may contain the following tabs:

- RCS Data
- RC Application
- RC Application (stby)
- RC Application Client

Complete all tabs before clicking "OK".
You must rectify all errors before adding all projects to the multiproject.

If you click "Cancel", no projects will be added.

Note

If you have already added a project to another multiproject, this is indicated in the "From multiproject" column.

You cannot add a project to more than one multiproject.

If you click "OK", a prompt appears asking whether or not the project should be removed from the other multiproject.

"RCS Data" Tab

This tab is displayed if Route Control configuration data already exist in the multiproject and in the projects to be added.

You have two options:

- Option 1:
  - Check the "Delete" box.
    The project will be added without Route Control configuration data.
- Option 2:
  - Click "Cancel".
  - Synchronize the project data with the multiproject.
  - Add the project again, checking the "Delete" box on the "RCS Data" tab.

"RC Application" Tab

This tab is displayed if addition would result in there being more than one RC application in the multiproject.

In the "Projects" list, select as many "Delete" check boxes as required to ensure that only one RC application will exist in the multiproject after addition.

"RC Application (stby)" Tab

This tab is displayed if addition would result in there being more than one RC application (stby) in the multiproject.

In the "Projects" list, check as many "Delete" boxes as required to ensure that there will only be one RC application (stby) in the multiproject after addition.

"RC Application Client" Tab

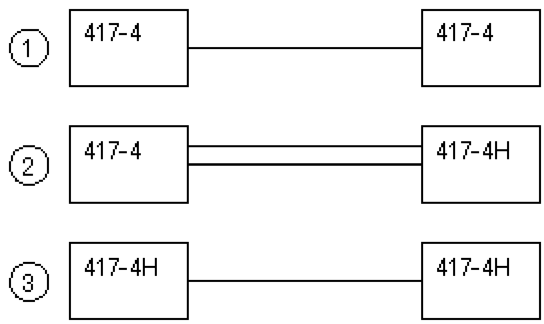
This tab is displayed if addition would result in the maximum number of RC applications clients for a multiproject being exceeded.

In the "Projects" list, select as many "Delete" check boxes as required to ensure that the displayed maximum number of clients in the multiproject will not be exceeded after addition.

10.1.3 Communication with H-machines

Overview

The communication links for H-machines are created by the Route Control Wizard. There are the following different cases:



#	Peer #1	Peer #2	Description
1	417-4*	417-4*	The Route Control Wizard creates **one standard connection** between two non-H automation systems.
2	417-4*	417-4H	The Route Control Wizard creates **two normal connections** between a non-H AS and a fault-tolerant AS (H-machine with 2 CPs). A fault-tolerant connection is not possible in this case.
3	417-4H	417-4H	The Route Control Wizard creates **one fault-tolerant connection** if the two communication peers are H-machines.

* 417-4 always means a 416-3 AS too (both are non-H automation systems).

Note

Connection between an RC server and a single H CPU

Depending on the firmware version of the CPs, no fault-tolerant connection can be made between the RC server with two CP 1613 and a CPU 41x-4H with two CP 443-1. A corresponding message is generated in this case.

H-systems and remote connections

You cannot establish an unspecified **high-availability** connection between an H-station and an S7-400 station. However, because this connection is a prerequisite for cross-system communication with remote elements, **no** cross-PCell communication can be used.

10.1.4 Run sequence of Route Control blocks

Run sequence

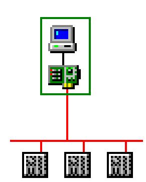
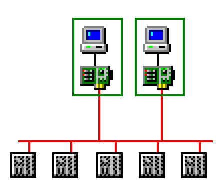
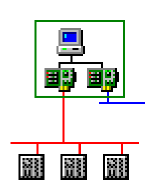
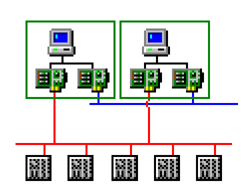
Allow the blocks to run in the following sequence:

No.	Blocks
1	User blocks that activate a route (e.g., SFC, phase, user program)
2	RC_IF_ENCODER
3	RC_IF_ROUTE
4	RC_IF_DECODER
5	RC_IF_CFG
6	RC_IF_XC_DIAG Insert in the OB processing the cross-coupling. You can find additional information under input OB_XC at block RC_IF_CFG (Page 172).
7	RC_IF_XC_LIFE
8	RC_IF_... (all element blocks)
9	Technological blocks that are connected to the RC_IF_... interface blocks

10.1.5 Configuring the Route Control Server

Overview

You can configure the Route Control Server either as single-user station or for operation in a redundant system with two computers. A server (or each of the two redundant servers) can be equipped with one or two network cards. Use two network cards to separate the server-server network from the server-AS network.

	One Route Control Server	Two Route Control Servers
One network card		
Two network cards		

Requirements

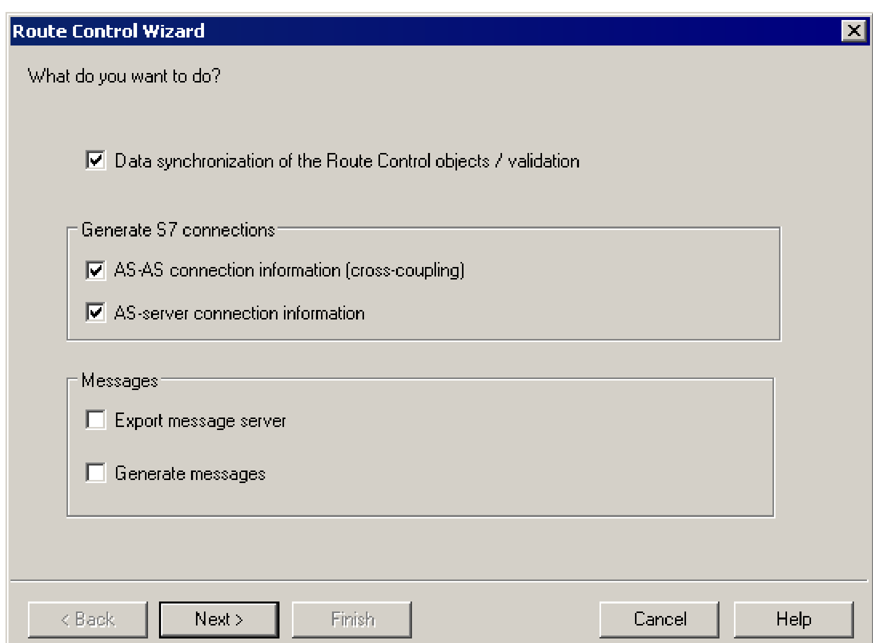
- The server computers must be physically present.
- The server computers must be equipped with the appropriate network cards.
- The corresponding IP addresses have been set up.
- The Route Control Server component has been installed.
- The PC station has been configured with a Route Control application in HW Config.
- An S7 project is available on the ES.

Note

You can find additional information on configuring a Route Control server and its redundant peer server in the manual *PCS 7 - Fault-tolerant process control systems.*

Overview of the procedure

The Route Control Servers and their properties are configured primarily at a single location, namely in the Route Control Wizard.

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the Route Control Wizard and select the AS server connection information
Additional information is available in the section
"Selecting actions". (Page 348)

</td></tr>
<tr><td>2</td><td>Run the full wizard session.
The data you entered are exported, and are imported to Route Control Engineering.</td></tr>
<tr><td>3</td><td>Check the transferred data
Additional information is available in the section
"Import log" (Page 356)</td></tr>
</table>

Step	Procedure
4	Download the Route Control configuration to the Route Control Server.
5	Start the server (or cold restart) Additional information is available in the section "Overview of servers" (Page 529)

10.2 Configuration in CFC

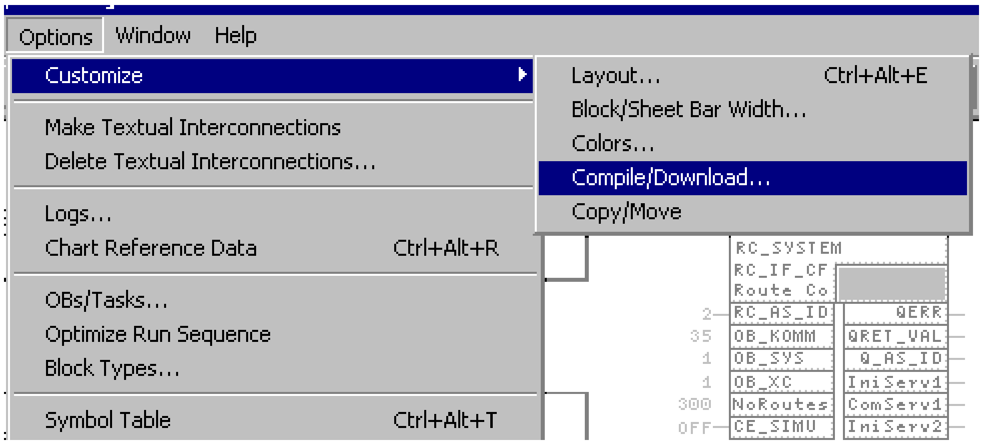
10.2.1 How to Adapt the Block Ranges

Introduction

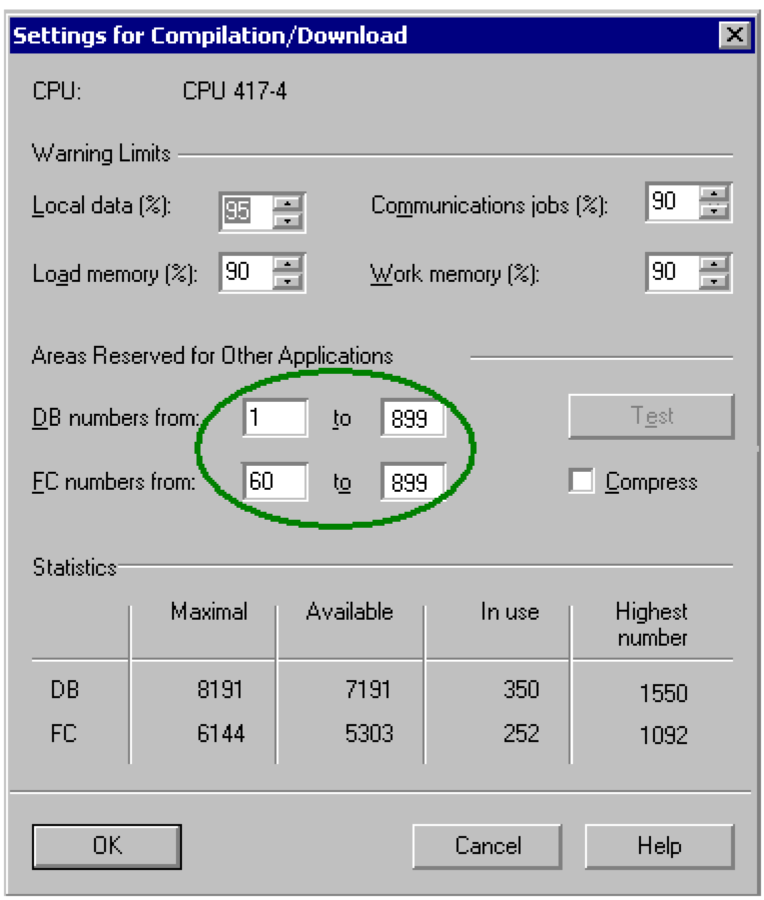
From the perspective of the S7 project, the SIMATIC Route Control blocks are user blocks. Because the default settings of an S7 project are too low, you must modify the range.

Procedure

1. In the CFC Editor, select the menu command **Options > Settings > Compile+Download**.



2. Set the upper limits to at least 899.



3. Click "OK".
   The program saves your entries.

10.2.2 Engineering the AS Configuration in CFC

CFC Engineering of the Configuration

Insert a separate instance of the RC_IF_CFG block type in a separate CFC chart in each AS.

If you are using two or more automation systems in your project, we recommend that you also include the following two blocks in each AS:

- RC_IF_XC_DIAG (FB 884) (Page 178)
- RC_IF_XC_LIFE (FC 884) (Page 182)

These two blocks are used for diagnostics of data communication between automation systems.
You can insert both blocks in the same CFC chart as the RC_IF_CFG block.

Additional information

- Section "Block RC_IF_CFG" (Page 172)

10.2.3 Configuring routes in CFC

CFC Configuration of Routes

Insert a separate instance of the RC_IF_ROUTE block type in a CFC chart for each route (later, material transport).

Note

Use a separate CFC chart for each instance, as it will also contain the user block, such as a phase block, in addition to the route block.

Additional information

- Section "Block RC_IF_ROUTE" (Page 101)
- Section "Guide to Dynamic ID Assignment" (Page 284)

10.2.4 Configuring elements in CFC

CFC Configuration of Elements

You have to insert a block from the standard library in a CFC chart for every element to be controlled in the system. Alternatively, you can use other block libraries. In this case, it must be ensured that these blocks are compatible with the routing-system interface blocks.

Insert a routing-system interface block for each element block, preferably in the CFC chart. This interface block links the external block to the data administration of the routing system in the automation systems.

Examples

- RC_IF_MOTOR and MOTOR
- RC_IF_VALVE and VALVE

10.2.5 Configuring user-defined element types

Introduction

If you want, for example, to use a motor with a special activation control and different feedback signals, you create a user-defined element type, insert it in CFC and export it to the Route Control project.

Overview of Procedure

Insert a default block, in this case RC_IF_MOTOR, in the appropriate user block, in this case RC_IF_USER_CE.

The following are supplied as templates for user elements:

- RC_IF_USER_CE (Page 150) control element)
- RC_IF_USER_SE (Page 159) (sensor element)
- RC_IF_USER_PE (Page 165) (parameter element)

User-defined attributes (UDAs) tell the Route Control Wizard that this block is relevant for data export.

Additional information

- Section "Example of a User-Defined Type" (Page 168)
- Section "Generic User Elements" (Page 169)

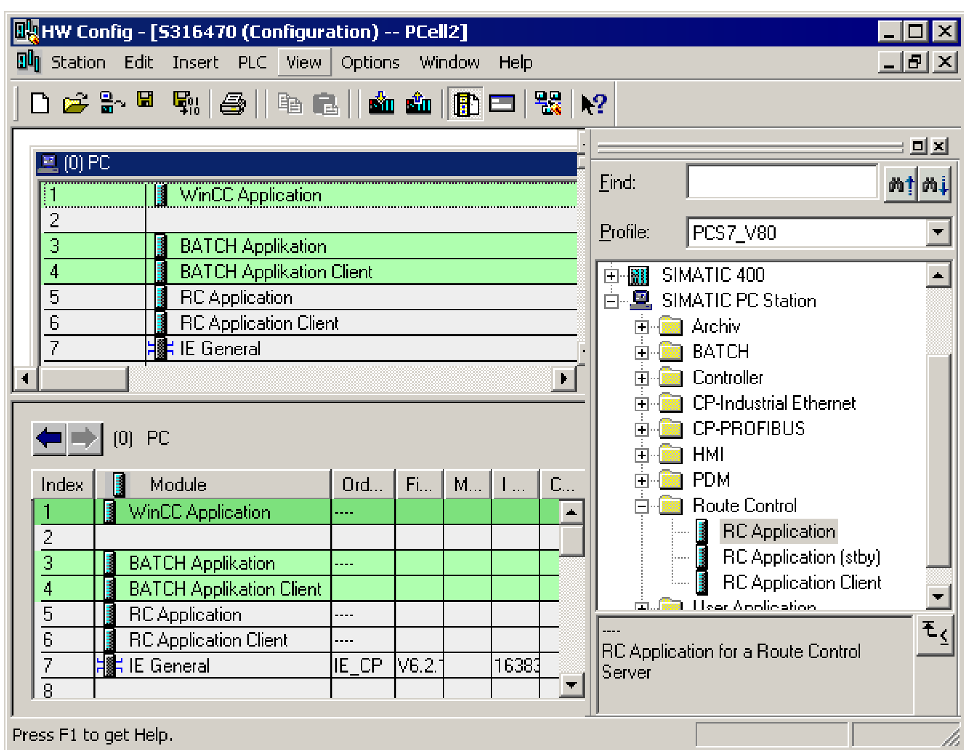
10.3 PC stations

10.3.1 Hardware configuration HW Config

Overview of the procedure

A Route Control Server is configured as a Route Control application in HW Config. Proceed as follows:

Step	Procedure
1	Add a new PC station.
2	Install one of the following applications in this PC station: RC Application (Page 314) RC Application (stby) (Page 314) RC Application Client (Page 315) The Route Control Wizard creates connections between the Route Control applications and the Route Control automation systems.
3	Download this configuration to the target station. Additional information is available in the section "Component Configurator" (Page 316).
4	Start the Route Control Server (configuration must have been downloaded).



Result

The Route Control Server now activates the named connections to the automation systems.

10.3.2 Route Control application properties

"General" Tab

This dialog box displays the general properties of the selected Route Control application. You can change the "Name" and "Comment" boxes in HW Config.
You can also change the name of the object directly in the SIMATIC Manager.

Field	Meaning
Short designation	Here you can view the application abbreviation from HW Config.
Article no.:	---
Name	When necessary, change the name to suit your situation. The new name then appears in the SIMATIC manager.
Comments	You can enter additional information relating to the application here.

10.3.3 Route Control application

RC Application

The Route Control application object represents the Route Control server component.

The Route Control server, Route Control standby server and Route Control clients (Route Control Center) usually run on different computers. In order to be able to download the process-cell data for a project to these computers separately, you have to create a SIMATIC PC station in the SIMATIC Manager component view for every Route Control server and every Route Control client. You must also configure these stations in HW Config, using the corresponding Route Control application.

10.3.4 Route Control application (stby)

RC Application (stby)

The Route Control application (stby) object represents the Route Control standby server component.

The Route Control server, Route Control standby server and Route Control clients (Route Control Center) usually run on different computers. In order to be able to download the process-cell data for a project to these computers separately, you have to create a SIMATIC PC station in the SIMATIC Manager component view for every Route Control server and every Route Control client. You must also configure these stations in HW Config, using the corresponding Route Control application.

10.3.5 Route Control application client

RC Application Client

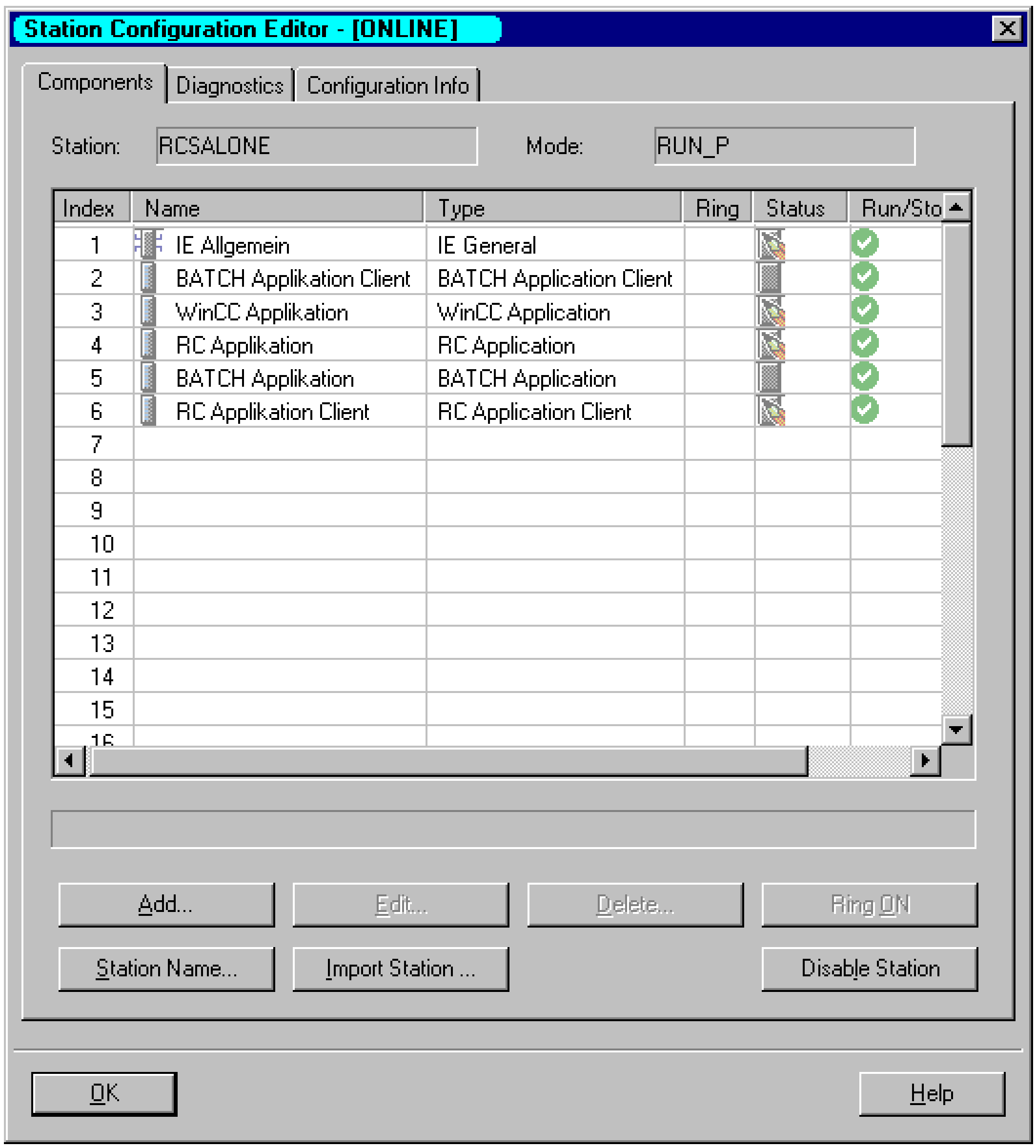
The Route Control application client object represents the Route Control client (Route Control Center) component.

The Route Control server, Route Control standby server and Route Control clients usually run on different computers. In order to be able to download the process-cell data for a project to these computers separately, you have to create a SIMATIC PC station in the SIMATIC Manager component view for every Route Control server and every Route Control client. You must also configure these stations in HW Config, using the corresponding Route Control application.

10.3.6 Station Configuration Editor

Overview of Procedure

The Station Configuration Editor must be downloaded to the server PC station:



10.4 Route Control Objects

10.4.1 Creating Route Control Objects

"Route Control" Objects

When Route Control is installed, a "Route Control" object is also created automatically in the project folder in SIMATIC Manager.

A "Route Control" object is also created automatically when the Route Control application client is inserted in a PC station.

If one of these objects has been deleted, you can recreate it manually.

To do this, open the shortcut menu in the project folder or RC application client and select the menu command **Add New Object > Route Control**.

Additional information

- Section "Route Control Object Properties" (Page 317)
- Section "Route Control Object in the Project Folder" (Page 318)
- Section "Route Control Object in the RC Application Client" (Page 318)

10.4.2 Route Control object properties

"General" Tab

This dialog box displays the general properties of the "Route Control" object.

Field	Meaning
Name	You can change the name of the object here.
Project path	Here you can view the path from the project to the current object (via the components) from the component view.
Storage location of project	The path for the project directory appears here.
Author	The name of the creator is displayed here.
Date created	The date on which the object was created is displayed here.
Last modified	The date on which the object was last changed is displayed here.
Comments	You can enter additional information relating to the object here.

10.4.3 Route Control object in the project folder

Route Control object

This object contains information about the location of the Route Control database.

To start Route Control Engineering, double-click the object or open the shortcut menu and select the menu command **Object > Open**.

To download the server and, if available, the standby server, open the shortcut menu and select the menu command **PLC > Download**.

To start the wizard, display the wizard log or start the Engineering, open the shortcut menu and select the menu command **SIMATIC Route Control**.

To display the object properties, open the shortcut menu and select the menu command **Object Properties**.

10.4.4 Route Control object in the RC application client

Route Control Object

The names and addresses of the Route Control server(s) are stored in this object.

To download the configuration to the client, open the shortcut menu and select the menu command **PLC > Download**.
Perform this action just once after the first download to the server.

To start the wizard, display the wizard log or start Engineering, open the shortcut menu and select the menu command **SIMATIC Route Control**.

To display the object properties, open the shortcut menu and select the menu command **Object Properties**.

Note

In SIMATIC Route Control V7.1 and higher this step can be omitted, as the RC clients can receive their downloads in RC Engineering directly (Download to server function).

10.5 Options Menu in SIMATIC Manager

10.5.1 SIMATIC Route Control

Options > SIMATIC Route Control Menu

You can perform the following actions using the submenu functions:

- Start the Route Control Wizard (Page 319)
- Display the Route Control Wizard log (Page 319)
- Start Route Control Engineering (Page 320)
- Open the wizard for importing/exporting equipment properties (Page 320)

10.5.2 SIMATIC Route Control Wizard

Options > SIMATIC Route Control > Wizard Menu

This menu command starts the Route Control Wizard in order to export the configuration from the S7 project.
The exported data are saved and can be imported into Route Control Engineering at a later time.

Additional Information

Section "Actions in the Route Control Wizard" (Page 346)

10.5.3 SIMATIC Route Control Show Wizard Log

Options > SIMATIC Route Control > Show Wizard Log Menu

This menu command opens an editor that displays the log of the last export carried out using the Route Control Wizard.

Additional Information

Section "Export Log" (Page 356)

10.5.4 SIMATIC Route Control Engineering

Options > SIMATIC Route Control > Engineering Menu

This menu command opens the Route Control Engineering window.

Additional Information

Section "Route Control Engineering Main View" (Page 381)

10.5.5 Import/Export of SIMATIC Route Control Equipment Properties

Options > SIMATIC Route Control > Import/Export Equipment Properties Menu

This menu command opens the wizard for importing/exporting equipment properties.

Additional Information

Section: ""How to export and import locations" (Page 332)

10.6 Locations

10.6.1 Locations

Locations of a project

Locations can be configured directly under a process cell in SIMATIC Manager.

Locations which are configured directly under a process cell in SIMATIC Manager are displayed under "General Locations" in Engineering.

Locations can be used for configuring partial routes.

The name of the location is preceded by the name of the process cell for better legibility.

The figure shows some examples of configured locations:

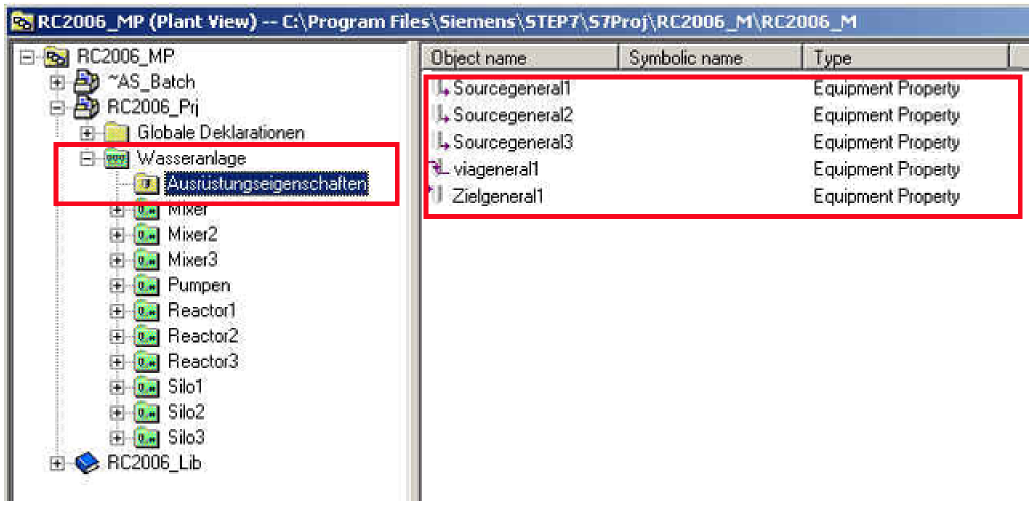


Image 10-1 Locations

The Route Control wizard detects these locations and transfers them to Route Control Engineering.

The figure shows an example:

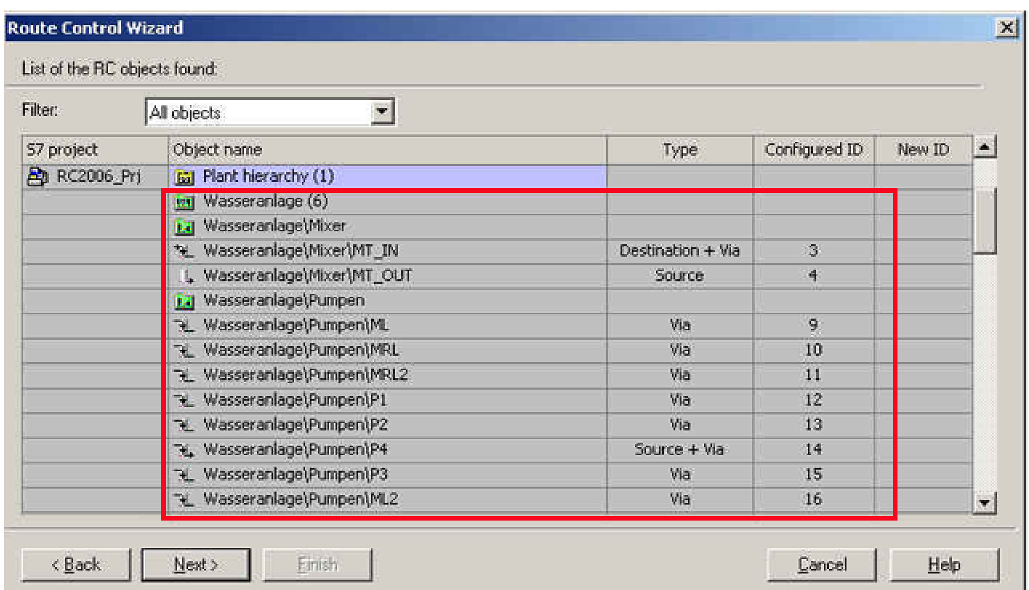


Image 10-2 Locations in Route Control Engineering

In Route Control Engineering, these locations are positioned under "General Locations" and can be used to configure partial routes.

The figure shows an example:

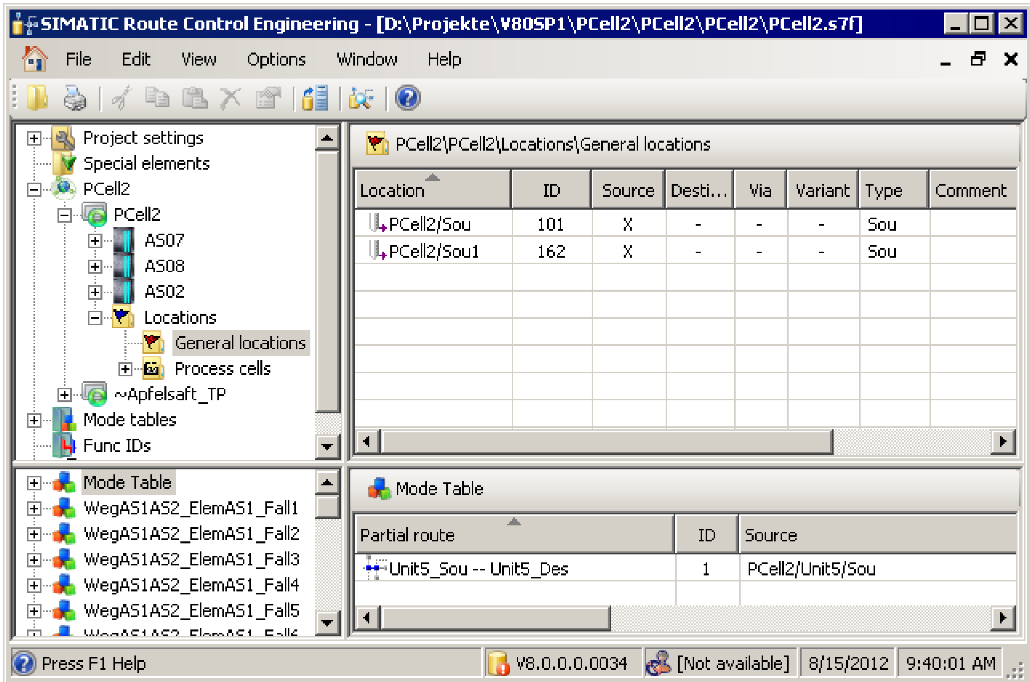


Image 10-3 General locations

Locations of an adjacent multiproject (shadow locations)

In SIMATIC Manager, objects of the plant hierarchy (i.e. process cell, unit and locations) of an adjacent multiproject can be declared via a new dialog.

This enables, for example, partial routes for process cells to be configured in adjacent multiprojects in Route Control.

The figure below shows an example of a dialog:

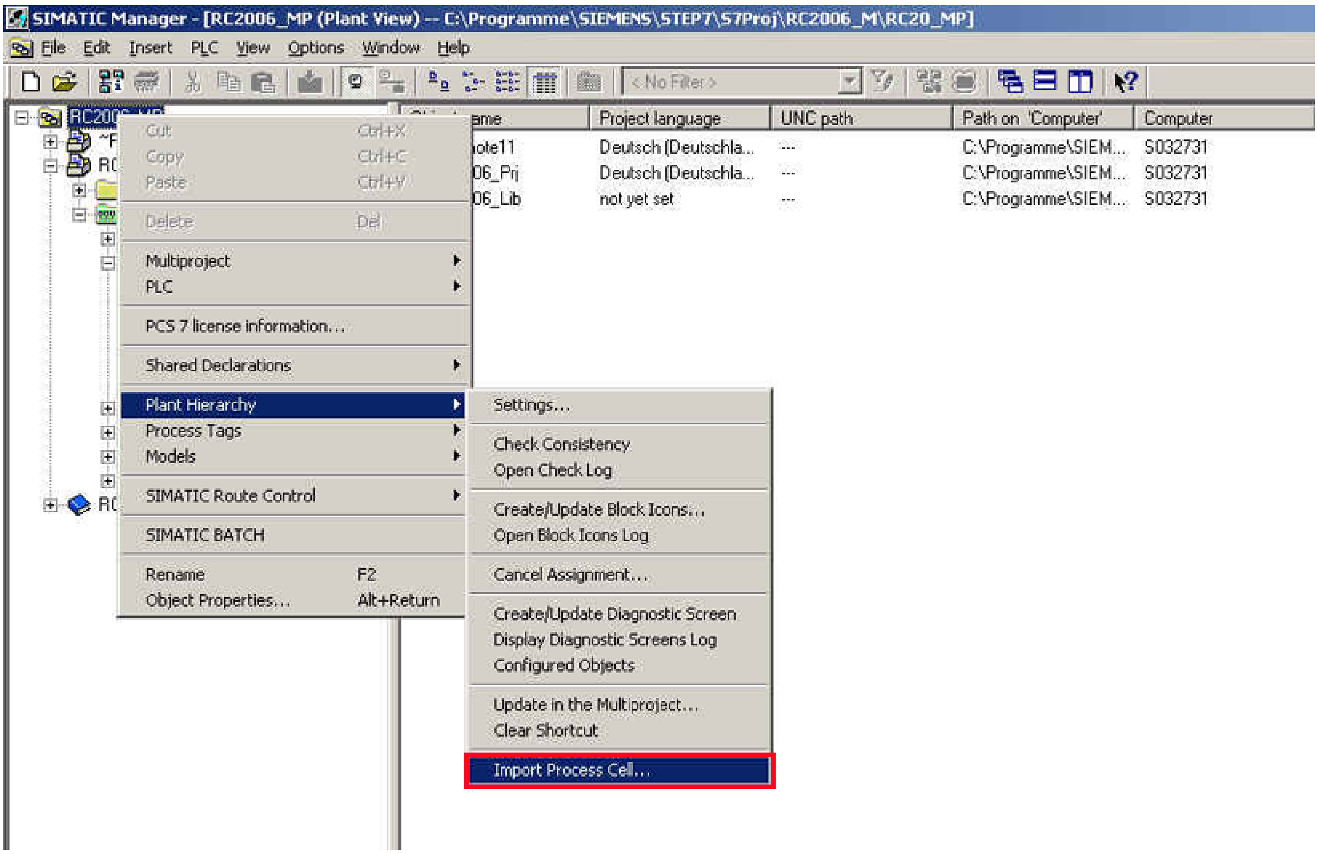


Image 10-4 Locations of an adjacent multiproject

After selecting the Save function, the following dialog box is displayed:

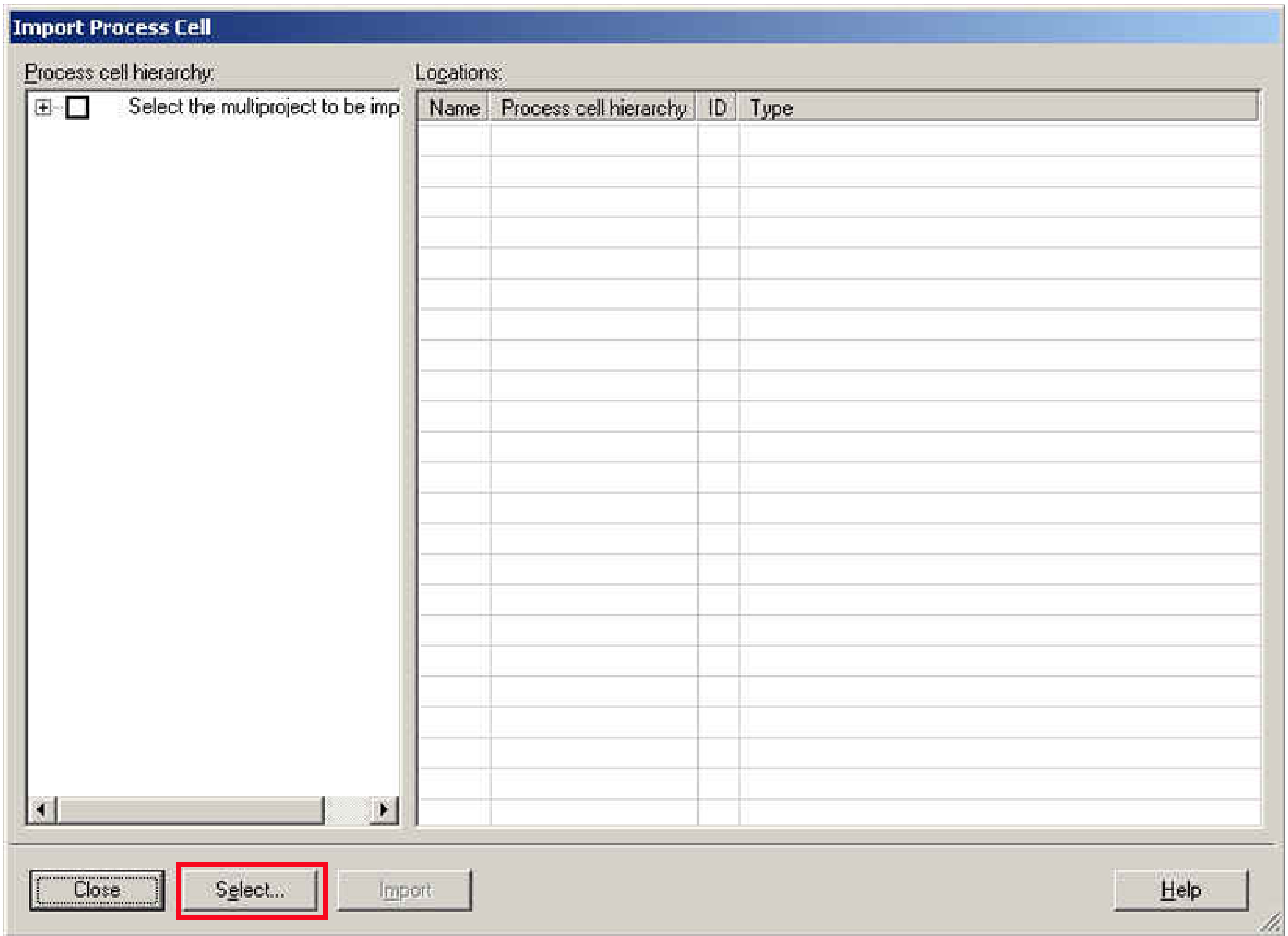


Image 10-5 Import process cell

Click "Select" to open the dialog box "Open Multiproject" to select multiprojects.

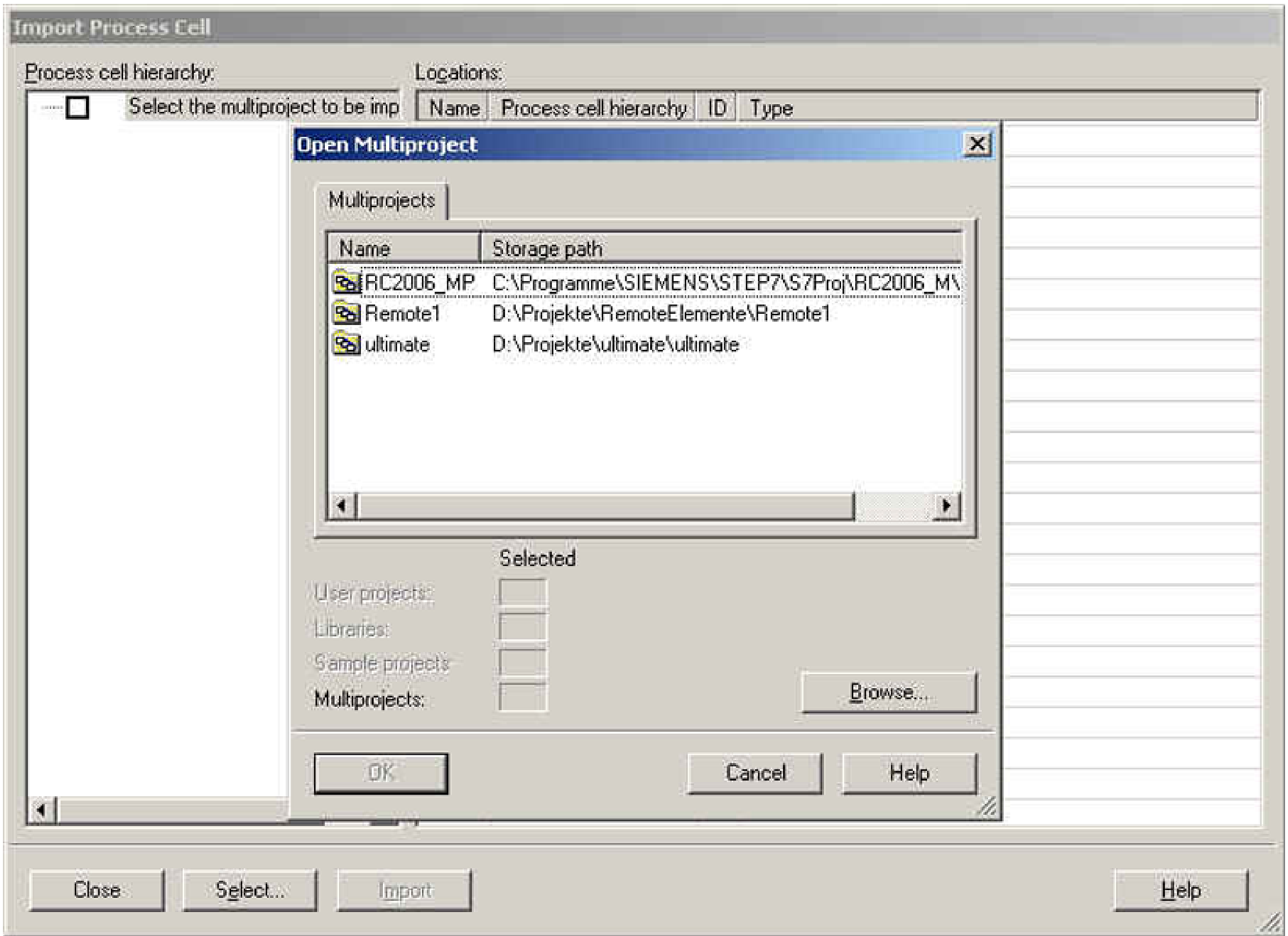


Image 10-6 Open multiproject

After selection of the required multiproject, the locations of the adjacent multiprojects are displayed for further selection. Locations can be selected using the existing boxes. Click "Import" to import the selected locations into the multiproject.

The imported multiprojects from adjacent multiprojects are identified by a tilde in front of the name. All objects from adjacent projects are read-only.

The following figure shows an example:

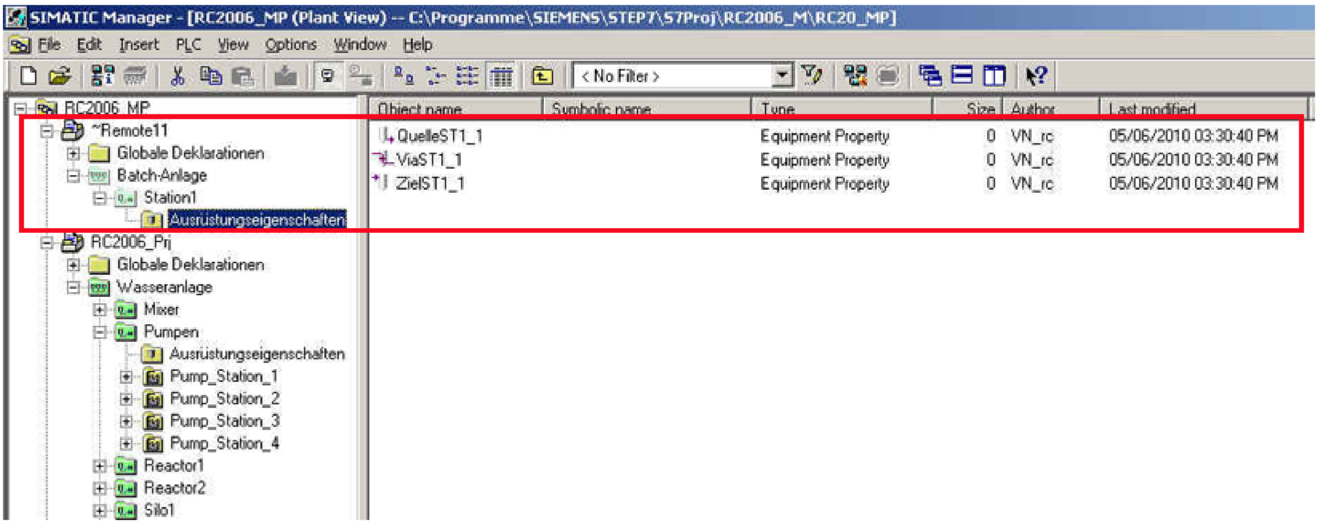


Image 10-7 Imported projects

The Route Control wizard detects the shadow hierarchy folders and transfers the locations to Route Control Engineering.

The following figure shows an example:

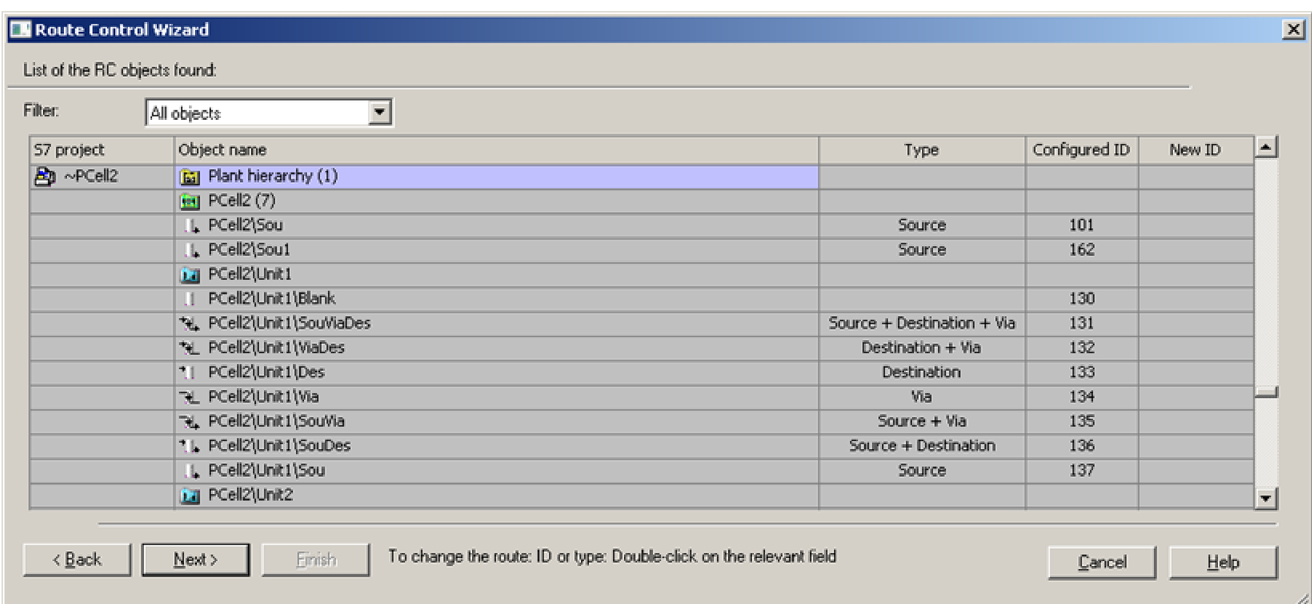


Image 10-8 Transferred locations

This enables locations to be used for configuring partial routes for adjacent process cells.

The following figure shows an example:

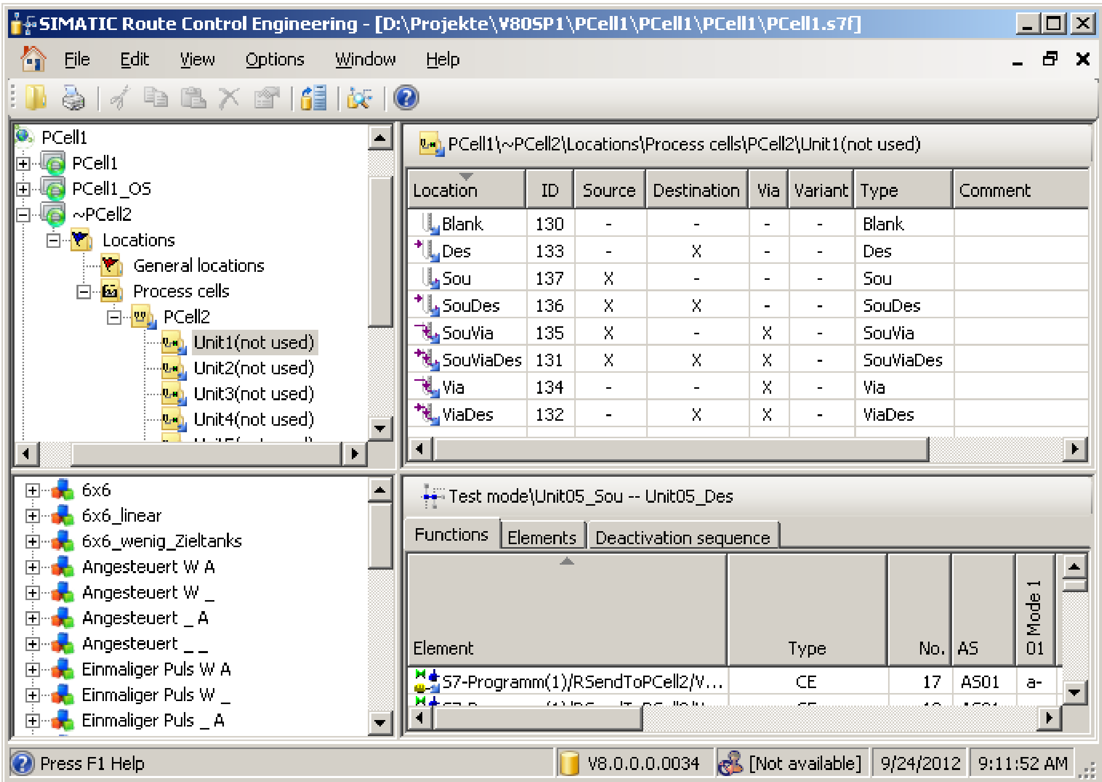


Image 10-9 Using locations

10.6.2 Number ranges

Number ranges of locations

From the Route Control perspective, the ID of a location must be globally unique within a multiproject. The number range in a project is defined in SIMATIC Manager via a dialog.

You must ensure that the number ranges in the SIMATIC projects of a multiproject are unique.

This uniqueness must also be ensured when importing shadow hierarchy folders.

When changing the number range, please ensure that the IDs are automatically numbered within the number range.

For this reason, check any possible fixed ID assignments within your configuration, for example, in your user programs or direct configurations at route blocks. These ID assignments are not known to SIMATIC Manager and are therefore not automatically updated You must manually update the ID changes at these positions in your project.

Defining number ranges of locations

You define the number range in SIMATIC Manager using the dialog box "Properties Equipment Properties" in the "Locations" tab.

The high and low limits of the number range is displayed here.

Number ranges may not overlap in the sub-projects and in a multiproject. This fact is checked when they are entered and an error message may be generated identifying the relevant sub-project.

The number range must contain positive integers from 1 to 65,535; a message appears if an entry is invalid.

The figure below shows an example of a dialog box:"Properties Equipment Properties":

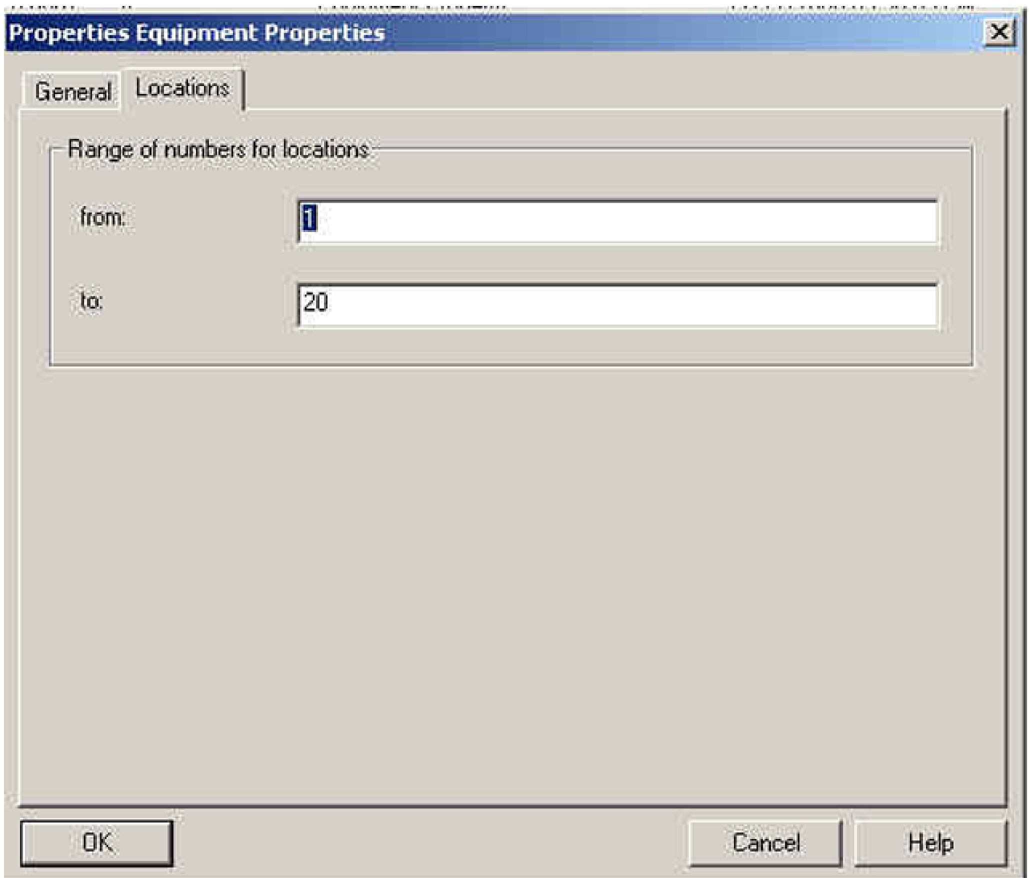


Image 10-10 Properties Equipment Properties

10.6.3 Configuring the locations

Introduction

Locations refer to the start, paths (vias) and final points of routes.

As of V7.0, do not configure locations in Route Control Engineering any more, configure them directly in SIMATIC Manager instead.

The locations are imported by both SIMATIC BATCH and SIMATIC Route Control and thus only have to be configured once.

Overview of Procedure

You configure the locations in two steps:

Step	Procedure
1	Create location types in the "Shared Declarations".
2	Create locations in units.

To inform the system about the types of location used, create all the required location types once as equipment properties in the project's "Shared Declarations" folder.
Additional information is available in the section
"How to configure location types" (Page 329)

Now create the locations (instances of the location types) as equipment properties in technological units. Each location is assigned an unambiguous ID within the entire project.
You can find additional information in
"How to configure locations" (Page 331).

Configuring general locations

As of V7.0, you must assign all locations to a unit in SIMATIC Manager. Therefore, distribute all locations to the technological units appropriately.

You can also formally create one or more units in the plant hierarchy, which are not available for BATCH batches. Equip these formal units with the locations which you do not wish to assign to a technological unit.

Note

The "General Locations" folder in Route Control Engineering is no longer used.

10.6.4 How to configure location types

Introduction

Before you can create locations, you must first create the required location types in SIMATIC Manager. To do this, create a "Shared Declarations" folder and an "Equipment Properties" subfolder in your project. Configure an "Equipment property" object of the "LOCATION" data type there for each location type. In this object, specify if a location of this type should be used as a source, destination or via of a material transport in runtime. You can also assign several or all these properties to a location type.

You can use locations for which you have assigned none of these properties to create partial routes in Route Control Engineering. These locations are not offered for selection when configuring a material transport in runtime.

When creating location types, keep in mind that you can insert instances of a certain location type in any number of units. However, you can only insert one instance of a certain location type in each unit.

Therefore, the number of identical location types that you have to create is dictated by the maximum number required in a unit.

Example

Each unit in your project contains a maximum of three inlet valves of the same type, which should only be used as the destination of a route or partial route.

You then configure three location types, for example, inlet1, inlet2 and inlet3, all with the "Destination" property. You can assign "inlet1", for example, to units that have only one inlet valve.

Procedure for Configuring Location Types

1. If a project-specific "Shared Declarations" folder does not exist in the component view of SIMATIC Manager, open the project-folder shortcut menu and select the menu command **Add New Object >Shared Declarations**
   The "Shared Declarations" folder is created.
2. Select the "Shared Declarations" folder.
3. If an "Equipment Properties" folder does not yet exist there, open the unit shortcut menu and select
   Add New Object > Equipment Properties. The "Equipment Properties" folder is created.
4. Select the "Equipment Properties" folder.
5. Open the shortcut menu and select
   Add New Object > Equipment Property.A new object is created.
6. Open the shortcut menu and select the
   Object Properties command.
   The "Properties equipment properties" dialog box opens.
7. Enter the name of the location type in the "Name" edit box.
   The "Display name" field is updated automatically. The name and the display name must be the same.
8. Select the "LOCATION" entry from the "Data type" drop-down list.
9. Check none, one or several of the "Source", "Destination" and "Via" boxes.
10. If necessary, enter information in the "Author" and "Comment" fields.
11. Click "OK".
    The program saves your entries.

Note

If the name entered in the "Name" edit box is already in use, your entries are not accepted.

Result

You have created an object in the "Equipment Properties" folder of the "Shared Declarations" for each location type and have given each location type a unique name.

Additional information

You can find information about equipping units with locations in

- "How to configure locations" (Page 331)

10.6.5 How to configure locations

Introduction

Once you have created the location types, you then configure the locations as instances of the location types in the units. To do this, create an "Equipment Properties" subfolder in each affected unit. In this subfolder, create an "equipment property" object for each location. Give each object (location) the name and properties of a suitable location type. Each location is assigned an unambiguous ID within the entire project.

Note

Only create locations in units. The Route Control Wizard will not export locations in subfolders.

Unique Location IDs

Numerical values from 1 to 65535 are allowed for the IDs.

When configuring locations as equipment properties in the plant hierarchy, the system suggests an ID (this can be changed by the user). A plausibility check ensures that the ID is unique within the individual project, while the Route Control wizard checks the uniqueness of the locations in the multiproject.

Procedure for Configuring Locations

1. In the Plant view in SIMATIC Manager, select a unit.
2. If an "Equipment Properties" folder does not yet exist in this unit, open the unit shortcut menu and select
   Add New Object > Equipment Properties. The "Equipment Properties" folder is created.
3. Select the "Equipment Properties" folder.
4. Open the folder's shortcut menu and select
   Add New Object > Equipment Property.
   A new object is created.
5. Open the shortcut menu and select the
   Object Properties command.
   The "Properties equipment properties" dialog box opens.

6. Select the applicable type of location from the "Names" drop-down list box.
   The location receives the name of its location type.
7. The system will have determined an ID for the location which is unique within the project and displays it in the "Value" box. You can change this number if necessary.
8. If necessary, enter information in the "Author" and "Comment" fields.
9. Click "OK".
   The program saves your entries.

   Note

   If the ID entered in the "Value" box is not allowed, your entry will not be accepted.

Result

You have distributed all locations to units appropriately. In the course of this, each location was assigned a unique ID. Following import into Route Control Engineering, you can use these locations when creating partial routes.

10.6.6 Mass configuration of locations via exporting and importing

Introduction

The "Equipment Properties Import/Export" wizard is available for mass configuration of locations. During the export process, locations that have already been configured are exported to a CSV file, which can then be expanded to include additional locations. When importing data that has changed, the new equipment properties are created in the plant hierarchy. For consistency reasons, the wizard only permits delta configuration; i.e. only new locations can be added to the configuration.

If there are no locations in SIMATIC Manager, the "Equipment Properties Import/Export" wizard imports all locations along with the IDs configured in the CSV file.

Note

When the **Save As... > With Reorganization** function is used for a multiproject, in some cases the system assigns new IDs to the configured node points.

Export procedure

1. Open SIMATIC Manager and select
   Options > SIMATIC Route Control > Equipment Properties Import/Export.
   The wizard starts and opens the "Introduction" step.
2. Select the export check box.

3. Click "Project".
   The "Open" dialog box opens.
4. Select the S7F file of the corresponding PCS 7 multiproject.
5. Click "Open".
   The "Open" dialog box closes.
6. Accept or change the proposed path for saving the export file.
   Click [..].
7. Click "Next".
   The wizard scans the multiproject and displays all data found.
8. Click "Next".
   The "Summary" dialog box opens.
9. Click "Finish".
   The program runs the export and opens the "Result" dialog box.
10. Click "Show log".
    The log file opens.
11. Check the log and then close the editor.
12. Click "Close".
    The wizard is closed.

Import procedure

1. Select the
   Options > Equipment Properties Import/Export command in SIMATIC Manager.
2. The Wizard is started and the "Introduction" step opens.
3. Select the import check box.
4. Click [..].
   The "Open" dialog box opens.
5. Select the required CSV file and then click "Open".
   The wizard checks the data in the CSV file and displays the result:
   - existing data are displayed in gray color
   - new data are displayed on a green background
6. Click "Next".
   The "Summary" dialog box opens.
7. Click "Finish".
   The data are imported.
   Any further hierarchy folders you enter in the CSV file between a plant and a unit are created as new folders in the PH.
   The "Result" step is displayed after the import is successfully completed.
8. Click "Show log".
   The log file opens.

9. Check the log and then close the editor.
10. Click "Close".
    The wizard is closed.

Mass configuration in Route Control as of V7.1 SP2

The name and display name of locations can now also be edited in SIMATIC Manager.

The old CSV structure for exporting and importing locations only contains columns for the location type name as up to now the location type name was identical to the location name.

The old CSV structure contained the columns

- Location type
- Display name

Instead of this, the new CSV structure contains the columns

- Location type
- Location type (display name)
- Location name
- Location name (display name)

This setup now also enables handling of the names and display names of the individual locations via import/export.

Note

Transfer of former CSV structure

The CSV structure used up to now can no longer process the import/export of locations.

You therefore have to adapt your existing CSV file to the new columns.

Export the existing locations from the plant hierarchy of Simatic Manager and adapt the content, if necessary.

For consistency reasons, the wizard only permits a delta configuration; this means that apart from the update of comments and the display names of existing locations, only new locations are imported from the CSV file to the plant hierarchy.

Inconsistent properties of locations result in an error message with subsequent termination of the program and must be rectified.

10.7 Route Control Dynamic Wizard

10.7.1 Overview of Route Control Block Icon Interconnection

Description

The Route Control Dynamic Wizard assists you when interconnecting a Route Control block icon to a route instance and an SFC block that activates the route.

Overview of the Procedure

Step	Procedure
1	In the PCS 7 OS Explorer, open the PCS 7 OS Graphics Designer.
2	Open file @Template_RC.pdl in the Graphics Designer
3	Copy the Route Control block icon contained in this file.
4	Switch to the PCS 7 OS picture and paste the copied block icon.
5	Start the Dynamic Wizard. If it is not visible: Right-click in the free area underneath the control elements. Select the check box for the Dynamic Wizard.
6	Select the "RC Faceplates" tab in the Dynamic Wizard window. Double-click on "RC Faceplate Wizard".
7	The first step of the Route Control Dynamic Wizard is displayed. Option: Suppress this step when displaying other interconnections.
8	In the next step: Select the route block instance to which this block icon is to be interconnected.
9	In the third step: Select an SFC block to which this block icon is to be interconnected. If you interconnect an SFC block, an SFC dialog can be opened during runtime to display the SFC chart controlling the route.
10	In the fourth step (display all settings): Click "Finish". The selected interconnections are created.

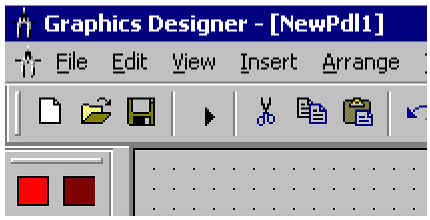
Additional information

- Section "How to Copy the Route Control Block Icon" (Page 336)
- Section "How to Start the Dynamic Wizard" (Page 337)

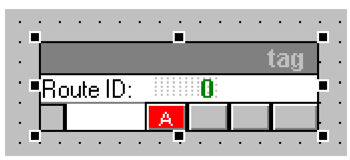
10.7.2 How to Copy the Route Control Block Icon

Procedure

1. Open the PCS 7 OS Explorer.
2. Open the Graphics Designer.



3. Open the @Template_RC.pdl file with the menu command **File > Open**.
4. Select and copy the Route Control block icon.



Additional information

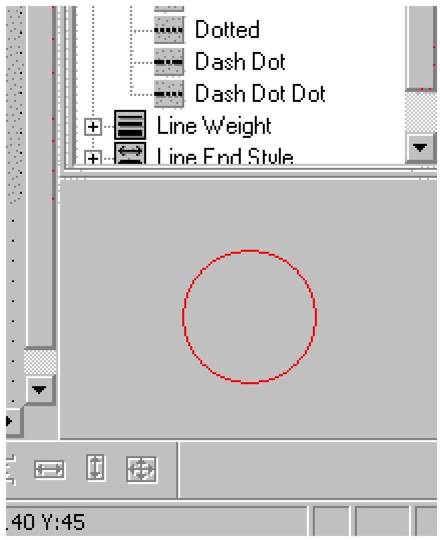
You can find information about interconnecting Route Control block icons in:

- "How to Start the Dynamic Wizard" (Page 337).

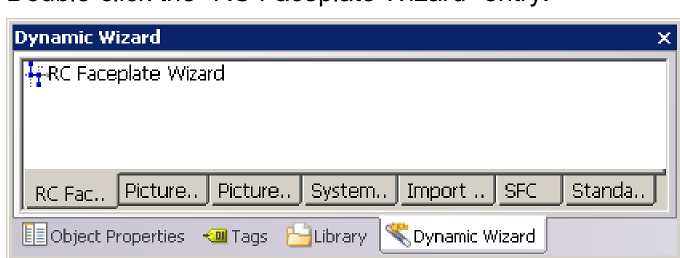
10.7.3 How to Start the Dynamic Wizard

Procedure

1. If the Dynamic Wizard is not visible, right-click in the empty area below the control elements.

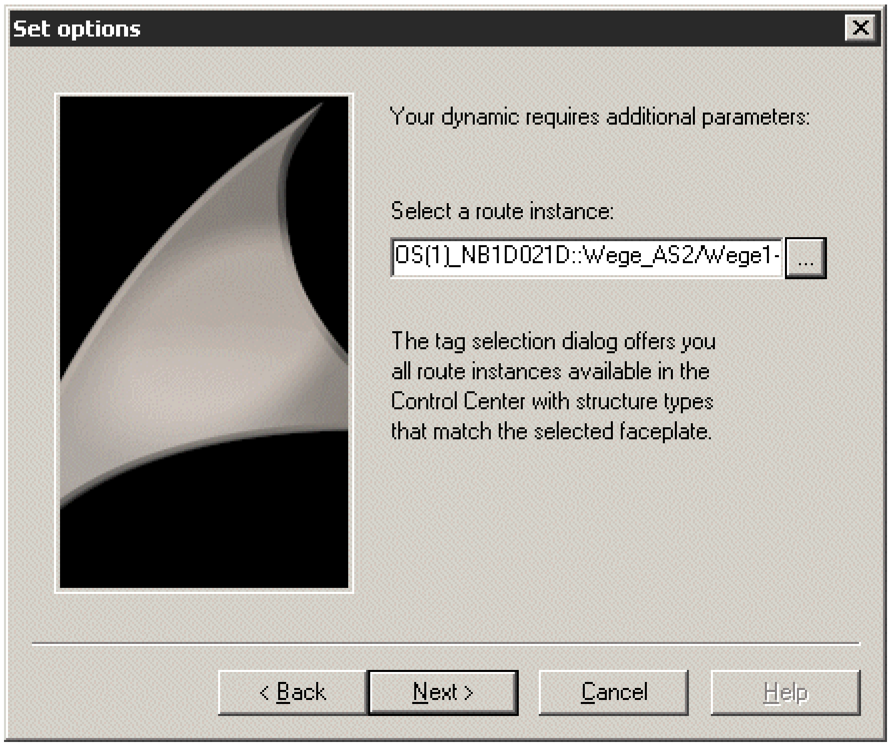
   The "Toolbars" dialog box opens.
   Check the Dynamic Wizard box in the dialog box.
   Click "OK".
2. Select the block icon.
3. Select the "RC Faceplates" tab in the Dynamic Wizard window.
4. Double-click the "RC Faceplate Wizard" entry.

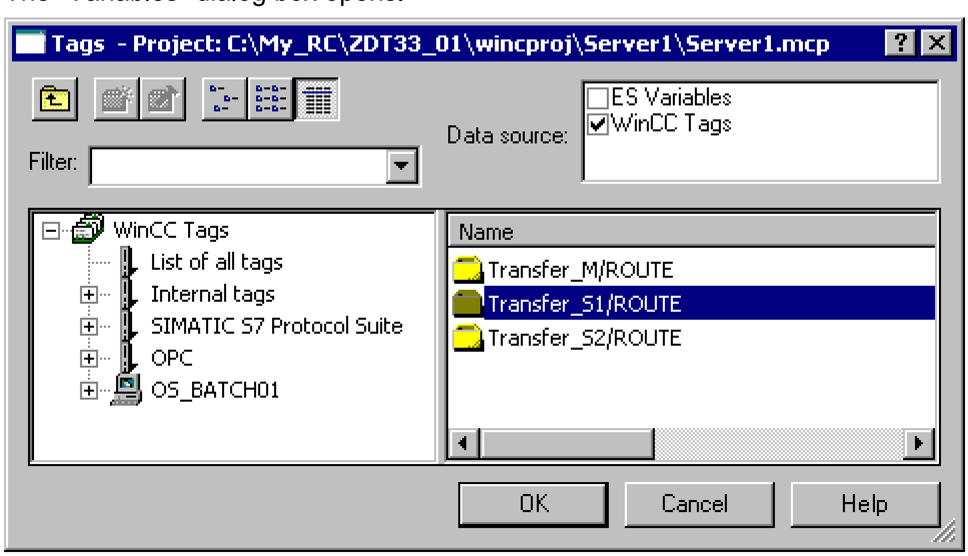
   The first step is displayed.
   If you do not wish to view this step in the future, check the "Do not display this page again" box.
5. Click "Next".
   The step for entering Selecting a Route Instance (Page 338) is displayed.

10.7.4 How to Select a Route Instance

Procedure



1. Click "...".
   The "Variables" dialog box opens.



2. Select the route-block instance (type RC_IF_ROUTE) to which the block icon is to be interconnected.

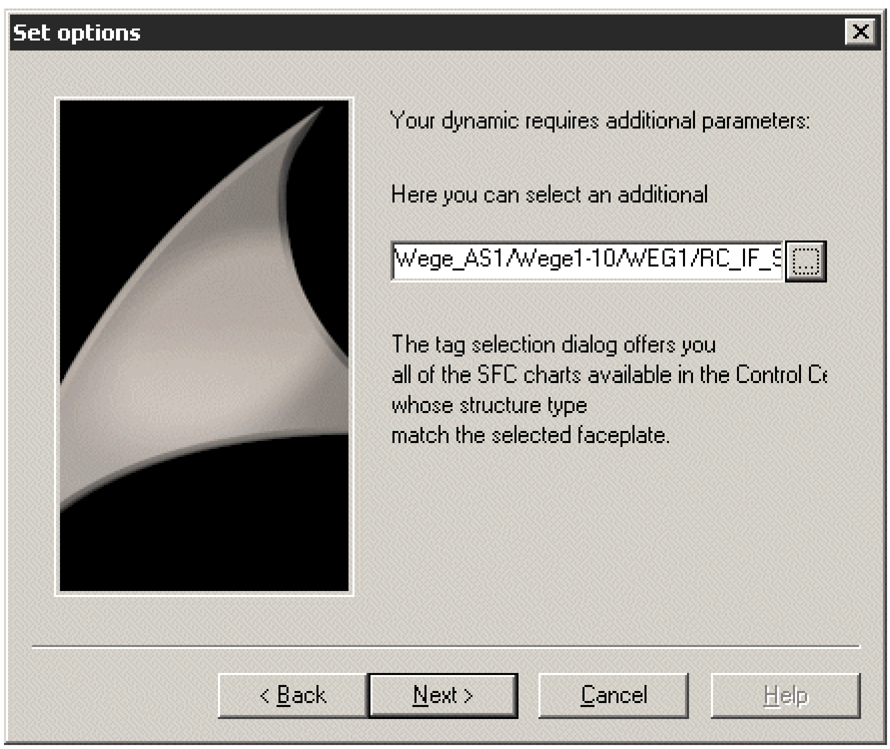
3. Click "OK".
   The "Variables" dialog box closes.
   The selected instance of the route block is entered.
4. Click "Next".
   The step for Selecting an SFC Block (Page 339) is displayed.

Note

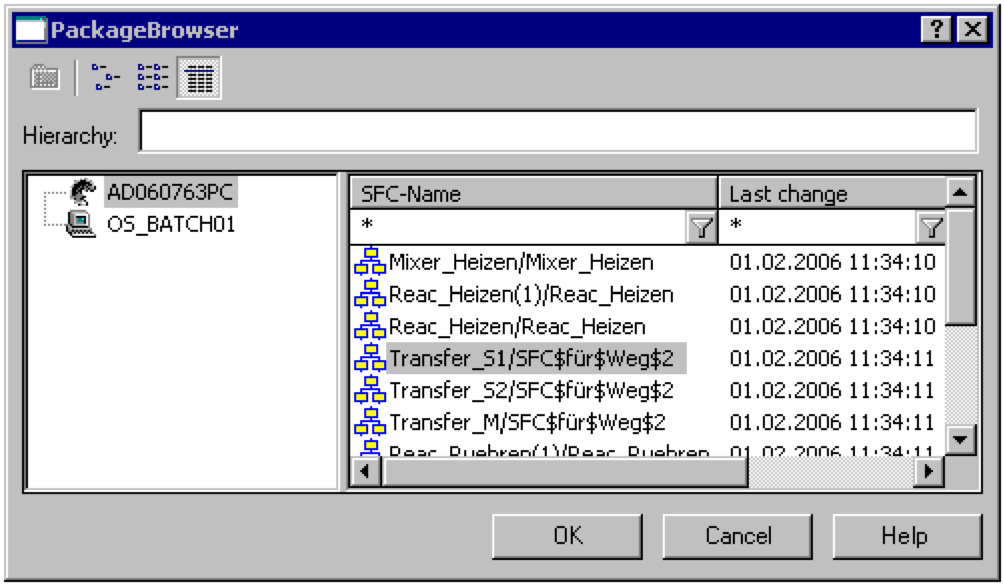
The RC_IF_ROUTE instances must have been transferred from engineering to the PCS 7 OS project beforehand (see Compiling the OS in SIMATIC Manager).

10.7.5 How to Select an SFC Block

Procedure



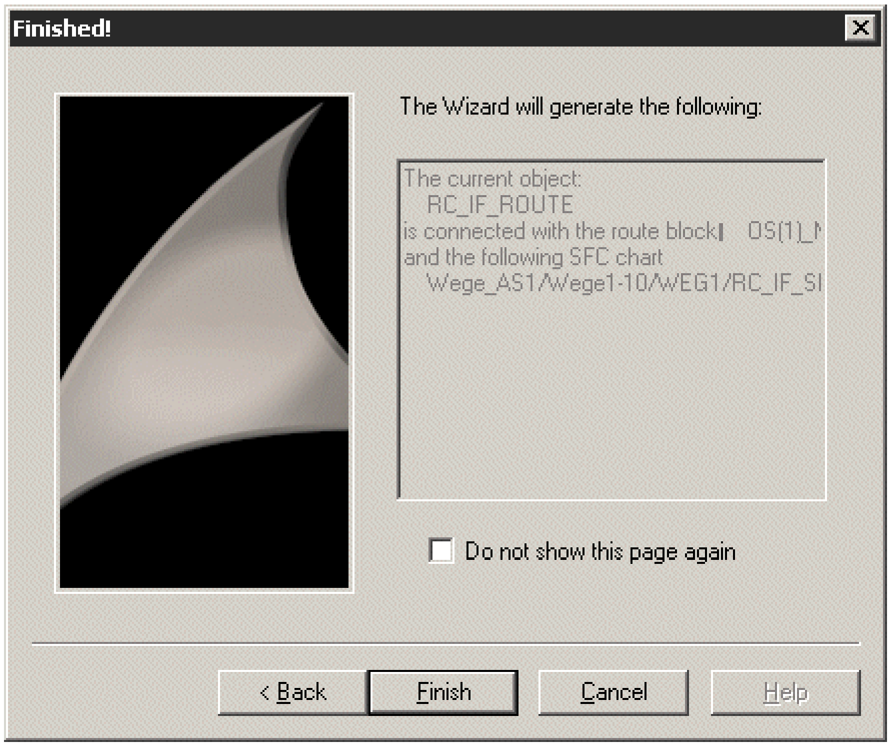
1. Click "...".
   The "PackageBrowser" dialog box opens.



2. Select the SFC block to which the block icon is to be interconnected.
   If you interconnect an SFC block, you can open an SFC dialog box during runtime to display the SFC chart controlling the route.
3. Click "OK".
   The "PackageBrowser" dialog box closes.
   The selected SFC chart is entered.
4. If you have not deactivated the last step:
   Click "Next".
   The Summary (Page 341) step opens.
   Otherwise, click "Finish"
   . The selected interconnections will be created.

10.7.6 Summary in Dynamic Wizard

Procedure



1. The interconnections you selected previously appear.
   You can deactivate this step for future calls.
2. Click "Finish".
   The selected interconnections are created.

11 Exporting/Importing with the Route Control Wizard

11.1 Transferring Data from an S7 Project

Interaction of the Components

You configure central data in SIMATIC Manager. Using the Route Control Wizard, you can export the data relevant for Route Control from the S7 project and import it into the Route Control project.

As of V7.0, there is only one Route Control Wizard, which performs both the export and import of data in immediate sequence.

You start the Route Control Wizard in SIMATIC Manager.

The Route Control Wizard generates a log file while it is running.

Additional information is available in the section "Actions in the Route Control Wizard (Page 346)".

Reaction after Removing Projects from a Multiproject

If you have removed individual projects from a multiproject for a time for the purposes of external editing and you then start the Route Control Wizard, you will be prompted that not all data from the multiproject are currently available.

When the Route Control Wizard imports data into Route Control Engineering, it informs you that the data removed from the multiproject must be handled in a particular way. The wizard does not delete these data from the Route Control project; instead, it shows the affected objects in gray and in brackets. You can nevertheless continue to work with these objects in Route Control Engineering.

When downloading to the server you are informed that these objects cannot be downloaded. The affected automation systems are locked for Route Control.

Exclusive use of the Route Control configuration tool

- Route Control Engineering
  If a project is open in Route Control Engineering, the same project cannot be opened, either with a different Route Control Engineering or with a Route Control Wizard.
- Route Control Wizard
  If a project is open in the Route Control Wizard, the same project cannot be opened, either with a different Route Control Wizard or with a Route Control Engineering.

11.2 Synchronizing Objects

Introduction

When the Route Control Wizard imports the data exported from the S7 project into the Route Control project, the wizard synchronizes the data to be imported with the data in the Route Control project.

Synchronizing Objects

The following rules apply when objects are synchronized:

Type of object	Result of synchronization
Objects with the following properties: • Created in the Route Control project during an earlier import performed by the wizard • Now contained in the import file again • Whose properties may have changed	Objects are updated..
Objects with the following properties: • Created in the Route Control project during an earlier import performed by the wizard • Not contained in the import file • Groups (e.g., CE, SE, etc., routes, TH) were selected during export	Objects are deleted.
Objects with the following properties: • Created manually in the Route Control project	Object are neither deleted nor modified.
Objects with the following properties: • Not previously available in the Route Control project • Available in the import file	Objects are newly created.
"Process cell" and "unit" objects with the following properties: • Containing an internal key, which the wizard can use for identification purposes	Interconnections are not lost.
Objects with the following properties: • Belongs to a project that has been removed from the multiproject for external editing.	Object are neither deleted nor modified.

CAUTION

Do not assign the Route Control object IDs in the CFC charts manually. Leave this to the Route Control Wizard. This ensures consistent data.

The ID is the key for these objects. For example, if you assign another ID to an AS, this AS is then recognized as a "new" AS and the old AS as a "deleted" AS. As a result, the interconnections of elements from this AS are then lost in Route Control Engineering.

Additional information

- Section "Deleting Used Elements" (Page 345)

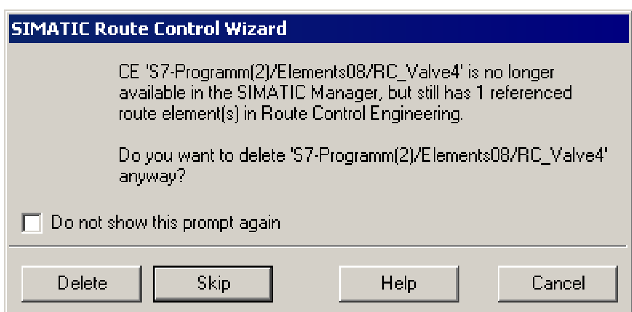
11.3 Deleting Used Elements

Introduction

If you change the type of an element in CFC, you usually also have to reassign the properties of the element in Route Control Engineering. To do this, the element must be removed from all partial routes and interconnected again.

Dialog box

If the Route Control Wizard finds such an element during an import, the following dialog box appears:



Meanings of Operator-Control Elements

Button	Meaning
Delete	The element is deleted, removed from all partial routes and reimported.
Skip	The element is not deleted, nor removed from partial routes, nor reimported.
Help	This opens the online help.
Cancel	The import procedure is canceled.

If you have clicked "Do not show this prompt again" and you then click "Delete" or "Skip", this choice is applied to all subsequent prompts for this import operation.

Note

You can undo this setting with the menu command
Options > Settings > Activated System Messages
.

11.4 Actions in the Route Control Wizard

Overview

The Route Control Wizard ensures that exported data are consistent.
Please also refer to the information in the section titled
"Route Control Wizard Start Requirements" (Page 86).

You can perform the following actions in various steps in the Route Control Wizard:

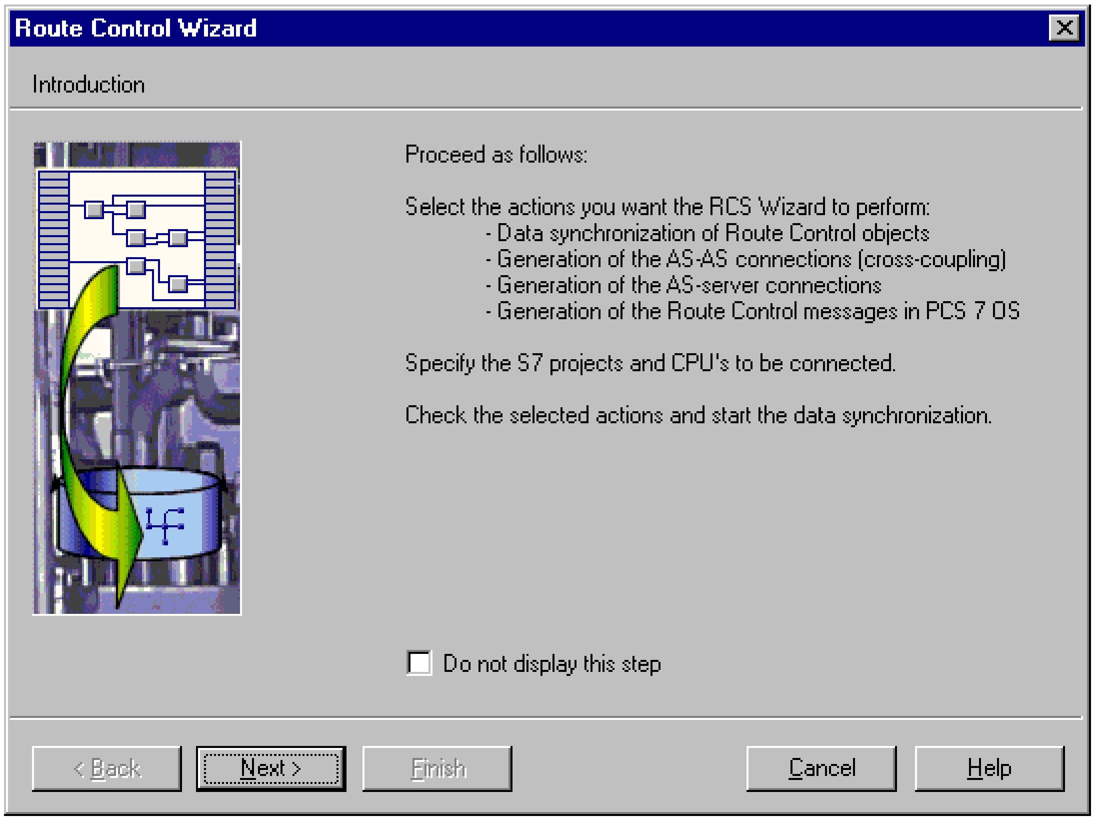
Action	Meaning
Data synchronization of Route Control objects/ plausibility check	Transfer the plant hierarchy, including process cells, units, and locations, from the S7 project to the Route Control project. Check and, if necessary, correct the element IDs in an AS. If an invalid ID has been configured for an element, the wizard will suggest a new ID. Transfer new element types, such as MYMOTOR. Check and, if necessary, correct the IDs of the automation systems relevant to Route Control. Transfer the AS names and IDs to Route Control Project Engineering.
Generation of AS-AS connections	Establish and modify the communication links between the automation systems relevant to Route Control (cross-couplings).
Generation of AS-server connections	Establish and modify the communication links between the automation systems relevant to Route Control and Route Control servers.
Export of message servers	If Route Control is to generate messages, you have to export the PCS 7 OS servers available in the project so that you can select the PCS 7 OS server in the next step.
Generation of messages	If this check box is selected, the messages for the Route Control server are generated in the PCS 7 OS project. These two settings have been separated because messages do not always have to be generated anew, for example, when only the name of the PCS 7 OS computer has changed.
Selection of the PCS 7 OS message server(s)	Specify the PCS 7 OS that is to act as the message server for Route Control (only one PCS 7 OS is ever selected here, including for a redundant configuration).

Note

AS-AS and AS-server connections:
In order for the Route Control Wizard to create the connections, the automation systems and their network cards must have already been configured in NetPro (HW Config).

Starting the Route Control Wizard

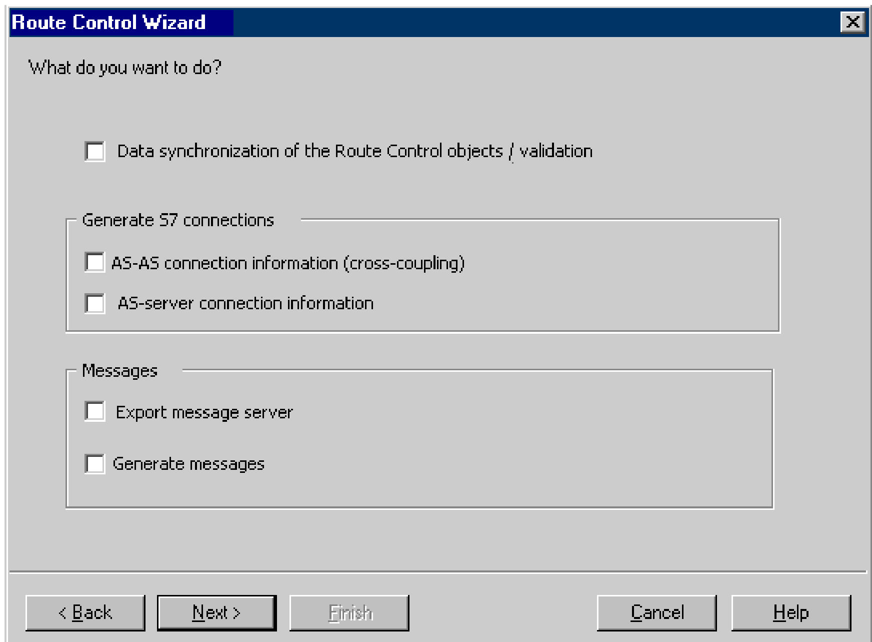
1. Close Route Control Engineering.
2. Start the wizard in SIMATIC Manager by selecting the menu command **Options > SIMATIC Route Control > Wizard**.
   The "Introduction" step opens.



   You can deactivate this step for additional calls.
3. Click "Next".
   The step for "Selecting Actions in the Route Control Wizard" (Page 348) opens.

11.5 Selecting Actions in the Route Control Wizard

Dialog box



Meanings of operator control elements

Operator-control element	Meaning
"Action" column	Tasks, which the Route Control Wizard can perform for you.
"Selection" column	☑ The wizard should perform these tasks. ☐ The wizard should not perform these tasks.
Back	This takes you to the previous step.
Next	This brings you to the next step.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be exported.
Help	This opens the online help.

Procedure

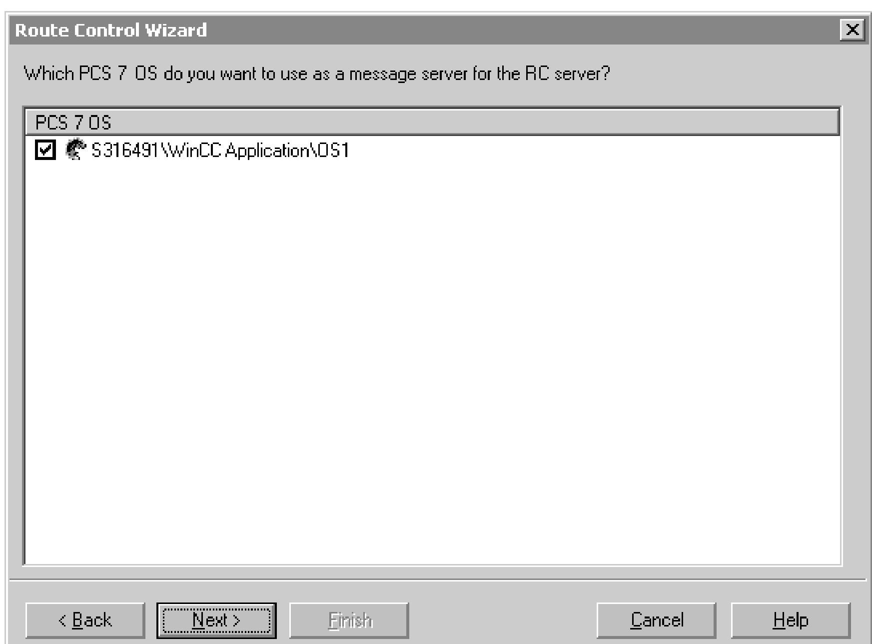
1. Select or deselect the required check boxes.
2. Click "Next".
   If you have checked the "Export message servers" box,
   the step for "Selecting the PCS 7 OS Message Server" (Page 349) will open.
   Otherwise, this step will be skipped and the step for
   "Selecting Objects to be Exported" (Page 350) will open.

   Note

   After a new or update installation of Route Control, the Route Control Wizard must be started at least once with all options (especially "Export message server" and "Generate messages"). This will ensure that the configuration of the message OS is up-to-date. This information is then distributed to the RC server(s) at the next "Load RC server" operation.

11.6 Selection of the PCS 7 OS Message Server

Dialog box



Meanings of operator control elements

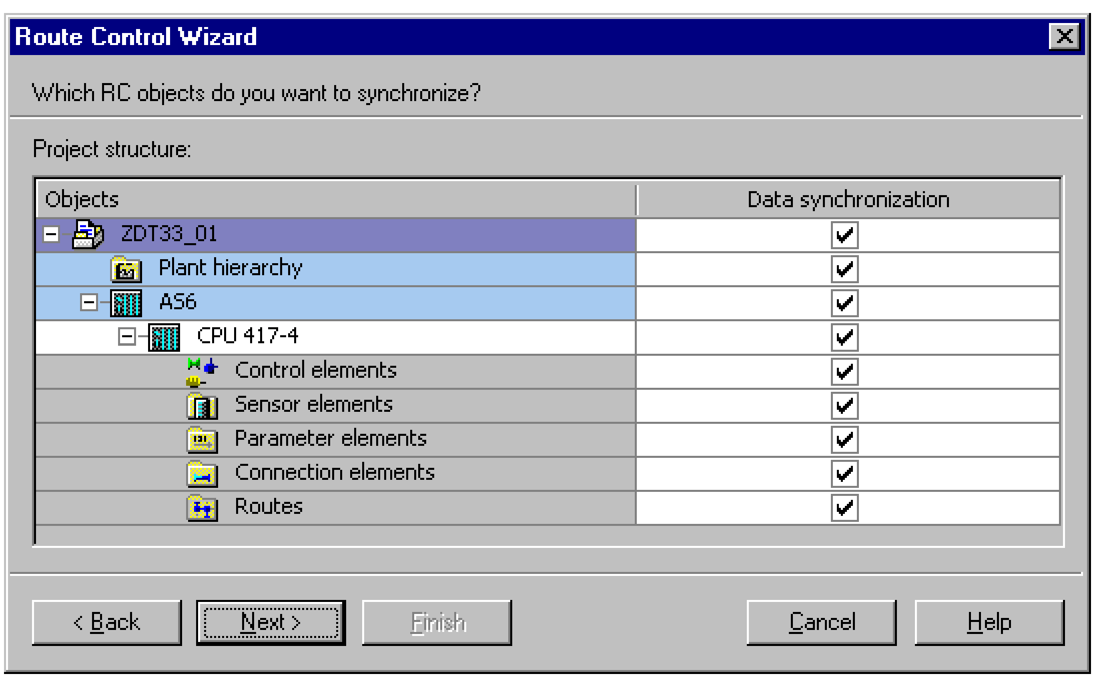
Operator-control element	Meaning
"PCS 7 OS" column	List of all PCS 7 OS servers the wizard has found in this project. Although any PCS 7 OS can be a message server for Route Control, no more than one PCS 7 OS can be selected.
"Message server" column	☑ This PCS 7 OS is to be the message server for Route Control messages. ☐ This PCS 7 OS is not to be the message server for Route Control messages.
Back	This takes you to the previous step.
Next	This brings you to the next step.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be exported.
Help	This opens the online help.

Procedure

1. Select the required box.
   Select the two computers for redundant PCS 7 OS servers.
2. Click "Next".
   The step for entering "Selecting objects to be exported" (Page 350) is opened.

11.7 Selecting Objects to be Exported

Dialog box



Meanings of Operator-Control Elements

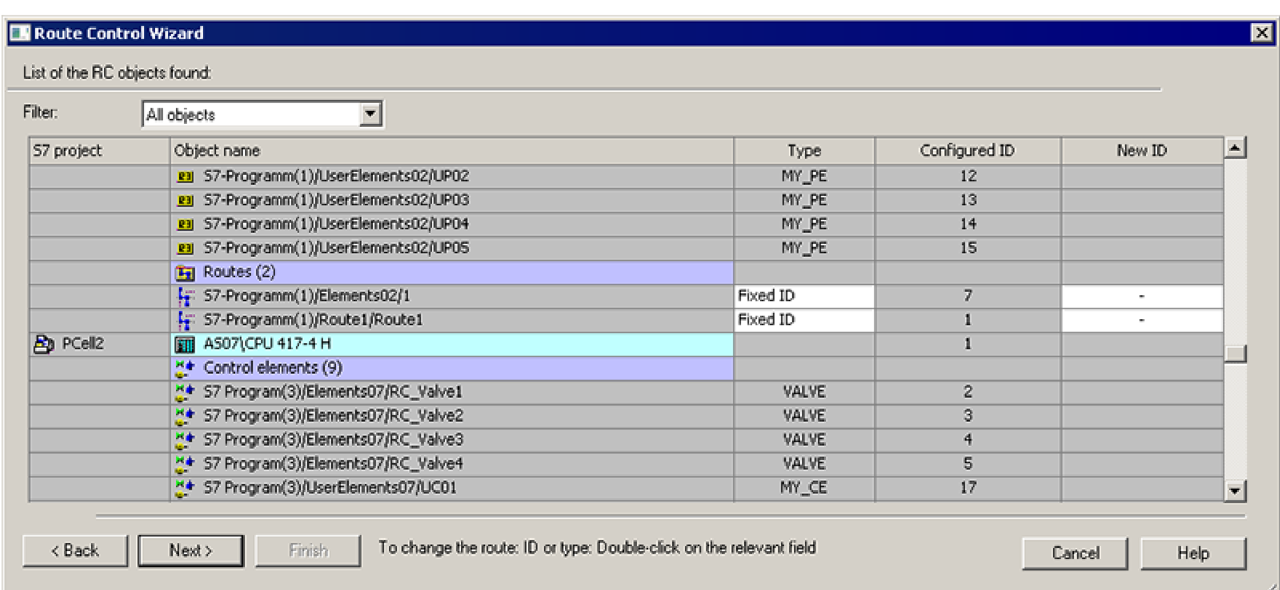
Operator-control element	Meaning
"Objects" column	Objects from the S7 project that can be exported and transferred to Route Control Configuration. Elements and routes can be exported as a group only and not as an individual instance.
"Data synchronization" column	☑ Objects/object group exported ☐ Objects/object group not exported Selecting a CPU or an S7 project check box will also select all of the lower-level objects.
Back	This takes you to the previous step.
Next	This brings you to the next step.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be exported.
Help	This opens the online help.

Procedure

1. Select or deselect the required check boxes.
2. Click "Next".
   The step for "Adapting Route IDs" (Page 351) opens.

11.8 Adapt IDs of Routes

Dialog box



Description

The Route Control Wizard has performed a plausibility check and displays the results here.

The wizard suggests suitable IDs and selects incorrect entries.

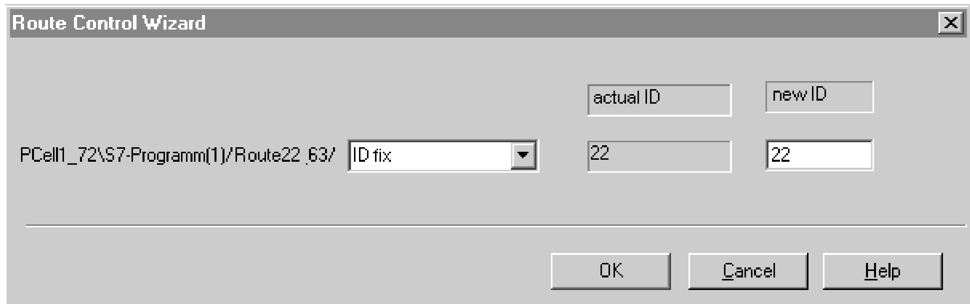
You can edit the entries in the fields with white backgrounds.

Meanings of Display and Operator Control Elements

Operator control element	Meaning
"Filter" drop-down	The filter criteria below are available: • All objects • Modifiable objects • Modified objects • Faulty objects **Note:** In the case of the "Modified objects" setting, the objects for which the wizard has recently modified the IDs will be shown. Objects that have been manually modified or deleted in the SIMATIC Manager will not be displayed here.
"S7 project" column	Name of the S7 project in which the wizard has found and checked the elements listed
"Object name" column	Instance of element = CFC chart name and instance name of the block in the CFC chart
"Type" column	Element type, that is, the "subtype" (for example, a MOTOR or VALVE for a control element). This type is specified in the blocks as a UDA with the UDA name "S7_SUBTYPE". This UDA can be configured for user blocks. You can specify if the route ID should be dynamic or fixed. To do this, click the field with a white background, open the drop-down list and select the desired entry.
"proj. ID" column ID	ID that has been configured or suggested by the wizard
"New ID" column	You can specify an ID for the route other than the one determined by the wizard.
Back	This takes you to the previous step.
Next	This brings you to the next step.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be exported.
Help	This opens the online help.

Procedure

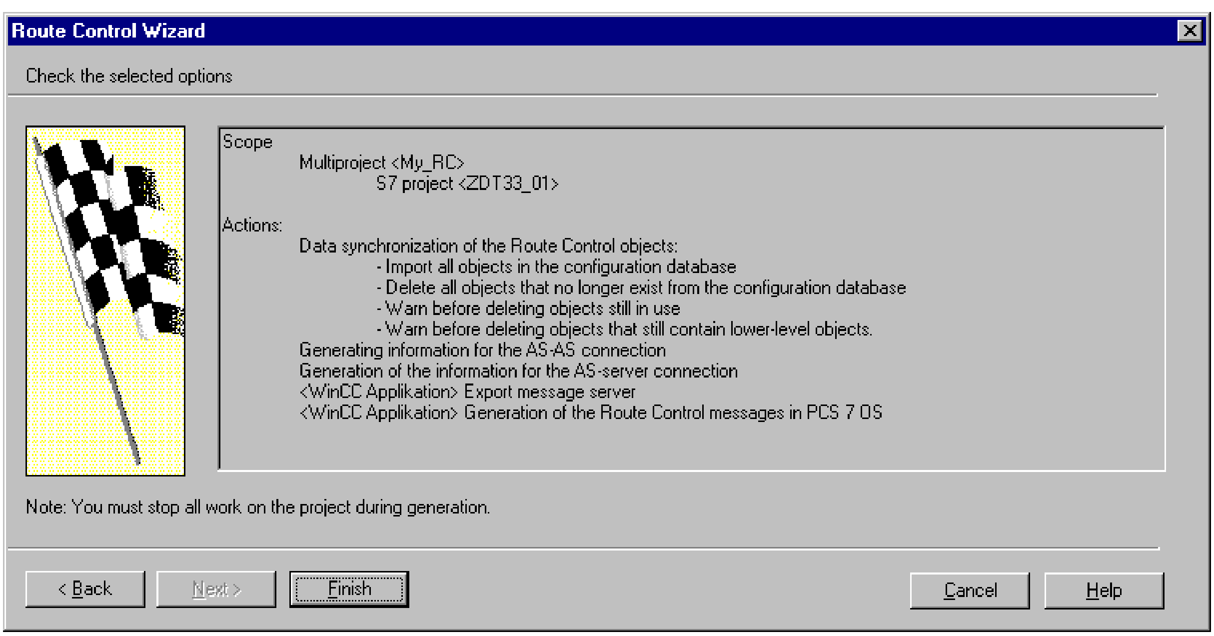
1. Double-click the value you want to change.
   An editing window opens.



2. Change the desired value.
3. Click "OK"
4. When you have made all the necessary changes, click "Next".
   The step with the "Summary of Actions" (Page 353) opens.

11.9 Summary of the Actions

Dialog box



Description

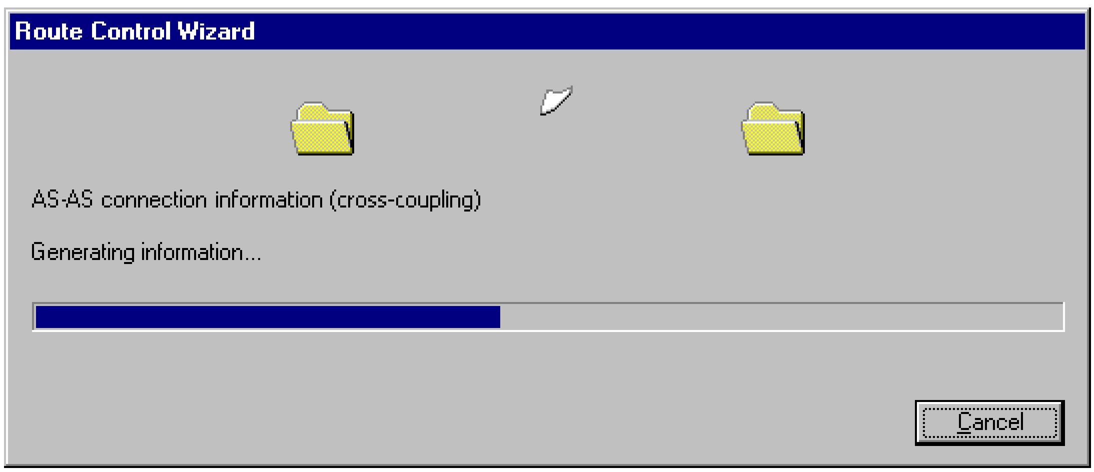
Here you can view the actions, which you have selected in the previous steps.

Meanings of Operator-Control Elements

Operator-control element	Meaning
Back	This takes you to the previous step.
Finish	Starts data synchronization and export
Cancel	This cancels the wizard; no changes will be made to the data and no data will be exported.
Help	This opens the online help.

If you want the Route Control Wizard to perform the selected actions, then click "Finish".

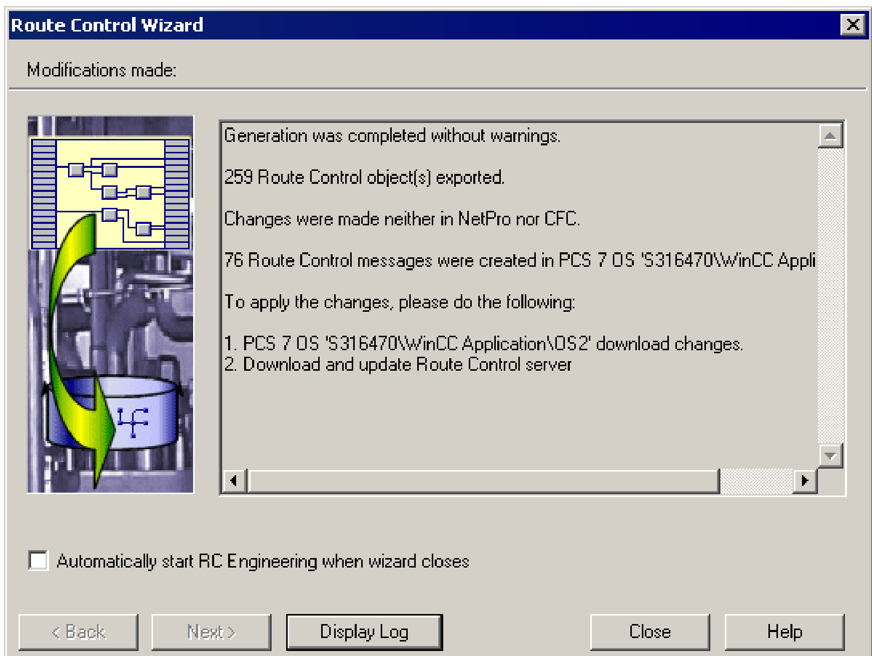
Afterwards, the progress of each action is displayed as it is being performed.



When the process is completed, the "Result of the Actions" (Page 355) are displayed.

11.10 Result of the Actions

Dialog Box



Description

Here you see the results of the actions performed by the wizard and the actions remaining.

If errors occurred, you should display the log.

If the wizard has made changes in NetPro or to the CFC charts, you must compile and download them to the AS. Once this has been carried out, Route Control can "go online" again.

If Route Control messages were generated, you need to compile the PCS 7 OS.

If objects were entered into Route Control Project Engineering (for example, elements, routes, PH, locations), you must download the Route Control server again and perform an update.

Meanings of Operator-Control Elements

If required, check the box for starting Route Control Engineering automatically.

Operator-control element	Meaning
Display Log	Opens the log file.
Close	Closes the Route Control Wizard.
Help	This opens the online help.

Additional Information

- Section "Export Log" (Page 356)

11.11 Log

File Name

RC_EXPORT_ASSISTANT.LOG

File Location

The log file is saved to the same location as the Route Control project database, e.g., Program Files\SIEMENS\STEP7\S7Proj\Multiproject\Project\Global\RCS.

File Sections

The meanings of the file sections are listed in the following table:

Section	Meaning
Log of the Route Control Wizard (V x.y)	S7 project path in whose context the Route Control Wizard was called
Reading of project structure	General information relating to the project
Selecting Actions	Actions to be performed by the wizard
Selection of message server	PCS 7 OS (WinCC application)
Selection of Route Control objects	The objects/object groups (such as CE, PE, SE, LE, and routes) to be exported from an AS are specified here (filter).
Reading of instances	A list of the elements (instances of elements, routes, and plant hierarchy) that were found in this project (restricted by the filter indicated above)
Prepare transaction	List of objects that have been exported Information as to whether an element ID has to be modified and, if so, which new ID is suggested
Generation of AS-server connections	List of S7 connections
Generation of AS-AS connections	List of S7 connections
Update of the cross-coupling variables at the <RC_IF_CFG> block	List of variables Indication if update is required
Close transaction	Information about closing actions
Database synchronization	Information about the synchronization of the Route Control database
Summary	Information about the results of the export
TODO	Actions you need to perform to put the changes into effect.

CSV Export/Import 12

12.1 CSV Interface Overview

Description

This interface allows you to simplify and accelerate the configuration process in Route Control. You can export the most important objects from Route Control Engineering to a CSV file, edit these using external tools, and then re-import them. A wizard supports you in exporting and importing the data.

Benefits can mainly be seen during configuration if you are able to make good use of the copy function, for example in Microsoft Excel.

Note

Editing the CSV file

Observe the rules for the editing sequence applicable to configuring in Route Control when editing the CSV file. If you insert routes into the CSV file, you need to adapt the sequence according to modes. First, enter the elements of mode 1, then the elements of mode 2, etc. Then adapt the sequence or renumber the elements.

Note

Import/Export of a CSV file

There is a language dependency in the ALLRouEL.CSV file in the CSV Import/Export in RC Engineering. For this reason, the same language must be set in the CSV Import/Export of the ALLRouEL.CSV file for export and import

Example:

English is set in the RC Engineering and the CSV Export Wizard generates the ALLRouEL.CSV file. If the language is now set, for example, to German and an attempt is made to import the ALLRouEL.CSV file with the CSV Wizard, an error occurs.

The following data can be exported:

- CE - control elements
- SE - sensor elements
- PE - parameter elements
- LE - link elements
- All locations
- User types

- Activation masks for user types
- All mode tables
- All partial routes
- All partial routes with interconnected elements
- One partial route with interconnected elements

The following data can be imported:

- Activation masks for user types **from screenshot**
- All mode tables
- All partial routes
- All partial routes with interconnected elements
- One partial route with interconnected elements

You can import some of the following data:

- CE - control elements
  "Ignore error" only
- PE - parameter elements
  "External" only
- All locations
  "Variants" only
- User types
  "Unit" only for PE

Note

You cannot import the following data or can import it only partially:

- Locations
- User types
- Elements

This data is now configured in SIMATIC Manager and not in Route Control Engineering. The Route Control Wizard scans the PCS7 project for this data and imports it into Route Control Engineering. To prevent inconsistencies between the SIMATIC PCS 7 project and Route Control Engineering, importing this data via the CSV interface is not allowed. The elements, locations and user types must be configured in SIMATIC Manager. You cannot import these data using the CSV interface.

Note

Note on editing in Excel

Instead of double-clicking the CSV files to open these for editing in Microsoft Excel, use the menu command **File > Open** so that you can set the separator correctly.

Save the files after editing in Microsoft Excel as"Unicode Text". The separators are replaced with tabs.

Comments

You can add comments at the end of a line when editing exported CSV files. A comment may also appear on its own in a line.
A comment must always begin with the character [//].

The Wizard ignores the comments during import.

Note

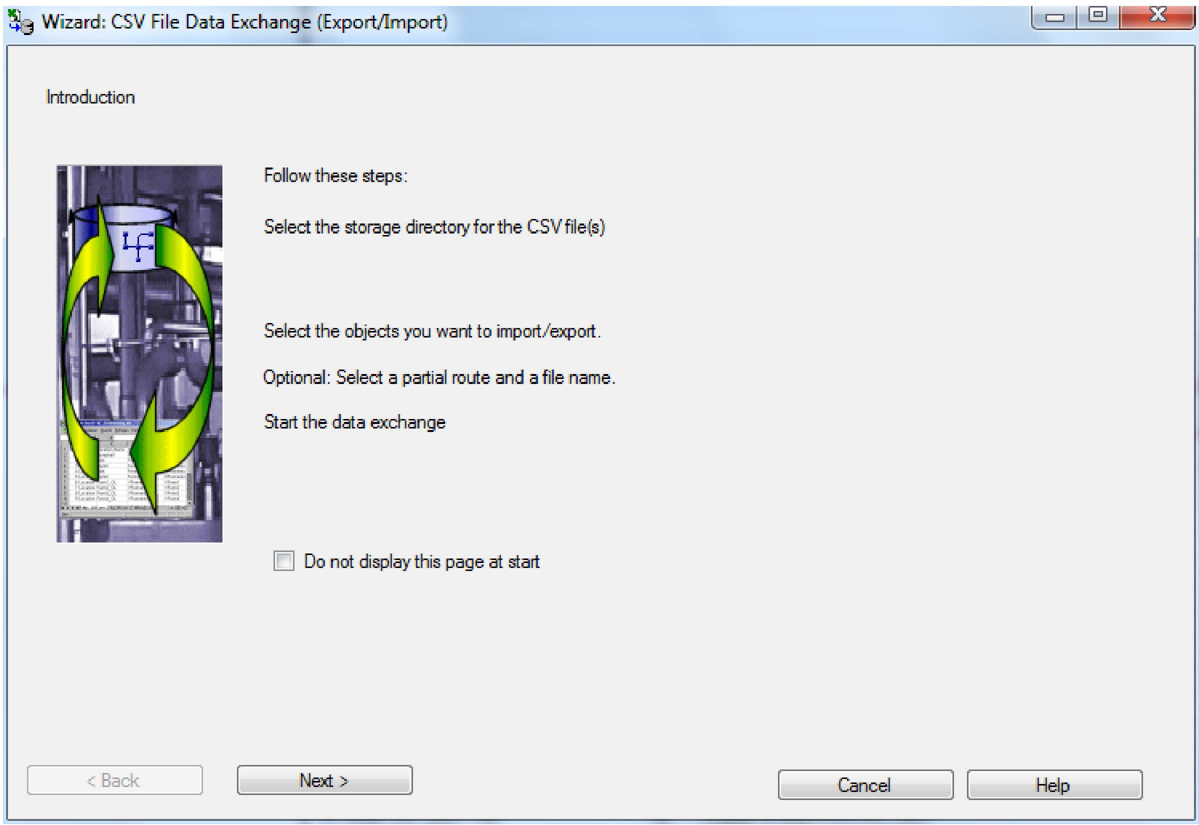
A new export to the same file deletes all comments from this file!

Starting the wizard

Select the
Options > Export/Import > CSV command in Route Control Engineering.
The Start step (Page 360) is displayed.

12.2 Initial Step

Dialog box



Description

Here you are provided with an overview of the actions to be performed. This step can be disabled so that it will no longer appear, even if the CSV wizard is called again. If you want to reactivate it, select the following menu command in Route Control Engineering:
Options > Settings > Activate System Messages.

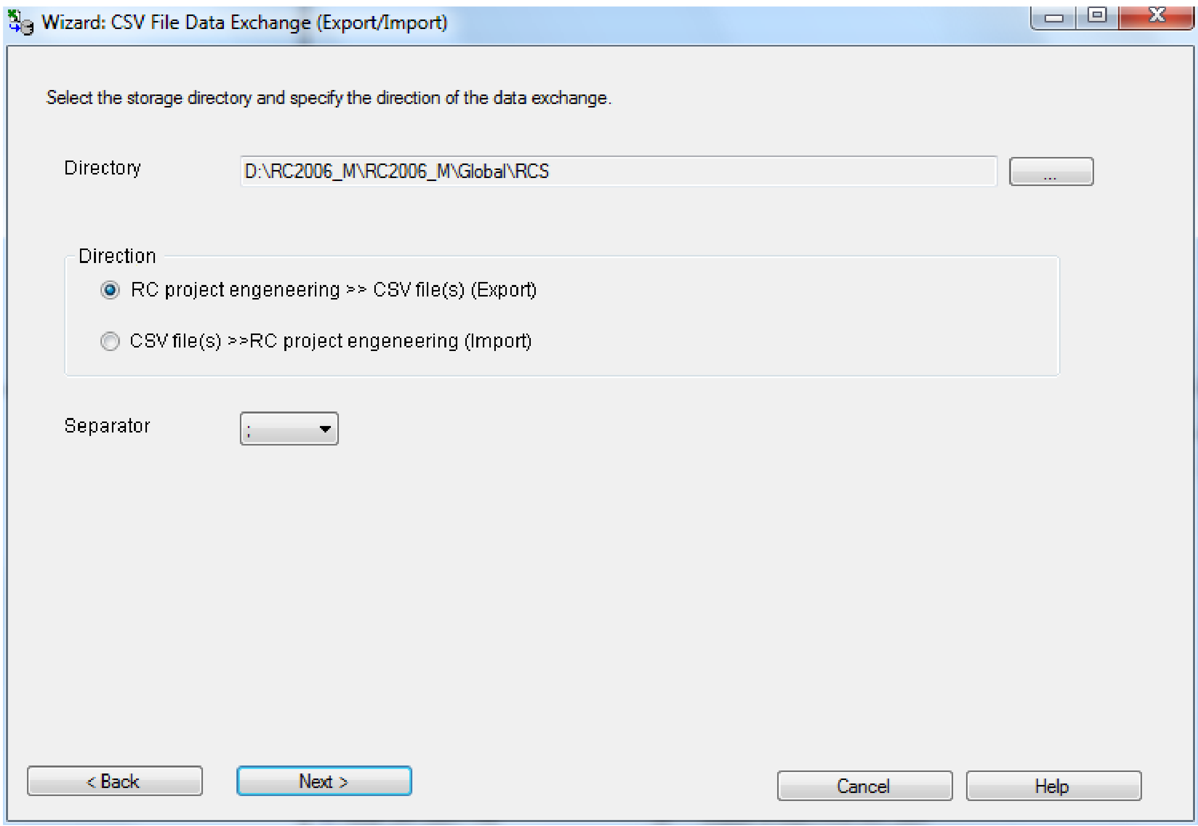
Meanings of Operator-Control Elements

Operator-control element	Meaning
☐ Do not display this page again	This step will always be displayed upon subsequent calls.
☑ Do not display this page again	This step will no longer be displayed upon subsequent calls.
Next	This brings you to the next step.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be imported or exported.
Help	This opens the online help.

Click "Next".
The step for entering global settings (Page 361) is displayed.

12.3 Global Settings

Dialog box



Description

In this step, you must make the following settings for data exchange:

- Directory in which the CSV files are to be stored or in which the CSV files to be imported are located.
  The default setting is the directory in which the Route Control configuration database is located.
  Click "..." to change the default setting.
- The direction in which data is to be exchanged:
  Export = data exchange from the Route Control configuration to the CSV file.
  Import = data exchange from the CSV file to the Route Control configuration.
- Separators to be used as a marker to distinguish between columns in the CSV files. TAB is the separator recommended for EXCEL, since EXCEL uses the TAB separator set in Windows when saving.

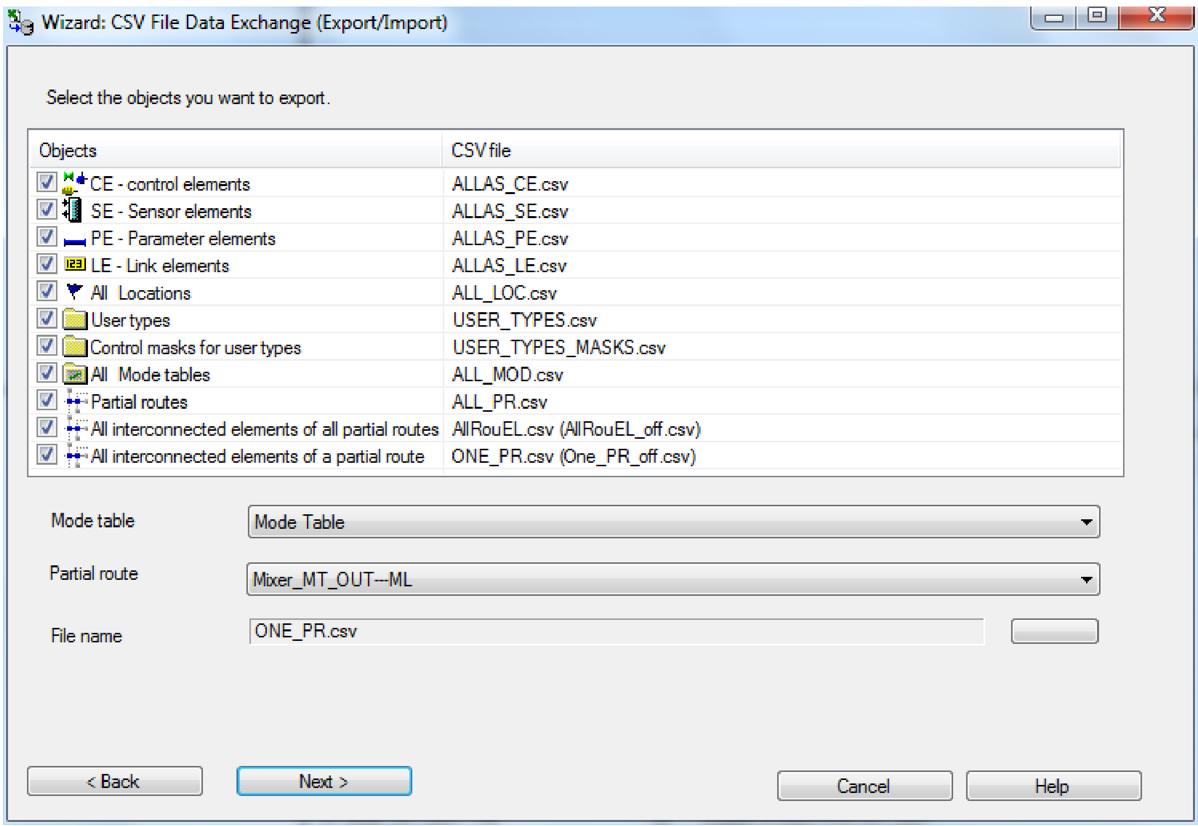
Meanings of operator control elements

Operator control element	Meaning
Back	This takes you to the previous step.
Next	This brings you to the next step.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be imported or exported.
Help	Opens the online help.

Click "Next".
The step for selecting the objects (Page 363) is displayed.

12.4 Selecting Objects

Dialog box



Description

You select the objects to be exchanged in this step. If you select the bottom entry ('One partial route with interconnected elements'), you must select a configured partial route from the drop-down list and specify a file name (with a *.CSV extension) underneath it.

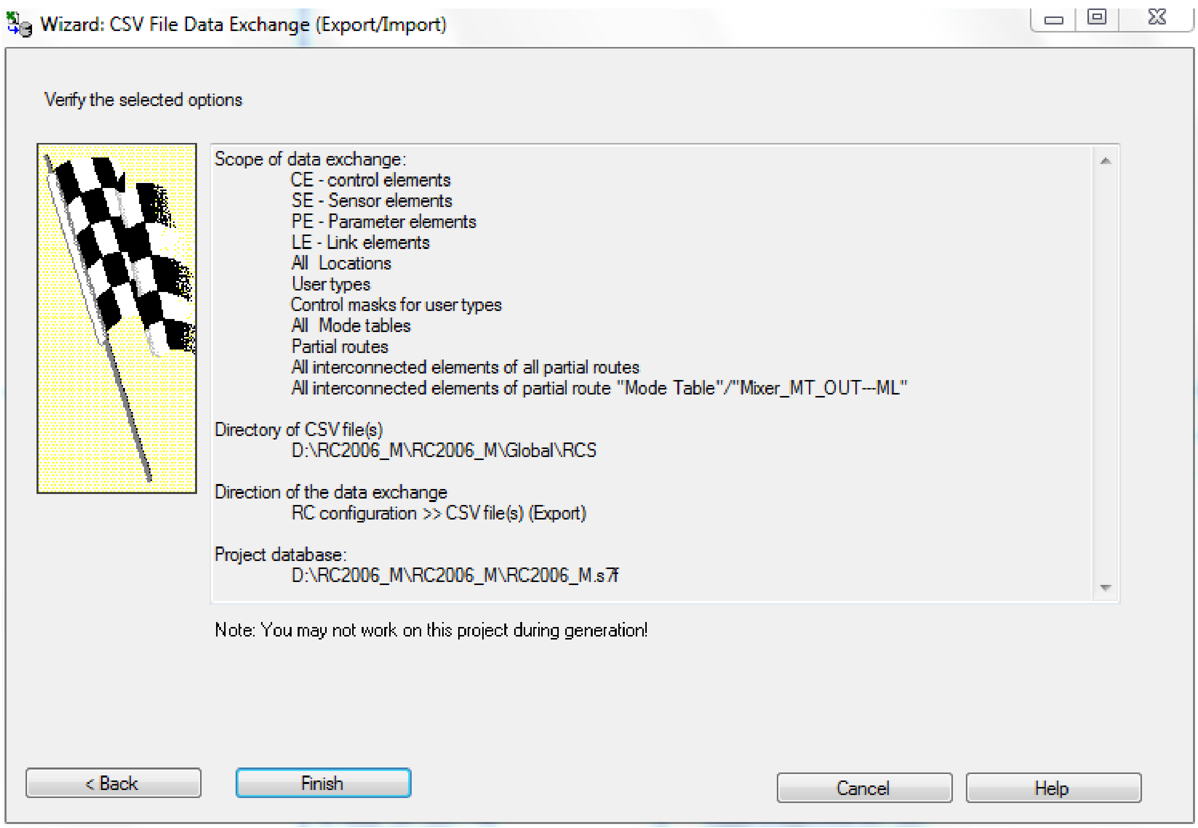
Meanings of Operator-Control Elements

Operator-control element	Meaning
..	Here you can select an existing CSV file.
Back	This takes you to the previous step.
Next	This brings you to the next step.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be imported or exported.
Help	This opens the online help.

Click "Next".
The Summary (Page 364) is displayed.

12.5 Summary

Dialog box



Description

This dialog box provides a summary of the actions, which you have set in the previous steps.

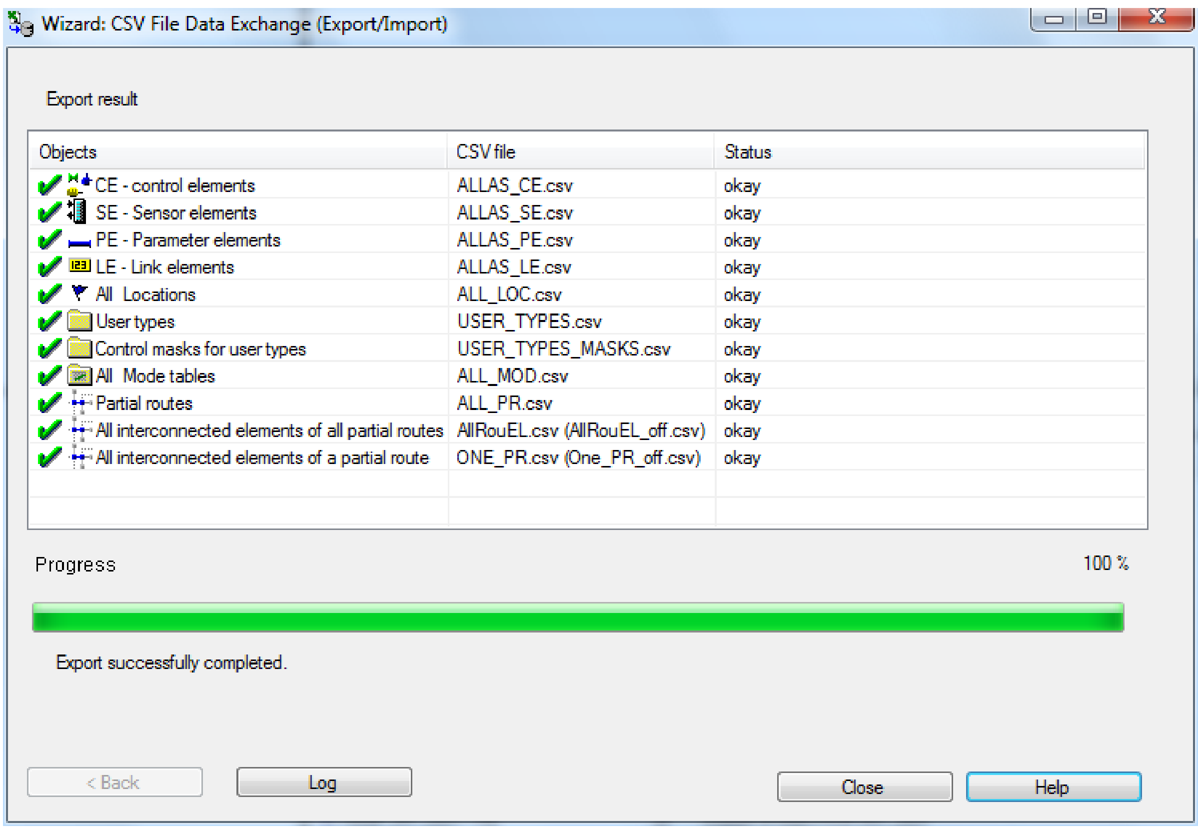
Meanings of operator control elements

Operator control element	Meaning
Back	This takes you to the previous dialog box.
Finish	This starts the export or import process.
Cancel	This cancels the wizard; no changes will be made to the data and no data will be imported or exported.
Help	Opens the online help.

Click "Finish". The progress display opens.

12.6 Result

Dialog box



Description

While the export/import is running, the progress and the result of individual actions is shown.

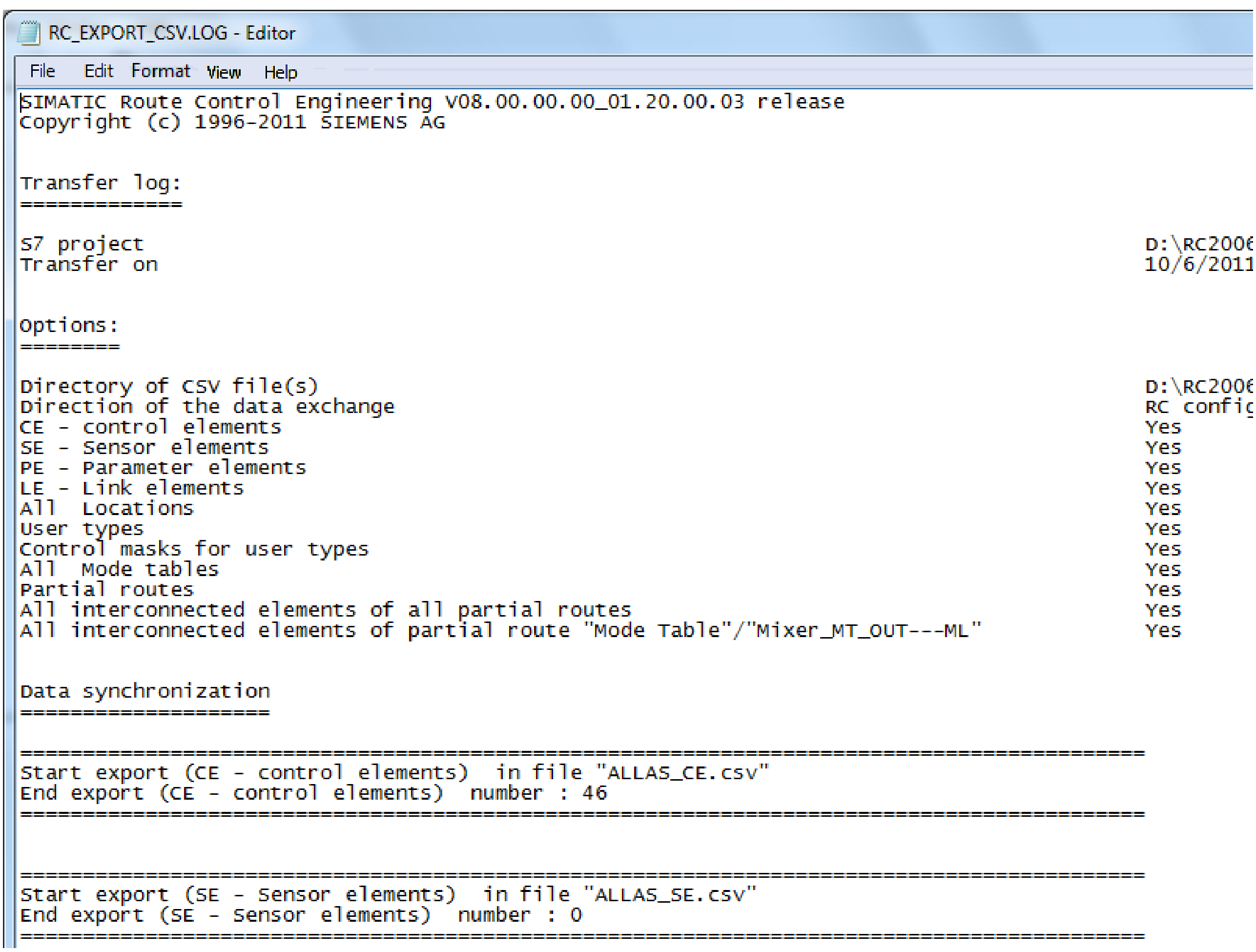
Once all of the actions have been performed, this dialog box provides an overview of the results of the individual actions.

Meanings of operator control elements

Operator control element	Meaning
Results list	The export/import operation was completed correctly for all elements in this group; no errors occurred. An error occurred in at least one element; the remaining elements were able to be imported/exported. A serious error occurred (for example, a CSV file could not be opened or an internal software error occurred).
Log...	This opens an editor displaying the "log file" (Page 366).
Close	This closes the wizard.
Help	Opens the online help

12.7 Log File

Dialog Box (Section)


```
RC_EXPORT_CSV.LOG - Editor
File  Edit  Format  View  Help
SIMATIC Route Control Engineering V08.00.00.00_01.20.00.03 release
Copyright (c) 1996-2011 SIEMENS AG


Transfer log:
=============

S7 project                                                                          D:\RC2006
Transfer on                                                                         10/6/2011


Options:
========

Directory of CSV file(s)                                                            D:\RC2006
Direction of the data exchange                                                      RC confic
CE - control elements                                                               Yes
SE - Sensor elements                                                                Yes
PE - Parameter elements                                                             Yes
LE - Link elements                                                                  Yes
All  Locations                                                                      Yes
User types                                                                          Yes
Control masks for user types                                                        Yes
All  Mode tables                                                                    Yes
Partial routes                                                                      Yes
All interconnected elements of all partial routes                                   Yes
All interconnected elements of partial route "Mode Table"/"Mixer_MT_OUT---ML"       Yes


Data synchronization
====================

=========================================================================================
Start export (CE - control elements)  in file "ALLAS_CE.csv"
End export (CE - control elements)  number : 46
=========================================================================================


=========================================================================================
Start export (SE - Sensor elements)  in file "ALLAS_SE.csv"
End export (SE - Sensor elements)  number : 0
=========================================================================================
```

Description

This log summarizes all of the settings and results of the individual steps. If an error occurs, you can consult this log to identify the cause of the error. The RC_EXPORT_LOG.TXT or RC_IMPORT_LOG.TXT file is always located in the same directory where the CSV files are stored.

You can find details in:

- "CSV Interface Export Log" (Page 367)
- "CSV Interface Import Log" (Page 368)

Additional information

- Section "CSV File Structure" (Page 369)
- Section "Error Messages" (Page 376)

12.8 CSV Interface Export Log

File Name

RC_EXPORT_CSV.LOG

File Location

The log file is saved in the same path as the CSV files.

File Sections

The transfer log contains the following information:

- Global information
- S7 project name: Name of S7 project containing the Route Control project
- S7 project path: Path to the S7 project
- User: User who initiated the export operation.
- Transfer date: Time stamp indicating the date of the export

Options:

- Settings you have made
- CSV storage directory: Path where the export CSV files are stored
- Direction of data exchange: Whether data are to be exported (written to CSV file) or imported (read from CSV file) is indicated here: Exporting

Data synchronization: (CE-control elements):

- Number of exported objects

For the objects below, the number of exported elements is also indicated in the same way as for control elements:

- SE
- PE
- LE
- Mode tables
- Locations
- Partial routes
- All partial routes with interconnected elements
- A partial route with interconnected elements

Additional information

- Section "CSV File Structure" (Page 369)
- Section "Error Messages" (Page 376)
- Section "CSV Interface Import Log" (Page 368)

12.9 CSV Interface Import Log

File Name

RC_IMPORT_CSV.LOG

File Location

The log file is saved in the same path as the CSV files.

File Sections

The transfer log contains the following information:

- Global information
- S7 project name: Name of S7 project containing the Route Control project
- S7 project path: Path to the S7 project
- User: User who initiated the export operation.
- Transfer date: Time stamp indicating the date of the export

Options:

- Settings you have made
- CSV storage directory: Path where the export CSV files are stored
- Direction of data exchange: Whether data are to be exported (written to CSV file) or imported (read from CSV file) is indicated here: Import

Data synchronization: (CE-control elements):

- Name of imported objects and information indicating whether they were updated only or recreated

For the objects below, the number of imported elements is also indicated in the same way as for control elements:

- SE
- PE
- LE
- Mode tables
- Locations
- Partial routes
- All partial routes with interconnected elements

Number of objects transferred:

- Final information about the total number of imported elements

Compressed database:

- Information about the file size before and after compression, which is always initiated automatically

Additional information

- Section "CSV File Structure" (Page 369)
- Section "Error Messages" (Page 376)

12.10 CSV File Structure

Introduction

The structure of the CSV files must conform to specific syntax rules and conventions.

File header

Each CSV file has an information line at the beginning of the file that stores the following information:

- A unique "SIMATIC Route Control Engineering" string, which identifies the file as CSV Route Control Engineering.
- A unique language identifier as a decimal value, to identify the language contained within. The values correspond to the language constants used in Microsoft Windows. The following numerical values map the languages used in PCS7:

Language	ID
German	1031
English	1033
French	1036
Italian	1040
Spanish	1034
Japanese	1041
Chinese	2052

- A unique CSV table type identifier indicates the type of CSV table involved.

ID	Type	File
CE	Control element	ALLAS_CE.csv
SE	Sensor elements	ALLAS_SE.csv
PE	Parameter elements	ALLAS_PE.csv
LE	Link elements	ALLAS_LE.csv
Locations	Locations	ALL_LOC.csv
AllPartialRoutes	Partial routes	ALL_PR.csv
Mode table	Functions	ALL_MOD.csv
UserTypes	User types	USER_TYPES.csv
UserTypesMask	Controls of the user types	USER_TYPES_MASKS.csv
AllPartialRoutesWithElements	Route elements	AllRouEL.csv
AllPartialRoutesWithElementsOff	Route elements of the deactivation sequence	AllRouEL_off.csv

- A version counter per CSV table type, an integer starting with 1,
- A Route Control build ID, for example, "V08.00.00.00_01.01.00.21 release"

Example of a file header

The first file line for sensor elements in the ALLAS_SE.csv file appears as follows:

SIMATIC Route Control Engineering	1033	SE	1	V08.00.00.00_01.01.00.21 release

Control elements (ALLAS_CE.CSV)

Column	Min.	Max.	Meaning	Note
S7 project	-	-	Name of the S7 project	Not imported, comes from the CFC
Automation system	1 character	24 charac-ters	AS name	Not imported, comes from the CFC
Element name	1 character	64 charac-ters	Control element name	Not imported, comes from the CFC
Number	1	1,024	Element ID that is unique within this AS	Not imported, comes from the CFC
Type	MOTOR VALVE MOT_VAL MOT_SPED MOT_REV	-	Type of control element in plain text. User-defined types are also allowed, but these must have been transferred from an S7 project to the Route Control con-figuration prior to the CSV import.	Not imported, comes from the CFC
Ignore error	0	1	0: Control element feedback errors lead to a mode level error 1: Control element feedback errors do not lead to a mode level error	Is imported
Comment	0 characters	50 charac-ters	Comment field in the control element properties	Not imported, comes from the CFC

Sensor elements (ALLAS_SE.CSV)

Column	Min.	Max.	Meaning	Note
S7 project	-	-	Name of the S7 project	Not imported, comes from the CFC
Automation system	1 character	24 characters	AS name	Not imported, comes from the CFC
Element name	1 character	64 characters	Sensor element name	Not imported, comes from the CFC
Number	1	1,024	Element ID that is unique within this AS	Not imported, comes from the CFC
Type	CONDUC TIVITY SENSOR	-	Type of sensor element in plain text. User-defined types are also allowed, but must have been transferred from an S7 project to the Route Control configura-tion prior to the CSV import.	Not imported, comes from the CFC
Comment	0 charac-ters	200 charac-ters	Comment field in the sensor element properties	Not imported, comes from the CFC

Parameter elements (ALLAS_PE.CSV)

Column	Min.	Max.	Meaning	Note
S7 project	-	-	Name of the S7 project	Not imported, comes from the CFC
Automation system	1 character	24 characters	AS name	Not imported, comes from the CFC
Element name	1 character	64 characters	Parameter element name	Not imported, comes from the CFC
Number	1	1,024	Element ID that is unique within this AS	Not imported, comes from the CFC
Type	TIMER VOLUME	-	Type of parameter element in plain text. User-defined types are also allowed, but must have been transferred from an S7 project to the Route Control configuration prior to the CSV import.	Not imported, comes from the CFC
External	0	1	0: Internal parameter element. Value will be configured. 1: External parameter element; value will be transferred at RC_IF_ROUTE during runtime.	Is imported
Comment	0 characters	200 characters	Comment field in the parameter element properties	Not imported, comes from the CFC

Link elements (ALLAS_LE.CSV)

Column	Min.	Max.	Meaning	Note
S7 project	-	-	Name of the S7 project	Not imported, comes from the CFC
Automation system	1 character	24 characters	AS name	Not imported, comes from the CFC
Element name	1 character	64 characters	Name of the link element	Not imported, comes from the CFC
Number	1	1,024	Element ID that is unique within this AS	Not imported, comes from the CFC
Comment	0 characters	50 characters	Comment field in the properties of a link element	Not imported, comes from the CFC

All locations (ALL_LOC.CSV)

Column	Min.	Max.	Meaning	Note
S7 project	-	-	Name of the S7 project	Not imported, comes from the SIMATIC Manager
Plant (PCell)	0 characters	24 characters	Name of the plant The plant name is ignored if a unit name is not specified.	Not imported, comes from the SIMATIC Manager
PH path			Relative technological path	Not imported, comes from the SIMATIC Manager

Column	Min.	Max.	Meaning	Note
Unit	0 charac- ters	24 charac- ters	Unit name The unit name is ignored if a plant name is not specified.	Not imported, comes from the SIMATIC Manager
Location type			Name of the location type	Not imported, comes from the SIMATIC Manager
Location type (dis- play name)			Display name of the location type	Not imported, comes from the SIMATIC Manager
Location	1 character	24 charac- ters	Location name	Not imported, comes from the SIMATIC Manager
Location ID	1	64,000	Unique location number	Not imported, comes from the SIMATIC Manager
Source	0	1	0: Location **cannot** be used as source for partial routes. 1: Location can be used as source for partial routes.	Not imported, comes from the SIMATIC Manager
Via	0	1	0: Location **cannot** be used as Via for partial routes. 1: Location can be used as Via for partial routes.	Not imported, comes from the SIMATIC Manager
Destination	0	1	0: Location **cannot** be used as destination for partial routes. 1: Location can be used as destination for partial routes.	Not imported, comes from the SIMATIC Manager
Variant	0	1	0: Location **cannot** be used as variant for partial routes. 1: Location can be used as variant for partial routes. Variants are virtual intermediate points that are used to detail the path of a partial route.	Is imported
Comment	0 charac- ters	100 charac- ters	Comments pertaining to this location	Not imported, comes from the SIMATIC Manager

User types (USER_TYPES.CSV)

Column	Min.	Max.	Meaning	
User type	-	-	Type of type. Possible values are CE, SE, PE	Not imported, comes from the CFC
User type name	1 character	24 charac- ters	Name of the user type	Not imported, comes from the CFC
Comment	1 character	50 charac- ters	Comment pertaining to this user type	Not imported, comes from the CFC
Unit (only PE types)	1 character	50 charac- ters	Name of the unit	Is imported

Activation masks for user types (USER_TYPES_MASKS.CSV)

Column	Min.	Max.	Meaning	Note
User type	-	-	Type of type. Possible values are CE, SE	Not imported, comes from the CFC
User type name	1 character	50 characters	Name of the user type	Not imported, comes from the CFC
Activation • [GERMAN/(1031)] • [ENGLISH/(1033)] • [FRENCH/(1036)] • [SPANISH/(1034)] • [CHINESE/(2052)] • [JAPANESE/(1041)]	1 character	24 characters	Name of the control in the selected language.	 PCS7 EU PCS7 EU, CH, MX PCS7 EU PCS7 EU PCS7 CH PCS7 MX
Bit array control (only CE types)	19 characters	19 characters	0000_0000_0000_0001, for example	
Bit array feedback	19 characters	19 characters	0000_0000_0000_0010, for example	Is imported
Bit array feedback mask	19 characters	19 characters	0001_1111_1111_1111, for example	Is imported
Deactivation	0	1	0: This control represents an active state. 1: This control represents the "deactivated" state.	Is imported
Comment	1 character	50 characters	Comment field in the properties	Is imported

All mode tables (ALL_MOD.CSV)

Column	Min.	Max.	Meaning
Mode table	1 character	24 characters	Table name specified in the Route Control configuration database. DO NOT change this name!
Mode table comments	0 characters	50 characters	Optional: Comments pertaining to a mode table
Number	1	32	Mode level number
Mode level	1 character	24 characters	Name of mode level
Mode level comment	0 characters	50 characters	Optional: Comments pertaining to a mode level

All partial routes (ALL_PR.CSV)

Column	Min.	Max.	Meaning
Partial route	1 character	48 characters	Partial route name
Mode table	1 character	24 characters	Name of the mode table to which this partial route is assigned
Source plant	1 character	24 characters	Name of the source plant of this partial route. The source must be specified!

Column	Min.	Max.	Meaning
Source unit	1 character	24 characters	Name of the source unit of this partial route. The source must be specified!
Source location	1 character	24 characters	Name of the source location of this partial route. The source must be specified!
Via plant	0 characters	24 characters	Plant name of the Via location of this partial route. A Via can be specified optionally.
Via unit	0 characters	24 characters	Unit name of the Via location of this partial route. A Via can be specified optionally.
Via location	0 characters	24 characters	Name of the Via location of this partial route. A Via can be specified optionally.
Destination plant	1 character	24 characters	Name of the destination plant of this partial route. The destination must be specified!
Destination unit	1 character	24 characters	Name of the destination unit of this partial route. The destination must be specified!
Destination location	1 character	24 characters	Name of the destination location of this partial route. The destination must be specified!
Priority	1	9999	Priority of this partial route Default value = 1
Bi-directional	0	1	0: The route is unidirectional, that is, it can only run from the source to the destination (important for the route search during runtime). 1: The route is bi-directional, that is, it can run in both directions. This also allows the search for paths in the reverse direction of this partial route (from destination to source). Default value = 0
Comment	0 characters	100 characters	Comments pertaining to this partial route

All partial routes with interconnected elements (ALLRouEL.CSV)

Column	Min.	Max.	Meaning
Mode table	1 character	24 characters	Name of the mode table to which this partial route is assigned.
Partial route	1 character	48 characters	Name of the partial route in which the element is installed.
Automation system	1 character	24 characters	Name of the automation system where the element resides.
Element name	1 character	64 characters	Element name
Mode level	1 character	24 characters	Name of the mode level at which this element is installed in this partial route, or at which the element is controlled.
Activation: • [GERMAN/(1031)] • [ENGLISH/(1033)] • [FRENCH/(1036)] • [SPANISH/(1034)] • [CHINESE/(2052)] • [JAPANESE/(1041)]	1 character	24 characters	Control name in the configured language, for example, ON or OFF for a MOTOR The text depends on the configured control commands of an element type.
Passive usage	0	1	0: Element is only passively requested to return an expected feedback. 1: Element is controlled actively by setpoint.

Column	Min.	Max.	Meaning
Monitor idle state	0	1	0: The "deactivated" state of the element is not monitored. 1: The element is monitored for the "deactivated" status if the mode levels at which the element was installed are deactivated.
PE value	-9999999999	99999999999	The number may contain up to 11 digits. This includes the sign and comma (or decimal point).
Type sum	0	1	0: Interconnected parameter element is not a summation PE. 1: Interconnected parameter element is a summation PE.
Pulse time on	0	255	Length of the signal if an element is pulse-controlled.
Pulse time off	0	255	Length of the signal if an element is pulse-controlled.
Delay time on	0	255	Length of the element activation delay time after a mode level has been activated.
Delay time off	0	255	Length of the element deactivation delay time after a mode level has been deactivated.
Sorting number	1	64,000	Consecutive sorting number. The number must be consecutive and unique within the entire CSV file.

One partial route with interconnected elements (<name>.CSV)

The structure of this file is identical to that of ALLRouEL.CSV. Corresponding information is available in the table above.

Additional information

- Section (Page 376) "Error messages"

12.11 Error Messages

Introduction

A number of errors can occur when objects are imported. You can find the range of values for individual columns in the import files in the section
"CSV File Structure" (Page 369).

Overview

No.	Error/info text	Meaning/remedy
1	Updated	Element has been successfully updated in the database.
2	Element length ("element ...") exceeded.	The character string of an element name is too long. Shorten to permissible length

No.	Error/info text	Meaning/remedy
3	Element name ("element ...") not defined	The element name is missing. Enter a name
4	AS ("AS <ID>") not found	You have specified an AS ID that does not exist in Route Control Configuration.
5	Type ("...") not found	This element type is unknown. This usually involves a typographical error, such as MOTORS instead of MOTOR.
6	Number ("...") is not numerical	The "Number" property for this element does not consist exclusively of numbers. Alphabetic characters are not permitted here.
7	Mode table name ("...") too long	The character string of a mode table is too long. Shorten to permissible length
8	Mode table ("...") is missing	The character string of a mode table is too short and thus does not exist. Enter at least one character.
9	Mode name ("...") not defined	The mode name is unknown.
10	Name of mode level ("...") too long	The character string of a mode level is too long. Shorten to permissible length
11	Number of mode level ('...') not numerical	The "Number" property for this mode level does not consist exclusively of numbers. Alphabetic characters are not permitted.
12	Name of process cell ("...") too long	The character string of a process cell (Pcell) is too long. Shorten to permissible length
13	Unit name ("...") too long	The character string of a unit is too long. Shorten to permissible length
14	Unit ID ("...") not defined	You have specified a unit ID that does not exist in Route Control Configuration.
15	ID of the plant location ("...") non-numeric	The "Number" property for this location does not consist exclusively of numbers. Alphabetic characters are not permitted.
16	Partial route ("...") is not defined	You have specified the name of a partial route that does not exist in Route Control Configuration.
17	Comment ("...") too long	The character string of a comment is too long. Shorten to permissible length
18	Value ("...") is no true value	The Import Wizard can not recognize the value as a true value; only 0 or 1 is permitted.

13 Configuring with Route Control Engineering

13.1 Process cells, units and locations

Transfer of Configuration Data

As of V7.0, you configure process cells, units and locations solely in SIMATIC Manager.
Use the Route Control Wizard to run an export/import and transfer the configuration data to Route Control Engineering.

SIMATIC BATCH also imports configuration data from the S7 project.
Some of these data are needed in order for BATCH and Route Control to interact.

Due to the central configuration in SIMATIC Manager, you only have to enter these data once.

Additional information

- Section "Transferring Data From an S7 Project" (Page 343)
- Section "Configuring Locations" (Page 328)

13.2 Getting Started

13.2.1 Starting Route Control Engineering

Procedure

Start Route Control Engineering using one of the three options below:

- From the Windows start bar
- From the "Options" menu in SIMATIC Manager
- From one of the "Route Control" objects in SIMATIC Manager

Note

Exclusive use of the Route Control configuration tool

Route Control Engineering

If a project is open in Route Control Engineering, the same project cannot be opened, either with a different Route Control Engineering or with a Route Control Wizard.

Route Control Wizard

If a project is open in the Route Control Wizard, the same project cannot be opened, either with a different Route Control Wizard or with a Route Control Engineering.

Starting via the Windows Start Bar

1. Select the menu command **Start > SIMATIC > ROUTE CONTROL > Engineering**. The Route Control Engineering window opens.
2. Select the menu command **File > Open,** then select the path to an S7 project (*.s7p) or S7 multiproject (*.s7f).
   The project context is created manually in this way.

   Note

   The next time Route Control Engineering is started from the Windows start bar, the most recently opened project database is opened once again.

Starting via SIMATIC Manager

Select the menu command **Options > SIMATIC Route Control > Engineering**.
The S7 project context is automatically supplied and the associated Route Control project database is opened.

Starting via one of the "Route Control" Objects in SIMATIC Manager

You will find two "Route Control" objects in SIMATIC Manager:

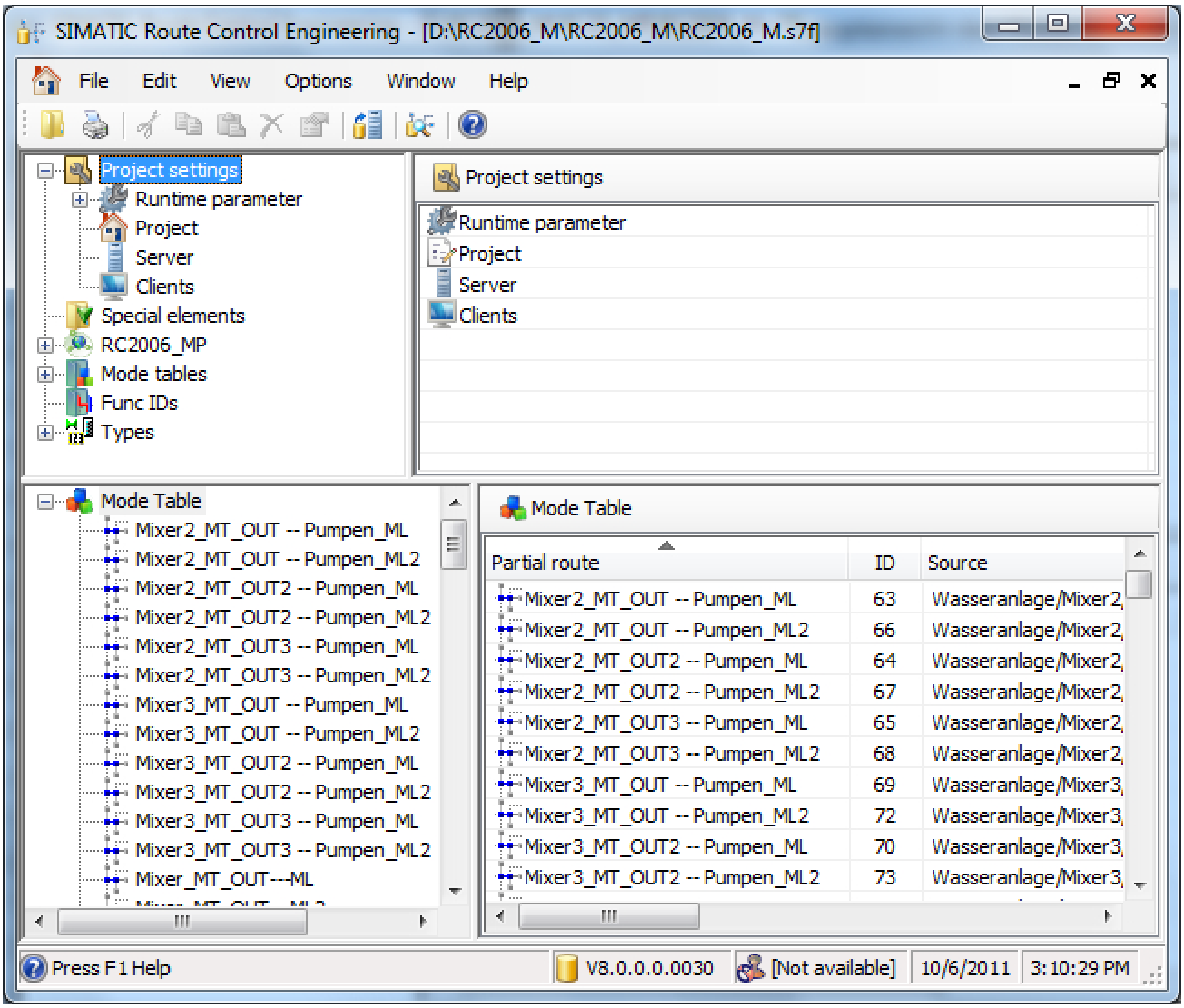
- In the project folder
- In the PC station in the RC application client

Open the shortcut menu of the object and select the menu command
SIMATIC Route Control > Engineering.
The S7 project context is automatically supplied and the associated Route Control project database is opened.

13.2.2 Route Control Engineering main view

Overview

The Route Control Engineering user interface consists of four panes:



- The two upper panes show the pool of elements, which have been imported from the PCS 7 project.
  The left pane shows the structure of the multiproject. The structure is divided into multiproject/projects/automation systems/ RC objects as well as S7 connections and routes assigned to the automation systems.
  The right pane shows information on the object selected in the left pane, for example, all control elements of an automation system or all routes configured for this automation system.
  You also configure global project settings, such as the Route Control server properties, here.
  You can find additional information in
  "Overview of Project Settings" (Page 390).

  Note

  Starting with V7.0 SP1, the automation systems are visualized in the Components View of SIMATIC Manager. This feature allows users to identify the association of an AS with a project or multiproject.

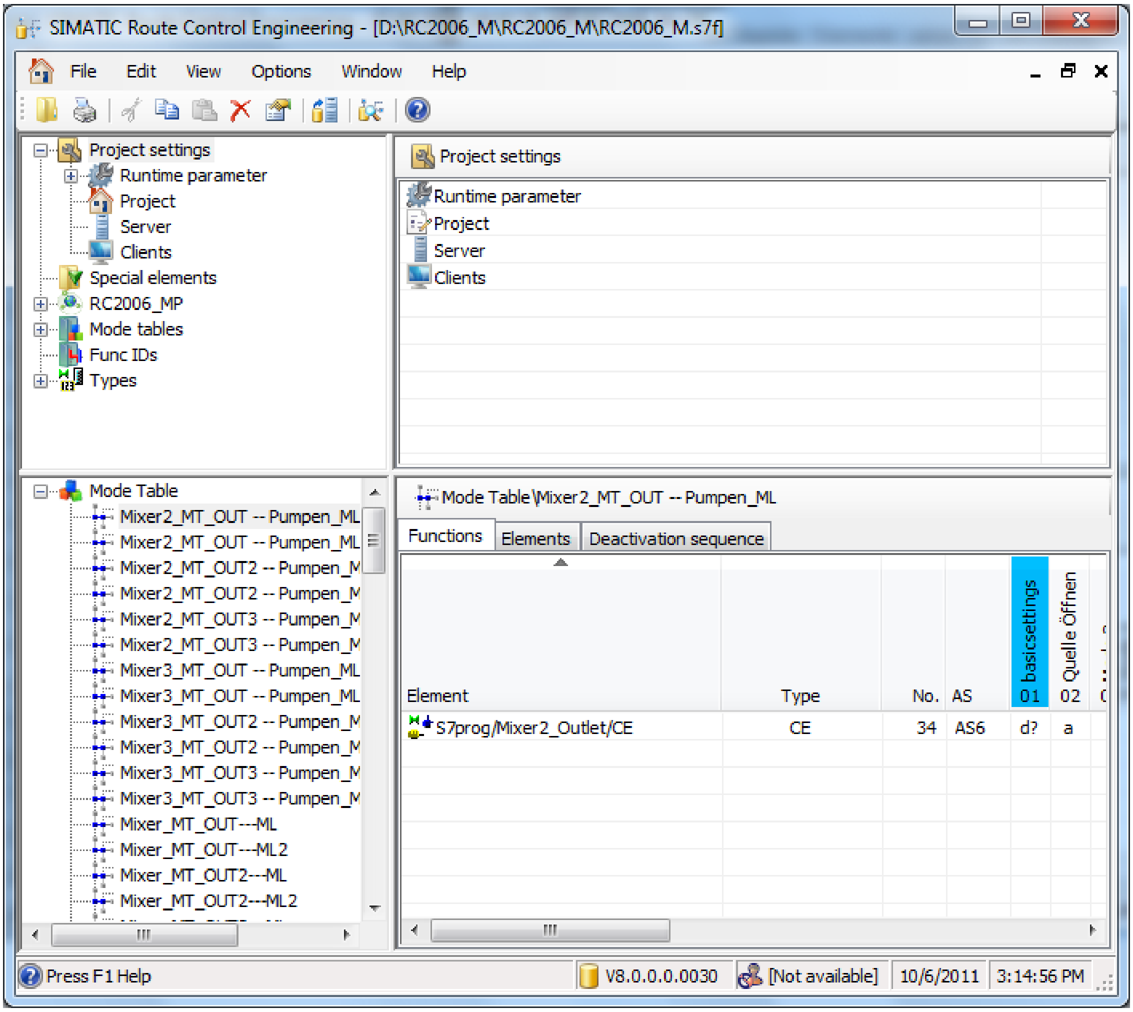
  The runtime parameters were distributed to subfolders in the "Project settings" folder.

- The two lower panes contain the partial routes and their elements along with the mode levels, i.e., the interconnected elements that are dependent on routes.

If a partial route is selected, the right-hand lower pane will contain two tabs:

- "Elements" tab
- "Modes" tab
- "Deactivation sequence" tab

Lists in which an arrow is displayed in their header can be sorted based on the contents of the underlying column.



In addition, selected columns in some lists provide an option to filter the content of the column. Where this is possible, a small filter symbol appears in the column header when you move the mouse over the column header. When the mouse leaves the area, this symbol disappears.

When a filter is active, a different symbol is displayed. It remains visible until the filter is removed.

"Elements" tab

The "Elements" tab displays all the elements that are inserted in a partial route. If an element is activated in several mode levels, a corresponding number of rows is displayed for this element.

The information in the previous "Values" and "Passive/Idle state" columns were accumulated in V8.0 in a new "Command/Value" column.
This aligns the representation of control commands with the layout of the "Elements" tab in Route Control Center.

For further information, refer to the section
"Elements tab in the Route Control Center" (Page 509)

Note

As of V7.0, you can change the order of the elements in a partial route on the Route Control Engineering "Elements" tab.

This option will be provided for future expansions (solid material transports).

"Modes" tab

The "Modes" tab is new as of V7.0. Each element is displayed in a separate line. You will find configured activation keys for each of the 32 mode levels for every element.

You have already configured the mode levels when the element was inserted in the partial route. Configure the activations in other mode levels from this view.

"Deactivation sequence" tab

In the "Deactivation sequence" tab, Wait elements can be inserted and deleted, or the sequence of the elements can be changed.

A deactivation sequence can be defined for each partial route and mode. The presence of a deactivation sequence is indicated by color coding in the column header of the mode in the function view.

A deactivation sequence basically contains all the CE, SE and PE elements of the partial route. If an element is deleted, therefore, it disappears from the deactivation sequence. When an element is inserted into a partial route and there is a deactivation sequence, it is also integrated into it.

In some circumstances, a deactivation sequence without Wait elements can be useful. If, for example, a route is composed of partial routes 1,2,3 and PR1 contains 3 Wait elements in the deactivation sequence, all elements from the involved partial routes that are before the first Wait element of PR1 in the sequence and all elements of an involved partial route that has no deactivation sequence are immediately deactivated. If PR2, therefore, had no deactivation sequence, its elements would be deactivated immediately.

If PR2 has a deactivation sequence without Wait elements, all its elements are deactivated when PR1 with its Wait elements is completely deactivated.

The actual deactivation sequence of the elements in a route is derived from the order of partial routes in the route and from the sorting order of elements within the partial routes.

Since the route first comes into existence in runtime and is composed of the assembled partial routes found, it is difficult to make a statement about the exact sequence of elements at the point in time when configuration is performed. This does not apply to saved routes.

You can find additional information on this in the sections:
"How to program the activation of elements" (Page 420)
"Meaning of the activation key symbols" (Page 422).

13.2.3 Route Control Engineering menu

Overview

File

Menu subitem	Meaning
Open	Opens an already existing database file. As a rule, this function is no longer necessary if the Route Control engineering environment is started via SIMATIC Manager. The correct database file is opened automatically from the path under the S7 project.
Close	Closes the database file. The database is closed automatically when the Route Control engineering tool is closed.
Print Report	Creates prepared reports (lists) for printout.
Change logon	Opens a submenu for logging on or off of the Logon service.
1 ...	Opens the most recently opened database.
...	
4 ...	
Close	Closes the Route Control Engineering tool.
	Availability of the following functions depends on the object selected.

Edit

Menu subitem	Meaning
Cut	Cuts an element and copies it to the clipboard
Copy	Copies an element to the clipboard
Paste	Pastes an element from the clipboard to a selected location
Delete	Deletes an element
Rename	Renames an element
Properties	Opens the Properties dialog for the selected element.

View

Menu subitem	Meaning
Toolbar	Displays or hides the toolbar 
Status bar	Displays or hides the status bar 

Options

Menu subitem	Meaning
Settings	Changes the language setting if SIMATIC Manager is not installed; otherwise, the language setting in SIMATIC Manager is used. Compresses the database automatically (recommended). Activates the system dialog boxes: The initial general information dialog box in the wizard can be hidden. These system dialog boxes can be displayed again using this function.
Compress Database	Performs compression once
Download to server	Downloads the Route Control configuration to the Route Control server. This step does not activate the database file. The changes, and thus the database file, are not active until they have been enabled by means of the Route Control Center.
Verify Route	Checks the route network based on the configured partial routes and elements. The runtime system is not included.
Check Consistency	Checks the database, its tables and configured entries for consistency: • ID conventions • Sort order of elements • Variant check • Activation of elements: An element must not be inserted in the same mode level with different commands.
CSV Export/Import	• CSV Export/Import Wizard... • Display CSV Export Log... • Display CSV Import Log... Information under "CSV interface" (Page 299)
Material	Configures materials, material groups, and material sequence relationships
Symbols	Changes icons for the activation keys
User key	Deletes user keys
Control texts	Configuration of texts for the controls element in all supplied languages. The texts for for standard elements are supplied predefined.

Window

Menu subitem	Meaning
Arrange	Changes the arrangement of open windows in the application: • Overlapping • Horizontally* • Vertically* * If at least two Route Control projects are open.
Arrange Icons	Rearranges the icons of minimized projects at the bottom of the window.
Minimize All	Minimizes all open windows.
Close All	Closes all open windows.
1 ...	Activates the respective S7 project.

Help

Menu subitem	Meaning
Contents	Opens the Help system.
Context-Sensitive Help F1	Opens the Help system and jumps to a description of the active dialog box.
Introduction	Opens the Help system and jumps to the introduction.
Getting Started	Opens the Help system and jumps to the description of Getting Started.
Using Help	Opens a dialog box containing information about using the online help.
About	Opens a dialog box containing, for example, the following information: • Product name • Product version • Copyright • Company

13.2.4 Creating a new Route Control project

Introduction

You can use Route Control Engineering to create a new Route Control project.

Procedure

1. In Route Control Engineering, select the menu command **File > Open**.
2. In the dialog box, select the path to an S7 project (*.s7p) or S7 multiproject (*.s7f).

The Route Control Engineering tool opens the configuration database and you can begin your configuration.

Result

SIMATIC Route Control creates a Route Control subdirectory and a configuration database (\global\rcs\) associated with the given path. In doing so, SIMATIC Route Control assumes that the "\global" subdirectory already exists, as SIMATIC Route Control is always stored in an S7 project or S7 multiproject.

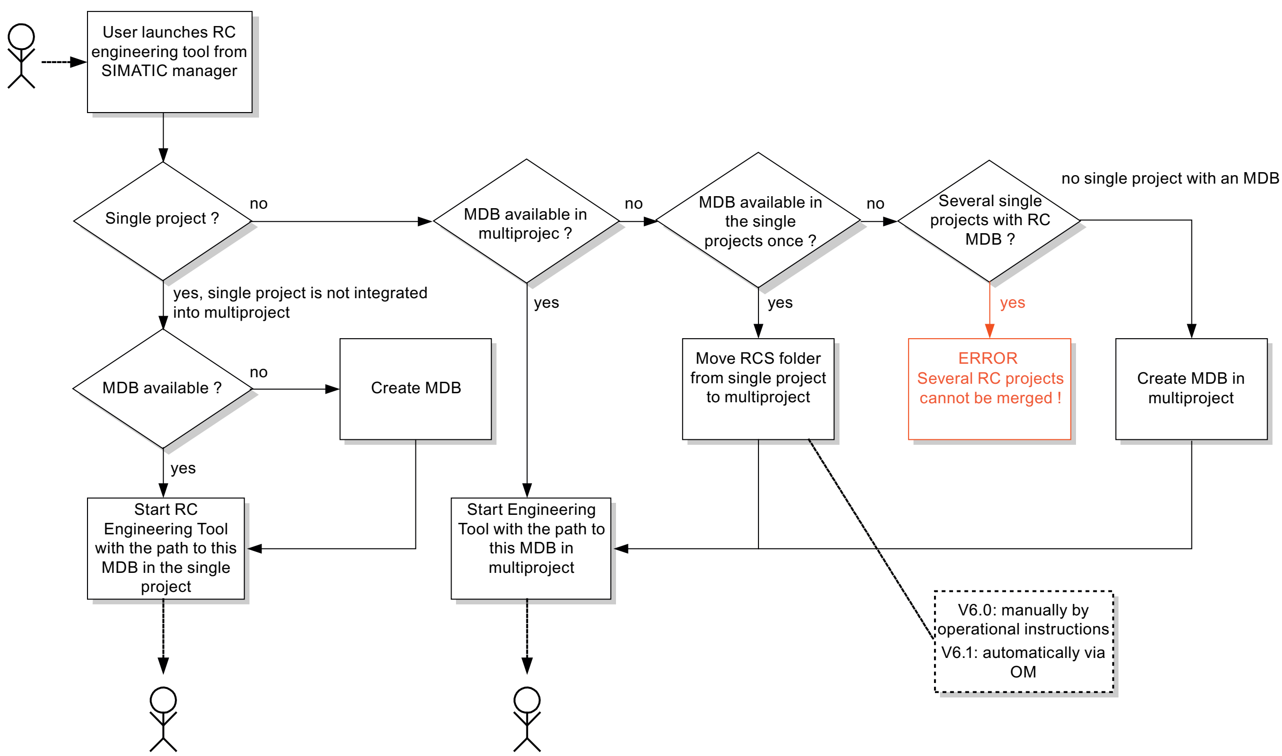
Note

If you start Route Control Engineering from SIMATIC Manager with an S7 project open, the associated Route Control database is automatically created in the S7 project path and opened.

13.2.5 Saving a Route Control Project

Saving a Route Control Project

Because a Route Control project is assigned either to an individual S7 project or to an S7 multiproject, this is also used to specify the storage location of the Route Control project database.

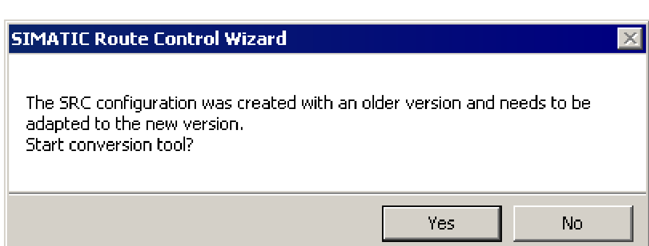


13.2.6 Converting a Route Control Project

Route Control Engineering

If you open a configuration database whose data do not possess the current structure in Route Control Engineering, the data have to be converted.

In such a case, the dialog box below opens:

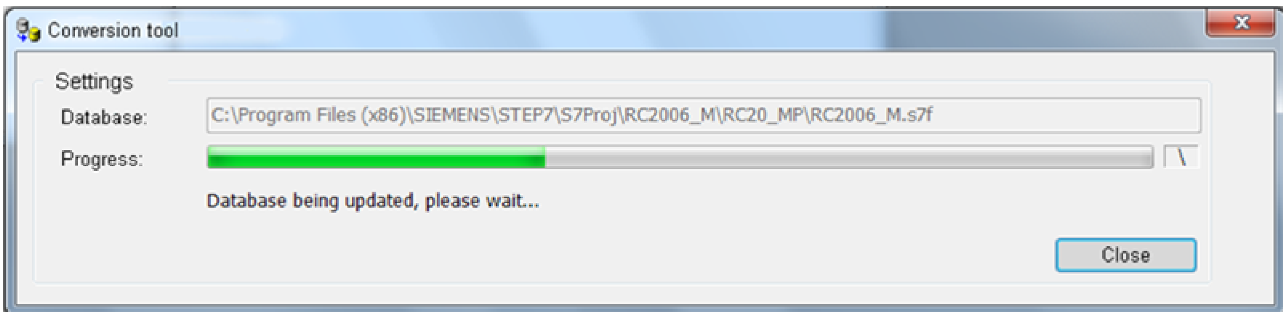


If you wish to start up the conversion tool, click "YES".

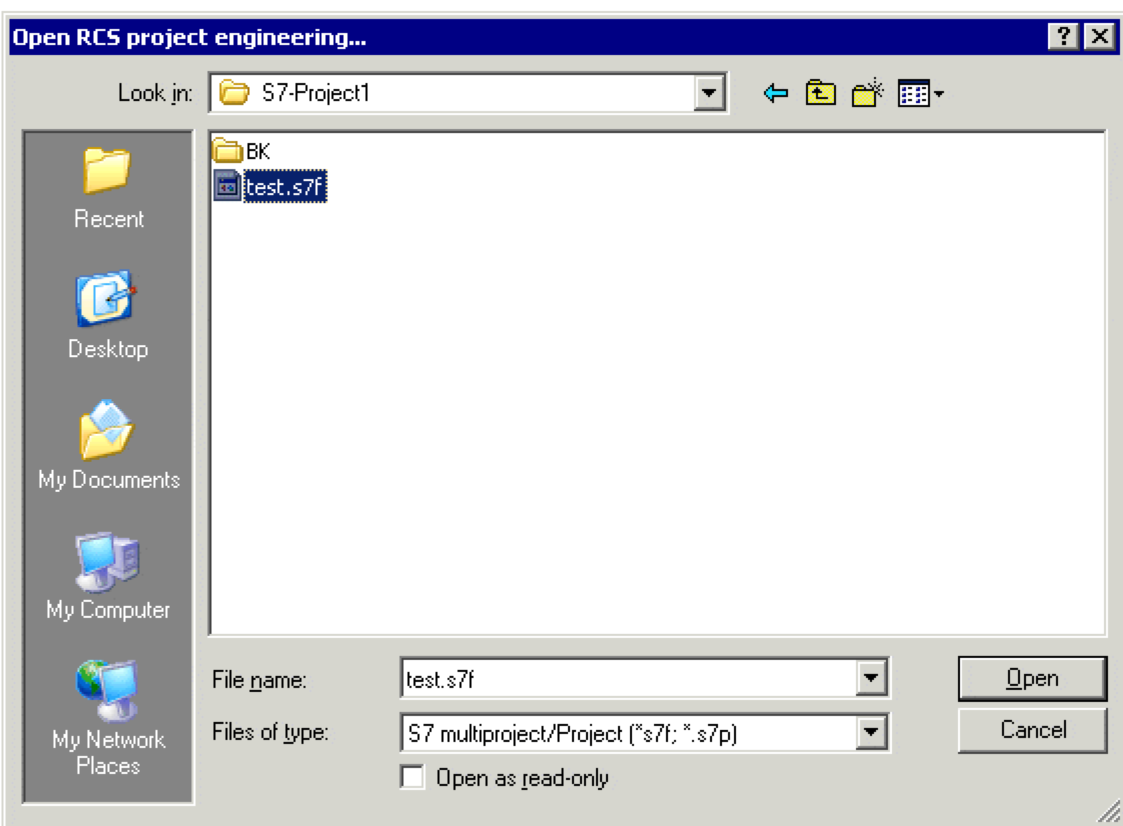
If you do not wish to start up the conversion tool, click "NO".
You will then not be able to open and edit your Route Control configuration with the new version of Route Control Engineering.

Conversion tool

The conversion tool is displayed with the following dialog box:



The database to be converted is usually set as the default.
If the database to be converted is not set as the default, the following dialog box appears:



You can select an MDB file from this dialog box.

Procedure

1. Click "START" to start the conversion.
   For safety, the selected database is saved as a SIC file.
   To restore the original configuration, simply rename the back-up file manually.
   Once the process is underway a progress bar will track the progress of the conversion.
2. Once the conversion is complete, click "CLOSE".
   Route Control Engineering opens the database file and you can make your configuration settings in the usual way.

13.2.7 How to print out the configuration of elements and partial routes

Procedure

1. Select one of the following objects in Route Control Engineering:
   – A partial route from a mode group with all of its interconnected elements
   – An automation system from the "Automation Systems" folder
   – One of the following element groups of an automation system:
     "Control elements"
     "Sensor elements"
     "Link elements"
     "Parameter elements"
   – Process cell
   – A unit of a process cell
2. Select the menu command **File > Print Report > Preview**.
   The print preview opens.
3. Select the menu command **File > Print Report > Print**.
   Printing begins.

13.3 Global Project Settings

13.3.1 Overview of project settings

"Properties" dialog boxes

Configure all global settings for a Route Control project in the in the "Project settings" folder in the upper pane of Route Control Engineering.

There you will find the subfolders

- Attributes
- Runtime parameters

Open the "Properties" dialog boxes by double-clicking the entries in the list.
You can find additional information about these dialog boxes in the sections:

- "Attribute properties" (Page 391)
- "Runtime parameter properties" (Page 392)

Additional information

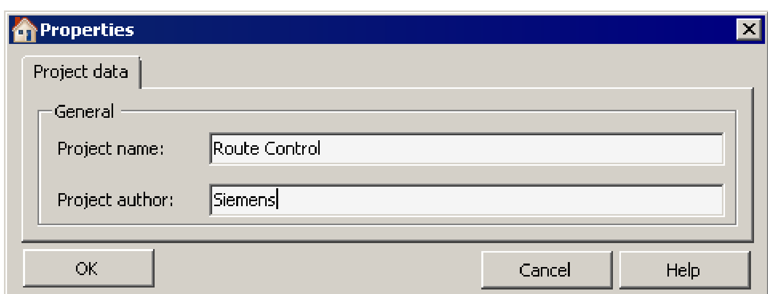
- Section "Monitoring the servers and AS" (Page 399)

See also

Overview of Runtime Parameters (Page 392)

13.3.2 Attribute properties

Dialog box



Description

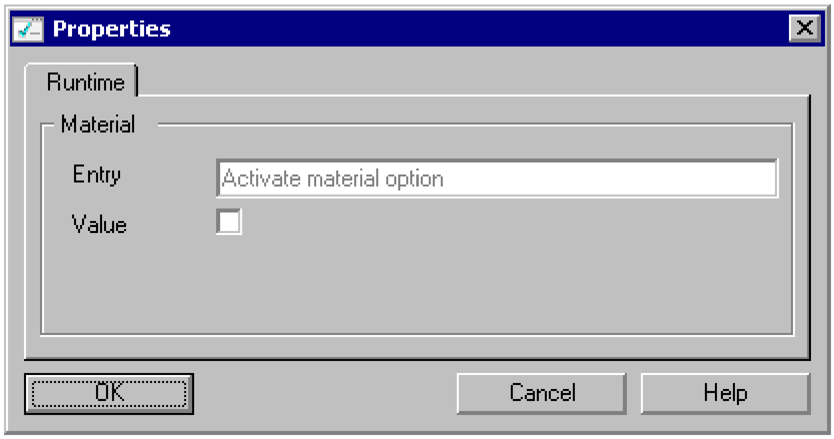
You use this dialog box to make settings that apply throughout the Route Control project.

Meanings of operator control elements

Operator control element	Meaning
Project name	Name of the project Enter the name of the area encompassed in this Route Control project. A dialog box for selection of a Route Control server is subsequently displayed in the Route Control Center. The project name will be displayed in this dialog box.
Project author	Name of engineer who performed the configuration

13.3.3 Runtime Parameter Properties

Dialog box



Description

This dialog box gives an example of how to enter the runtime parameters for a project.

Meanings of operator control elements

Operator control element	Meaning
Entry	Entry name
Value	Check box, if only yes/no is possible, otherwise an edit box in which an integer number can be entered

13.3.4 Runtime parameters

13.3.4.1 Overview of Runtime Parameters

"Project Settings\Runtime Parameters" List

In the "Project settings" folder in Route Control Engineering, select the "Runtime parameters" subfolder and you will find 5 folders containing the runtime parameters.

You can find additional information in:

- "Folder - general" (Page 393)
- "Folder - material" (Page 394)
- "Folder - rules for the route algorithm functions" (Page 394)

- "Folder - route log" (Page 395)
- "Folder - monitoring" (Page 397)

13.3.4.2 "General" folder

Route Control server startup and PCS 7 OS process mode

You can find the "General" functions in Route Control Engineering in the "Project settings" folder, "Runtime parameter" subfolder.

No.	Key	Standard value	Range of values and description
	Route Control server startup dependent on PCS 7 OS process mode	No	Indicates whether, on startup, the Route Control server is to wait until the PCS 7 OS process mode is active. No: The Route Control server does *not* wait for PCS 7 OS process mode during startup. If the Route Control server starts up before the PCS 7 OS process mode is active, messages may be lost. Yes: The Route Control server waits until the PCS 7 OS process mode is active during startup.

Load Route Control server

If WinCC is operated in Service mode, that is, without a logged on user, the flag "Route Control server depends on WinCC startup" must **not** be set.

Only then is it ensured that the Route Control server continues to run if WinCC is loaded.

For this reason, the RC wizard no longer sets the flag "RC server depends on WinCC startup" as of V8.0.

This means that the setting selected in RC Engineering is kept.

Additional Information About Runtime Parameters

- Section "Overview of Runtime Parameters" (Page 392)

13.3.4.3 "Material" folder

Overview

You can find the "Material" functions in Route Control Engineering in the "Project settings" folder, "Runtime parameter" subfolder.

No.	Key	Standard value	Range of values and description
	Activate material option	No	No: The Route Control server does *not* read the material configuration in during startup. The material sequence is *not checked* when a route request is made. Yes: The Route Control server reads the material configuration in during startup. The configured material sequence is taken into account during the route search, i.e. if no route with a permitted successor material is found, the search will not provide a result.
	Accept unknown materials	No	Only relevant when the material option is activated. No: A route request with unknown materials results in a request error. Yes: Unknown materials in a route request are ignored.
	Use external material configuration	No	No: Depending on the value of the "Activate Material Option" button (see above), either the internal material configuration is used or the material configuration is deactivated. Yes: The external material configuration is used. Transfer of the files to the Route Control server at runtime (LOAD directory) Additional information in the section: "Material interface" (Page 465)

13.3.4.4 "Rules for the route algorithm functions" folder

Overview

You can find the "Rules for route algorithm" functions in Route Control Engineering in the "Project settings" folder, "Runtime parameters" subfolder.

No.	Key	Standard value	Range of values and description
	Ignore "manual" elements	No	No: Elements in "manual" mode could lead to an error during a route search. Yes: Elements in "manual" mode are ignored. Such elements are also accepted during a route search.
	Ignore "in maintenance" elements	No	No: Elements in maintenance mode could lead to an error during a route search. Yes: Elements in maintenance mode are ignored. Such elements are also accepted during a route search.

No.	Key	Standard value	Range of values and description
	Include "faulty" elements	No	No: Elements that are in error state lead to an error during the route search. Yes: Elements that are in error state are accepted during the route search.
	Ignore "inactive" elements	No	No: Elements that have been made inactive could lead to an error during a route search. Yes: Elements that are "inactive" are ignored. Such elements are also accepted during a route search.
	Ignore elements "affected by maintenance of other elements"	No	No: Elements affected by maintenance of another element could lead to an error during a route search. Yes: Elements affected by maintenance of another element are ignored. Such elements are also accepted during a route search.
	Optimize locations that do not lead to the destination during offline route search	No	No: There is no time optimization during the search for all routes between source and destination. Yes: There is a time optimization during the search for all routes between source and destination. Depending on the structure of the project, this optimization may prevent that all routes are found.

Note

These parameters only affect the route search.

During runtime, a found route will switch to fault mode if a mode level is not achieved.

You can find additional information about ignoring errors during runtime in"Control Element Properties" (Page 426).

13.3.4.5 "Route log" folder

Introduction

The route log is available in SIMATIC Route Control V6.0 SP1 and higher.

Overview

You can find the "Routes log" functions in Route Control Engineering in the "Project settings" folder, "Runtime parameters" subfolder.

No.	Property	Description
	Activate	Indicates whether the route log should be activated (X) or deactivated (-).
	Server storage path	Path for storage of route log files for the server in the form of "\\<computer name>\<share name>" You can find additional information in "Directory Sharing in the Route Log" (Page 399).

No.	Property	Description
	Standby storage path	Path for storage of route log files for the standby computer in the form of "\\<computer name>\<share name>" You can find additional information in "Directory Sharing in the Route Log" (Page 399).
	Size of cyclic buffer	Range of values: 1 ... 999 days

13.3.4.6 "Monitoring" folder

Overview

You can find the "Monitoring" functions in Route Control Engineering in the "Project settings" folder, "Runtime parameters" subfolder.

No.	Key	Standard value	Range of values and description
	Cycle time for server/ AS monitoring	15	Specifies monitoring time in seconds Range of values: 10 ... 999 seconds The higher this value is, the higher the system tolerance for missing telegrams. You can find additional information in "Monitoring the Server and AS" (Page 399). Use this value in conjunction with the "Number of permissible missing monitoring frames" key. Note: This setting is only relevant if the redundancy monitoring that is dedicated to Route Control is used. You can obtain additional information in the section titled "General functions" (Page 393), under "Using PCS 7 redundancy". **Note**: If the cycle time for server/AS monitoring configured under "Project settings > Runtime parameters > Monitoring" is extremely short, this may result in redundancy switching during periods of high load. To prevent this, the default cycle time should be retained or increased insofar as this is permitted by the application case.
	Number of permissible missing monitoring telegrams	5	Number of missing response telegrams permitted from the AS to the server before an automatic failover occurs. Range of values: 5 ... 999 telegrams The higher this value is, the higher the system tolerance for missing telegrams. Use this value in conjunction with the "Cycle time for server/AS monitoring" key. You can find additional information in "Monitoring the Server and AS" (Page 399). Note: This setting is only relevant if the redundancy monitoring that is dedicated to Route Control is used. You can obtain additional information in the section titled "General functions" (Page 393), under "Using PCS 7 redundancy".

No.	Key	Standard value	Range of values and description
	Automatic server failover in the event of error	Yes	Yes: The system switches over to the standby computer if the maximum tolerance time is exceeded. No: The system does *not* switch over to the standby computer if the maximum tolerance time is exceeded. In this case, manual failover is required. You can find additional information in "Monitoring the Server and AS" (Page 399). Note: This setting is only relevant if Route Control redundancy monitoring is used. You can obtain additional information in the section titled "General functions" (Page 393), under "Using PCS 7 redundancy".
	Automatic restart when AS is recovered	Yes	Yes: Failure of the connection between the master server and an AS triggers an automatic server restart. In this case, this AS is deactivated, i.e., all its elements are "artificially deactivated". If the connection is restored, then the elements are also "activated" automatically. No: Any AS failure is ignored. Routes which involve this AS are found; however, any attempt to download element lists to the AS would fail. Note: This setting is relevant for both the redundancy monitoring that is dedicated to Route Control and PCS 7 redundancy. You can obtain additional information in the section titled "General functions" (Page 393), under "Using PCS 7 redundancy".

13.3.4.7 Downloading settings to the server

Downloading settings to the server

Like all other settings, these settings are made on the Route Control server by downloading the Route Control configuration.

Note

Once downloaded, activate the configuration via the Route Control Center.

Additional information

- Section "Downloading the Route Control Server" (Page 472).

13.4 Notes

13.4.1 Monitoring the server and AS

Sequence

The Route Control Server(s) constantly monitor the connections to the automation systems and also indirectly to the corresponding partner station. Monitoring sequence:

Step	Monitoring step
1	The master station broadcasts a monitoring frame to each automation system.
2	The automation system returns a response message frame to each server (master and standby).
3	Both servers are equipped with an internal timer. Additional information is available in the runtime parameters topic, "Cycle time for server/AS monitoring".
4	The counter is incremented by the count of one if a timeout is triggered before a response message frame is received from the AS.
5	If this counter reaches limits set at the "Permitted number of missing monitoring message frames" parameter either the connection of one of the servers to the AS is down, or the master server has failed. The standby server now attempts to determine the operating state of the master server. If the master server returns a message frame indicating its faultless state, the standby server does not assume the master function.
6	The calculated server tolerance time is derived from the combination of the "Cycle time for server/AS monitoring" and "Number of permissible missing monitoring frames" runtime parameters, whereby: *tolerance time (in seconds) = cycle time for server/AS monitoring (in seconds) x number of permissible missing monitoring frames*
7	The automatic changeover is only executed if activated. Additional information is available in the runtime parameters topic, "Automatic changeover of servers in error case".

13.4.2 Directory Sharing in the Route Log

Storage of the Route Log Files

You can configure the directory in which the Route Control server stores the route log files as you wish.

Storage in the standard directory on the Route Control server

If you do not configure a path, the Route Control server saves the log files locally.

Note

If you have a distributed system in which several computers access the route logs, the path to the route log must be configured; see below.

Storage in a Separate Directory on the Route Control Server

If you want route log files to be stored on the Route Control server, you must specify the path as follows:

\\\\<computer name>\\<share name>

The <computer name> is the name of the computer on which the Route Control server process is running.

The directory must be accessible for the Route Control server - read and write access - as well as the Route Control route log application - read access only (Windows user rights).

Storage in a Directory on Another Computer

If you want route log files to be stored on a server other than the Route Control server, you must specify the path as follows:

\\\\<computer name>\\<share name>

The <computer name> is the name of the other computer.

Note

If you want to access the log files using the route log application from another computer, you must ensure that the relevant directory is shared out on the computer on which the files are stored (Windows directory sharing). This applies to all three cases mentioned above.

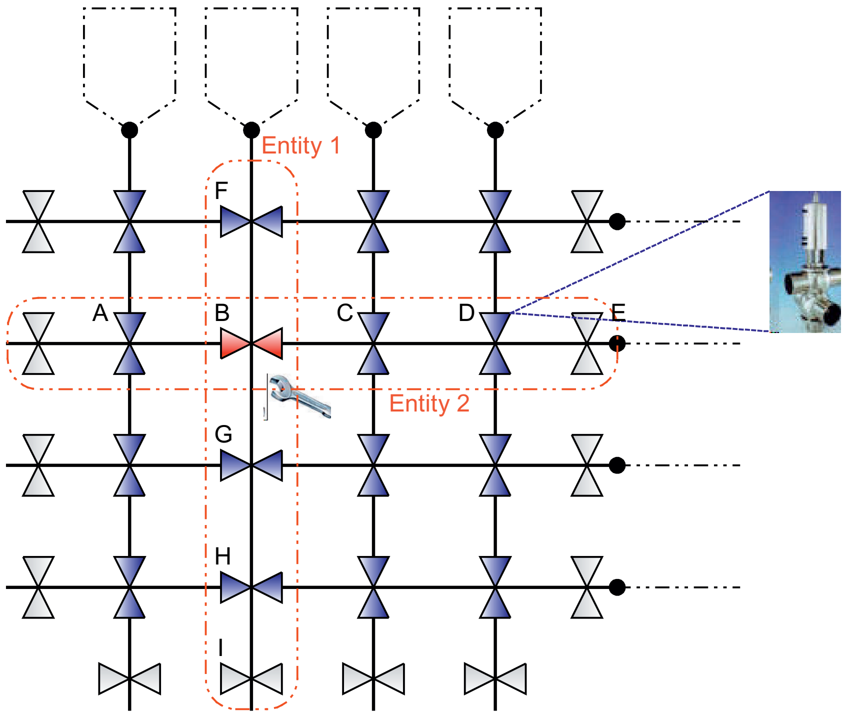
13.4.3 Notes on maintenance

Example

A practical example (a valve block with double-seated valves) will illustrate the differences between an "element in maintenance" and an "element affected by maintenance of other elements".

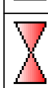
Note

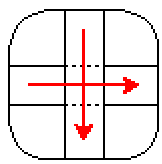
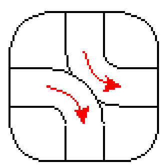
The ABM (affected by maintenance) function has not yet been implemented in SIMATIC Route Control (entity concept).



If, for example, valve B is "in maintenance", then all valves of the entities in which valve B is involved are "affected by maintenance". Routes over valve B are not possible due to the maintenance. Routes over other valves in both entities are possible, but restricted. Routes that request a particular valve position but do not activate the valve are permitted, whereas routes that would have to activate the valve (A, C, D, E, F, G, H, I) are not permitted. This is because they could cause material to be lost through the valve in maintenance.

Overview

Icon	Meaning
	Double-seated valve that does not have "faulty" status
	Double-seated valve that has "faulty" status
	Block valve or shutoff valve at the end of a pipeline

Icon	Meaning
	Entity (a group of elements that logically belong together, valves in this case) Definition of an entity: All elements (valves) up to which product (or another material) can flow unobstructed Two entities are drawn in here: Entity 1: Valves B, F, G, H, I Entity 2: Valves A, B, C, D, E
	Double-seated valve: possible material flow directions: "Crossover" material flow  "Diagonal" material flow  Important: A "locked valve position" is not available and product flows can not be combined.

13.5 General Information About Objects

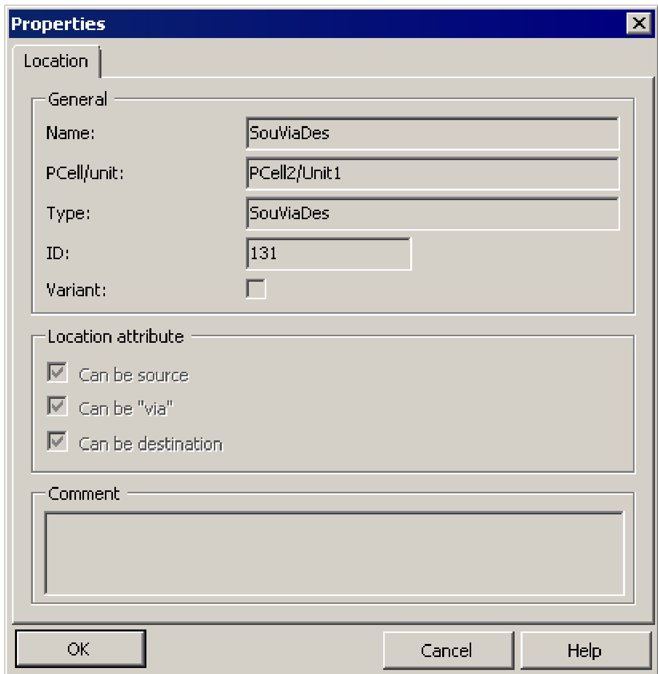
13.5.1 Locations

Definition

Locations refer to the start, paths (vias) and final points of routes.
As of V.70, you configure all locations directly in SIMATIC Manager and then import them into Route Control Engineering. You cannot add or change locations here.

13.5.2 Location properties

Dialog box



Properties

The "Properties" dialog box of a location in Route Control Engineering displays the following:

- Location name
- Process cell/unit to which this location is assigned
- Type of location
- Location ID that is unique throughout the project

The central area of the dialog box shows whether this location can be used as the source and/or destination location of a partial route or route or as the via location of a route.

13.5.3 Location type

Location type

As of Version V7.0 you configure location types in SIMATIC Manager.
You can neither enter nor change types in Route Control Engineering.

13.5.4 Partial routes

You can find explanations of the partial route in the section "Partial routes and VIAs (Page 89)".

13.5.5 Routes

You can find explanations of the routes in the section "Routes (Page 88)".

13.5.6 Predefined routes

Predefined routes

This functionality is no longer a feature in SIMATIC Route Control V6 and higher.

13.5.7 Mode tables

Definition

A mode table contains 32 mode levels.
You can set up multiple mode tables with mode levels with varying names.
Each partial route is assigned to a mode table.

During runtime, a route can only consist of partial routes from the same mode table.

13.5.8 Mode levels

Definition

The mode levels are activated or deactivated by the user program that is connected upstream of the route. You can also activate or deactivate mode levels manually in the Route Control Center. The individual mode levels are independent of one another but can be activated and requested in parallel. Route Control controls the individual elements in partial routes in accordance with which mode levels are activated or deactivated.
An element can be inserted in multiple mode levels with different modes of activation in a single partial route.

Example

Thus, in the following example, the "Pump on" and "Destination container full?" mode levels can be activated at the same time.

- The "initial state" mode level checks that:
  - All valves are closed
  - The pump is disabled
  - The source tank contains sufficient material
  - The destination container has sufficient space available
- Mode level: "Open transport valves":
  The transport valves on the route are opened.
  The mode level is "achieved" once all elements have adopted their set position.
- Mode level "Pump on":
  The material transport pump is turned on.
- Mode level "Open source valve":
  The valve on the source tank is opened.
- Mode level "Destination container full?":
  The sensor on the destination container outputs a signal when the container is full.
  Its feedback is continuously evaluated by the routing system.

13.5.9 Automatic generation of elements

Generating Elements

Note

The option to generate an entire range of elements has been removed from SIMATIC Route Control.

Up until version V5 (PCS 7 and BRAUMAT), the Route Control Wizard did not exist and there was thus no efficient way to transfer elements that had already been configured from CFC charts.

V6 now features the Route Control Wizard and is no longer based on BRAUMAT. This eliminated the need to generate elements on the Route Control project side. However, it did give rise to the risk of inconsistent data between the Route Control project and the S7 project.

The CSV interface for exporting and importing elements has been limited to ensure that inconsistent data can not be configured here either. You can find additional information in "CSV Interface Overview" (Page 357).

13.5.10 Creating Elements

Creating Elements

As of V6, Route Control no longer supports the creation of control, sensor, parameter, link elements, or routes .
For reasons of consistency, the elements are first inserted into CFC interface blocks (RC_IF_...) in the S7 project and then transferred to Route Control Engineering using the Route Control Wizard.

13.5.11 How to Delete Elements

Introduction

You cannot delete imported elements from the upper area of Route Control Engineering. However, you can remove an element inserted in a partial route in the lower area from that partial route.

Procedure

1. In the tree structure on the bottom left, open the mode table that contains the partial route from which you want to remove an element.
2. Select the partial route.
3. Select the "Elements" tab.
4. Select the element.
5. Press <DEL>.
   A prompt for confirmation appears.
6. Click "Yes".
   The element is removed from the list.

13.5.12 Element subtypes

Creating Element Types

As of V6, Route Control no longer supports the creation of control, sensor, parameter, or link elements types.
For reasons of consistency, subtypes are created in the S7 project as blocks with a specific ID and added to CFCs as instances. They are then transferred to Route Control Engineering using the Route Control Wizard.

You can find additional information in
"Example of a User-Defined Type" (Page 168).

13.6 Mode table

13.6.1 How to Configure Mode Tables

What are Mode Tables?

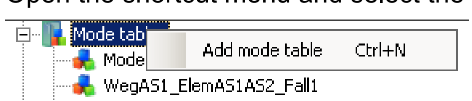
Mode tables are objects that group together associated technological mode levels. Each partial route is assigned to a mode table.

Example

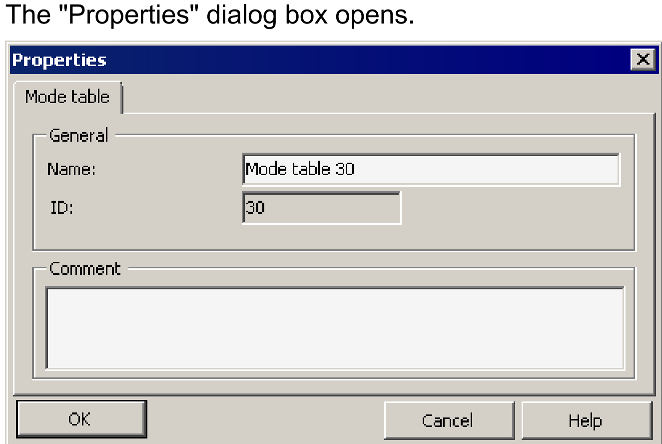
	"Production" mode table	"Cleaning" mode table
Mode level 1	Check initial state	Check initial state
Mode level 2	Is source tank full?	Is detergent available?
Mode level 3	Open transport valves	Transfer detergent
Mode level 4	Switch on product transport	Deactivate cleaning
Mode level 5	1. Is destination container full?	---
Mode level 6	Select second destination container	---
Mode level 7	2. Is destination container full?	---
Mode level 8	Switch on ventilation	---

Procedure

1. In Route Control Engineering, select the "Mode tables" folder.
2. Open the shortcut menu and select the menu command **Add Mode Table**.



The "Properties" dialog box opens.



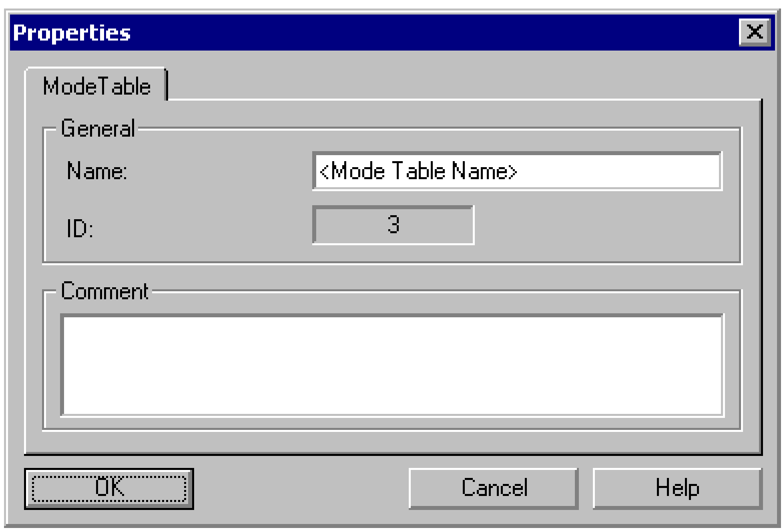
3. Enter a name for the mode table.
   The ID is preset by the system.
4. Enter a comment, if necessary.
5. Click "OK".
   The program saves your entries.

See also

Dialog boxes (Page 57)

13.6.2 Mode Table Properties

Dialog box



Description

This dialog box is used to input and change the properties of a mode table.

Meaning of operator control elements

Operator control element	Meaning
Name	Mode table name
ID	Mode table number that is unique from all others (assigned by the system)
Comment	User text

13.7 Mode levels

13.7.1 How to Configure Mode Levels

Introduction

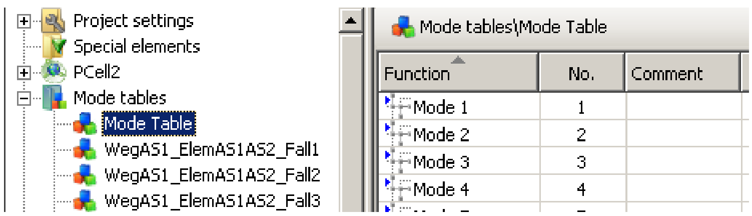
Mode levels are fine gradations used to control a route, that is, the elements of a route. In a technological process, it is not enough to merely enable a material transport and then terminate it after a certain period of time has elapsed or a particular quantity of products has been transported. Rather, the following conditions must be taken into account:

- Certain valves not directly located on the transport route must be closed to prevent the product from following an incorrect route.
- Elements such as manual valves, ventilators or similar are activated separately in response to conditions such as a temperature increase.
- During transport, the transport valves are opened first while the discharge valve on the source tank remains shut. This discharge valve is then opened and the pumped switched on only after the transport valves have attained their set position.
- Fill levels are scanned in the source and destination containers and, if necessary, the transport must be switched to other source and destination containers.

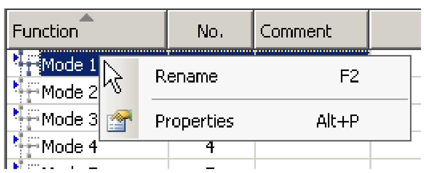
Procedure

If you have created a new mode table, it already contains 32 mode levels. You do not have to create any new mode levels. All you need to do is change the name.

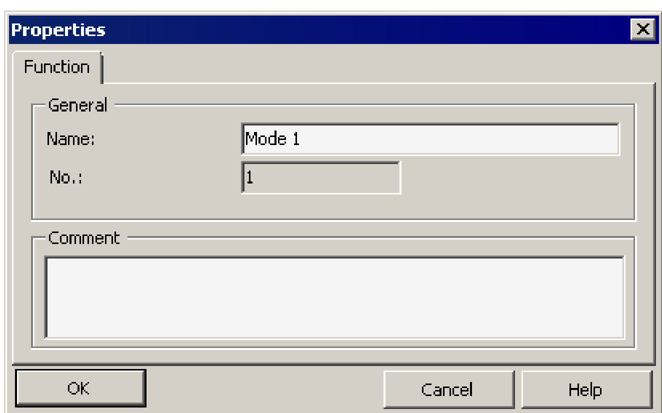
1. Select the mode table.



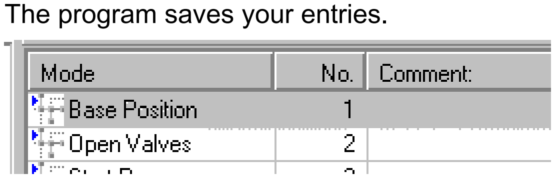
2. Open the mode level shortcut menu and select the menu command **Properties**.



The "User Properties" dialog box opens.

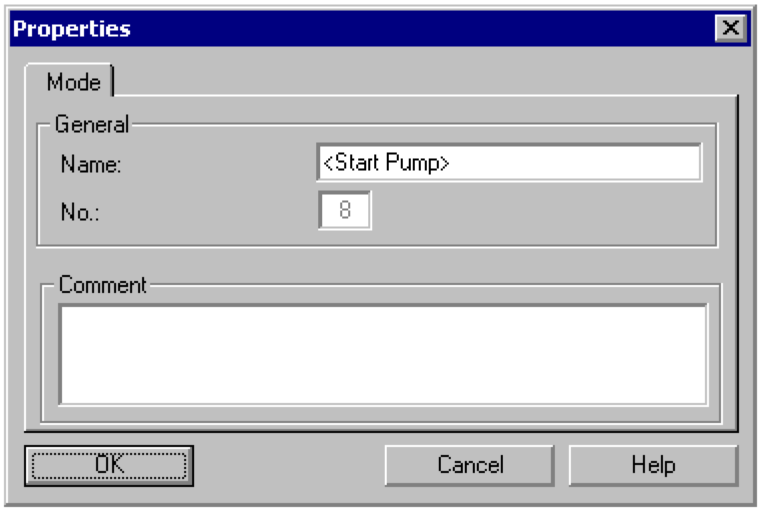


3. Enter a new name for this mode level.
4. Enter a comment, if necessary.
5. Click "OK".
   The program saves your entries.



13.7.2 Mode Level Properties

Dialog box



Description

This dialog box is used to input and change the properties of a mode level.

Meanings of Operator-Control Elements

Operator-control element	Meaning
Name	Name of mode level
No.	Unique mode level number (1 to 32)
Comment	User text

13.8 Partial routes

13.8.1 How to Configure Partial Routes

Introduction

Partial routes represent the smallest section within the route network (pipes, conveyor belts, etc.) in terms of a routing system. Partial routes have the following locations:

- Source location
- Destination location

The partial routes are assigned elements (motors, valves, parameter elements, sensors, link elements etc.).

An overall route is requested in runtime, including the source and destination locations of this overall route. The Route Control Server uses this information and an appropriate algorithm to search for the shortest possible path through the route network. (route network = total of all partial routes).

Requirement

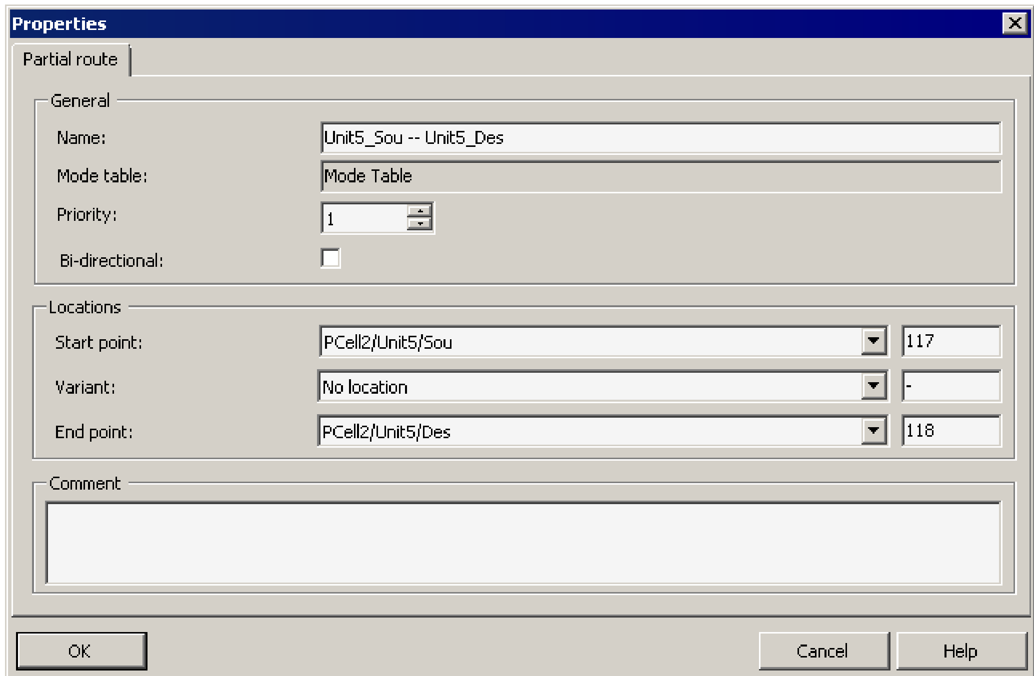
- The locations have been configured.
- A partial route can only be created if it is assigned a source and destination location. It is not possible otherwise to exit the Properties dialog of the partial route by clicking "OK".

Procedure

1. Select the required mode table in the lower left pane of Route Control Engineering.
2. Open the shortcut menu and select the **Add Partial Route** command.

The "User Properties" dialog box opens.

3. Select a source and destination location for this partial route from the drop-down list boxes.
   In the Variant field you enter a fictitious location for the description of an alternative path for the route.
   The system proposes a name for the partial route.
   This automatically generated name follows location changes until you change it for the first time.



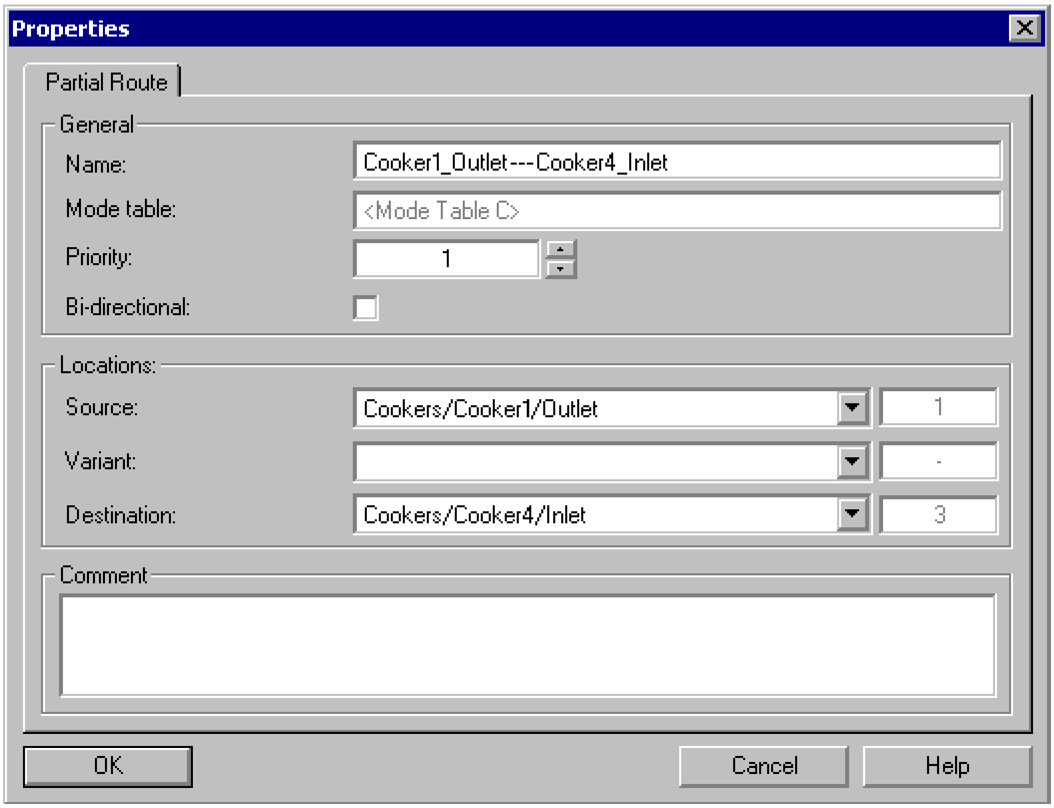
4. Enter a priority level from 1 to 9999.
5. Select the "Bi-directional" check box.
6. Enter a comment, if necessary.
7. Click "OK".
   The program saves your entries.

Additional information

- Section "Properties of the partial routes" (Page 414)

13.8.2 Partial Route Properties

Dialog box



Description

This dialog box is used to input or change the properties of a partial route.

Meanings of Operator-Control Elements

Operator-control element	Meaning
Name	Partial route name Use the following structure for the partial route name: <Source location><Arrow><Destination location> Example: "TankA>>LocationG" or "LocationG>>TankD" this will enable you to verify partial routes more easily later on during the route search (offline).
Mode table	Mode table in which this partial route was created. This property cannot be changed.

Operator-control element	Meaning
Priority	1: Highest priority 9999: Lowest priority When a route search is performed during runtime, partial routes are used according to their priority.
Bi-directional	Activated: This partial route can be traversed in both directions during the route search. Notice: Be aware that bidirectional partial routes significantly increase the number of routes that can be found on a network! Deactivated: This partial route can only ever be traversed from the source (source location) to the destination (destination location). Default value is "not bidirectional" in order to exclude undesirable paths initially.
Source	Source location of this partial route. The location numbers are also displayed for information purposes (on the right-hand side); they cannot be changed here (property of the respective location).
Variant	Variants are fictitious locations for the description of alternative partial routes.
Destination	Destination location of this partial route.
Comment	User text

13.9 Static routes

13.9.1 How to use static routes

Overview

In addition to dynamic route search, SIMATIC Route Control offers the option of saving an already found route.

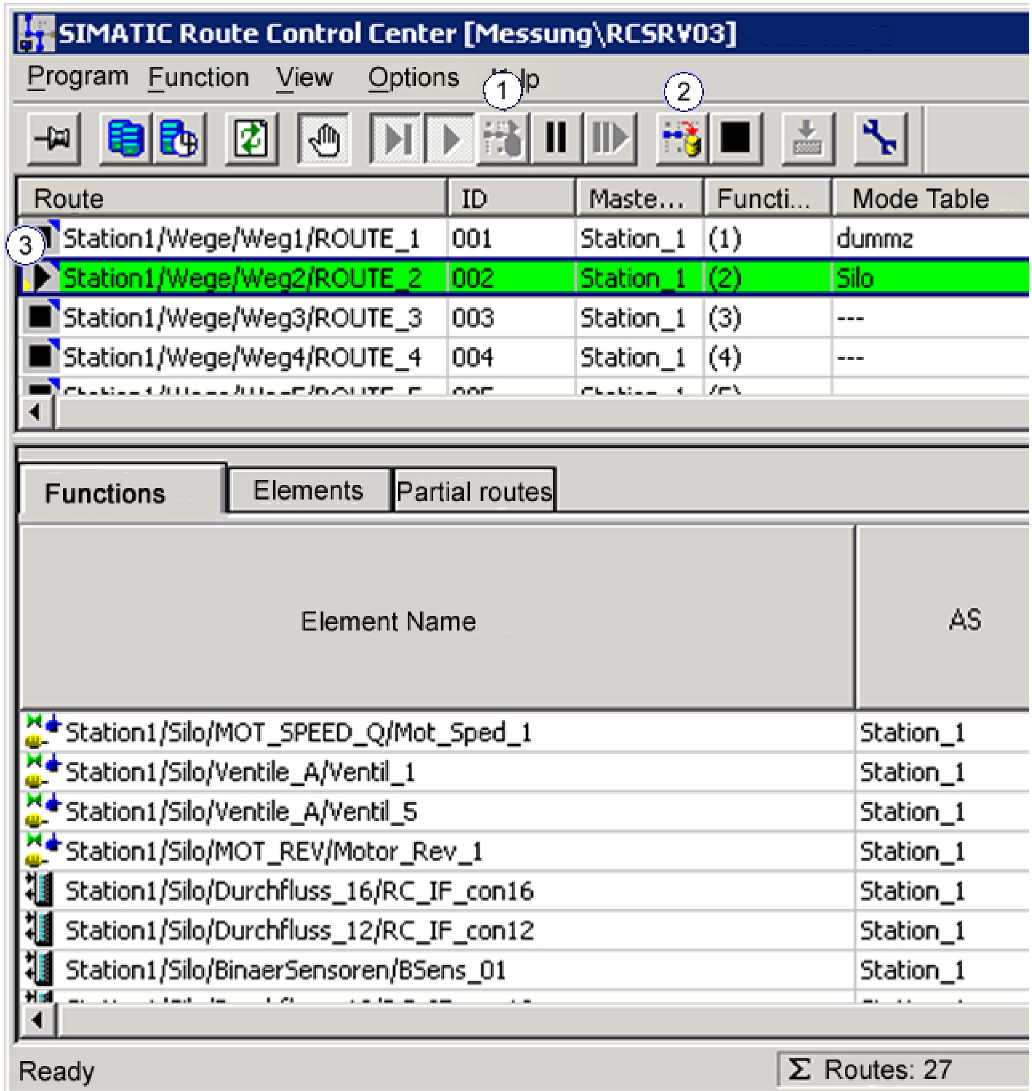
The saved route can be used again on a new route request After it is saved, the route is therefore a "static route".

A saved route can be found again by specifying the source, destination and vias. When a saved route is requested again for a route, the same partial routes will be reused.

You can save an active route either manually or via a user program.
Later, you can start the route again either manually or via a user program.

To enable manual saving or starting of routes, the interface of the RC Center has been extended to include new symbols (buttons).

The following figure shows an example:



1		Start a saved route
2		Save the current route
3		Indicator showing that a saved route exists

---

Note

Start a saved route

Note the following when starting saved routes:

The "Start Saved Route" button that can be used in manual mode in the Route Control Center is disabled if no route is stored for the selected source-via-destination combination. Therefore, you cannot start the route manually.

However, if the start of the saved route is performed automatically (0 -> 1 edge at IN_OUT parameter ONSR_AU) and there is no saved route, the RC server performs a normal search for a route. If a route is found in this way, this is also started, although it is actually not a "saved" route.

A small yellow triangle in the icon indicates whether a saved route exists for the currently stored combination of source, destination and via.

A saved route is requested and started via the route block FB800/RC_IF_ROUTE in the AS. The server takes the specified combination of source, destination and via from the route block as well as the other parameters at the start of the route (mode table, function ID…). It is determined whether a saved route exists for the combination of source, destination and via. If a route with this data is available, the server takes the partial routes saved for this route.

In the next step, a search is performed to determine whether the same partial routes exist for the mode table specified in the route request. This check is performed on the basis of the partial route name assigned by the user.

Note

Partial routes

Partial routes are configured as components of mode tables. Partial routes with the same name are allowed to exist in different mode tables. In this case, it is assumed that a physical partial route with identical elements in different mode tables has been configured.

The route request of saved routes permits use of a saved route with different mode tables.

The following errors can occur when saved routes are requested:

Cause of error	Response
Cannot find requested and allegedly saved route	The usual route search is performed
Partial routes of the requested saved route are not available for the specified mode table	Route request failed Error output
Elements of the partial routes of the requested saved route are disabled	Route request failed Error output

Static routes from the offline route search

Routes that were found during the offline route search can be saved as static routes. The online saved static routes are deleted when the Route Control server is downloaded. The static routes stored offline are copied for online use when the Route Control server is downloaded and may be used again there.

Error/message outputs via WinCC

- Stat. route request start: "source" -> "destination"
- Route cannot be saved
- Cannot be saved: Route has incorrect status
- Route was saved

13.9.2 Save route

Preliminary remark

You can save routes manually or automatically.

Saving a route manually

If a route is in the status "running", you can save it by clicking "Save Current Route". If a route cannot be saved due to its status, the button will be disabled.

Saving a route again manually

A route can only be saved once while it is running. A repetition of the operation is ignored as no new information can be saved. After stopping and restarting the route, clicking the button again results in the existing saved settings being overwritten.

Saving a route in automatic mode

In automatic mode, an active route can be saved for later reuse by a 0->1 edge at the IN_OUT parameter SVRT_AU of the FB800/RC_IF_ROUTE.
The route is identified on the basis of the combination of the parameters source, destination, via.

The route block sends a save request to the server. The route is only saved if the route has been started and is in the status "running". A route in error status cannot be saved.

Memory and distinguishing criteria

The location IDs of source, destination and via (not symbolic names) are used as memory and distinguishing criteria. All the currently used partial routes and the mode table will be saved.

Saving a route with redundant servers

The route to be saved is saved in the RouteControl database. If the process cell is part of a redundant configuration, which means both a Route Control master server and a standby server exist, the routes to be saved are transferred to the standby server by the master server. If the standby server is switched off or not available, the saved routes will not be found on the standby server. The routes have to be saved again as soon as the standby server is switched on and activated as the master.

Server update

The RC server stores this information in a database, which is deleted when the RC server is updated, which means there are no saved routes following a server update.

Exception:

A route is running and has been saved. If a server update is performed in this status, the route will still be saved in spite of the update.

13.9.3 Start a saved route

Preliminary remark

You can start routes manually or automatically.

If there is no saved route available for the current combination of source, destination and via, a standard route search is performed as for "Set route start".

Start a saved route manually

In manual mode you can start a saved route, evident by its icon (yellow triangle), via the "Start Saved Route" icon.

Start a saved route automatically

In automatic mode, a saved route can be saved by a 0->1 edge at the IN_OUT parameter ONSR_AU.

The route is identified on the basis of the combination of the parameters source, destination, via. A started saved route is displayed at the QONSR output.

13.10 Elements

13.10.1 How to Insert an Element in a Partial Route

Procedure

To insert an element in a partial route, proceed as follows:

1. Select the element from the list in the upper area of Route Control Engineering and drag-and-drop it to the partial route in the lower area.
   A dialog box opens.
2. Set the element properties:
   – Mode level in which the element is to be inserted/activated/requested
   – Activation value, for example, Switch on motor, Close valve, etc.
   – Passive usage: The element is only polled but not activated in this mode level.
   – Monitor idle state: The element is still monitored to ensure it retains the required position if the mode level is deactivated.
   – Pulse time on/off: Duration of the on and off signals, in seconds
   – Delay time on/off: Duration of the on and off signals, in seconds Elements can be switched on or off with a delay relative to activation or deactivation of their mode level (for example, motor coasting; valves with delayed closing).
3. Click "OK".
   The element is assigned to the partial route along with the programmed properties.
   If you click "Cancel", no element is inserted.

Additional information

You can then program the other instances of element activation in other mode levels on the "Modes" tab in Route Control Engineering.
You can find information on this in the section
"How to Program the Activation of Elements". (Page 420)

13.10.2 How to Configure Activation of Elements

Introduction

You configure the activation of an element in a mode level when the element is inserted in a partial route. You can then configure the activation of elements in other mode levels on the Route Control Engineering "Modes" tab, without having to open the "User Properties" dialog box each time.

Procedure

1. In Route Control Engineering, select the partial route whose elements you want to configure.
2. Select the "Modes" tab.
3. Use the left mouse button to click an element row, in the column for the required mode level.
   The drop-down list containing the icons for the activation keys opens.
4. Select the desired entry from the drop-down list.
   The selected icon is added to the list.

Note

If the type of activation selected requires further configuration, the "Properties" dialog box opens automatically.
Change the configuration here.

How to Change an Activation

To change the activation of an element in a mode level, proceed as follows:

1. Open the shortcut menu in the column of the element mode level that has already been configured and select the menu command "Properties".
   The "Properties" dialog box opens.
2. Change the configuration here.
3. Click "OK".
   The program saves your entries.
   The icon for the activation type is adapted automatically.

Note

If you no longer want to activate an element in a certain mode level, use the left mouse button to open the drop-down list and select the blank icon here.

Note

You must download the server again whenever you make a change to the configuration!
You can find information about this in
"Downloading the Route Control Server" (Page 472).

Additional information

- Section "Meanings of Activation Key Icons" (Page 422)
- Section "How to Change the Activation Key Icons" (Page 423)
- Section "How to Create User Keys" (Page 423)
- Section "How to Delete User Keys" (Page 425)

13.10.3 Meanings of Activation Key Symbols

Introduction

If a partial route is selected, the "Modes" tab in the lower section of the Route Control Engineering window shows how an element is used in the different mode levels, for example, whether it is actively controlled or passively requested.

Activation Keys and Symbols

The way in which an element is activated in the different mode levels is shown with activation keys.

An activation key consists of a symbol or a combination of symbols.

Meanings of Symbols

The following table shows the symbols with their default factory settings.

Symbol	Meaning
a	The element will be activated.
d	The element will be deactivated.
?	The actual position of the element will be requested (checked).
p	The element is activated in pulse mode. A pulse time is configured in the element properties.
1	The element is activated with a switch-on delay. A switch-on delay time is configured in the element properties.
2	The element is activated with a switch-off delay. A switch-off delay time is configured in the element properties.
3	The element is activated with a switch-on and a switch-off delay. A switch-on delay and a switch-off delay are configured in the element properties.
-	The idle state position is monitored. When the mode level is deactivated, monitoring will be performed to determine whether the element is also switched off (motor) or closed (valve).

You can change these symbols. You can also create your own user keys.

Additional information

- Section "How to Change the Activation Key Symbols" (Page 423)
- Section "How to Create User Keys" (Page 423)
- Section "How to Delete User Keys" (Page 425)

13.10.4 How to Change the Activation Key Symbols

Procedure

1. In Route Control Engineering, select the menu command **Options > Symbols**.
   The "Key symbols" dialog box opens.
2. Change the symbols in the entry fields.
3. Click "OK".
   The program saves your entries.

Note

You must download the server again whenever you make a change to the configuration! You can find information about this in
"Downloading the Route Control Server" (Page 472).

Additional information

- Section "Meanings of Activation Key Symbols" (Page 422)
- Section "How to Create User Keys" (Page 423)
- Section "How to Delete User Keys" (Page 425)

13.10.5 How to Create User Keys

Introduction

To simplify configuration, you can replace activation keys, which consist of more than one icon, with simple user keys.

Definition

A user key is a complicated activation key to which you have assigned a specific name.

The key is configured once and is then used like a symbol for each additional configuration.

A user key is assigned to a type and can only be assigned to elements which correspond to this type. In other words, a key defined for a MOTOR cannot be assigned to a VALVE. The function view only shows keys to the assignment that correspond to the current element type.

Only one key may exist for a given combination of properties. When a key is deleted, the system search for this key throughout all installation locations (partial routes) and replaces it with the default key. When a key is redefined for a combination of properties, the new key is transferred to all installation locations that comply with this combination.

Procedure

There are two ways to create a user key:

- By interconnecting elements in partial routes
- By using the menu command "Options" -> "User Keys" -> "New"

1. In Route Control Engineering, with a partial route selected, select the "Modes" tab.
2. Use the left mouse button to click an element row in the column for a mode level.
   The dropdown list opens with the symbols of the control key.
3. Select "p..." in the drop-down list.
   The "Properties" dialog box opens.
4. Configure the activation of the element.

   Note

   If there is already a user key for selected parameter combination, its name is displayed. This cannot be changed at this location. However, if you choose a new combination, you can also define a new name and thus a new user key.

5. Enter the name of the new user key.
6. Click "OK".
   The program saves your entries.

"Options" menu command

1. In Route Control Engineering, select the menu command Options > User Keys.
   The "User keys" dialog box opens. All available user keys are displayed.
2. Click "New".
   The dialog box for configuring a user key opens.
   Select the desired CE type, the control, etc., and specify a new name.
   If the chosen name already exists, you must correct your entry.
   It is also not possible to assign different names to the same parameter combination.
3. Click "OK".
   The new user key is displayed as a new row in the table.
4. Click "Close" to exit the dialog.

   Note

   Download the server again after each change to the configuration.
   You can find information about this in the section
   "Downloading the Route Control Server" (Page 472)

Result

The new key is available in the drop-down list as an additional icon, with the specified properties.

Additional information

- Section "How to Delete User Keys" (Page 425)

13.10.6 How to Delete User Keys

Procedure

1. In Route Control Engineering, select the menu command **Options > User Keys**.
   The "User Keys" dialog box opens.
   All existing user keys are displayed.
2. Select a row in the list and click the "OK".
   If you want to delete all user keys, click the "Delete All" button.
   The confirmation dialog box opens.
3. Click "Yes".
   The selected keys are deleted.

Note

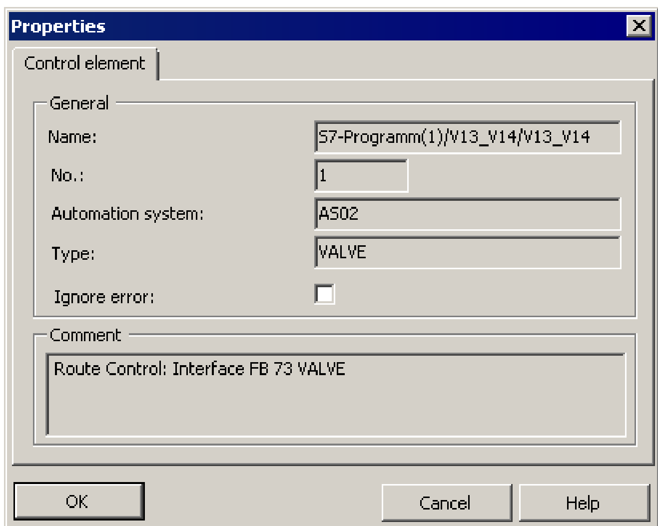
Although a key may still be in use, it can nevertheless be deleted.
A dialog box shows you the partial routes in which the key is still used. If you delete the key anyway, the default key combinations are entered at all locations of this key.

13.10.7 Control elements

13.10.7.1 Control Element Properties

Opening the Dialog Box

1. In the tree view in Route Control Engineering, select the "Control Elements" folder in an automation system.
2. Double-click on a line of the list.
   The dialog box opens.



Description

This dialog box displays the properties of a control element. For reasons of consistency, the properties can not be changed (except for comments), as they have been imported from the S7 project. The properties have already been assigned in the appropriate blocks in the CFC.

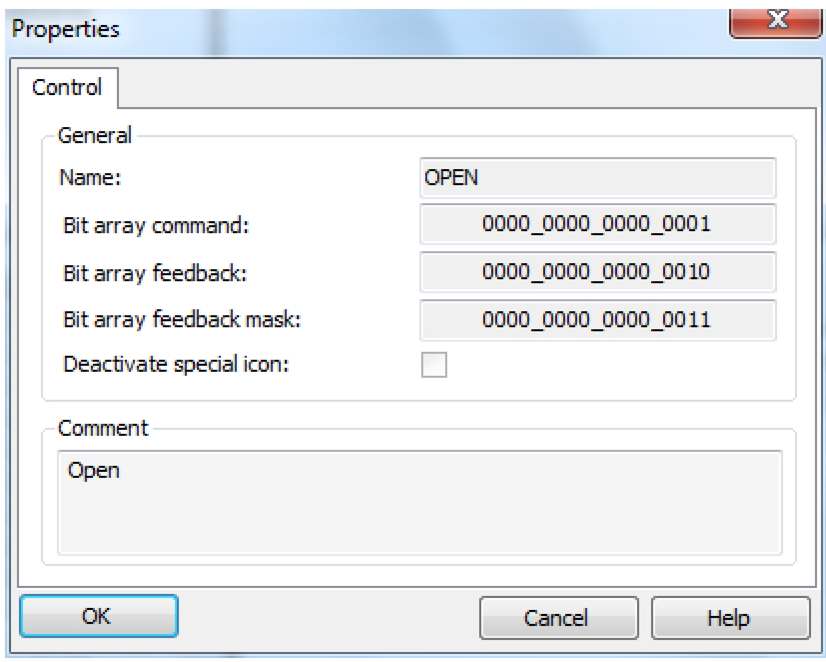
Meanings of Fields

Field	Meaning
Name	Control element name
No.	Control element number that is unique from all others
Automation system	Name of automation system to which the control element is assigned through configuration
Type	Type of element
Ignore error	Deactivated: Control element feedback error results in a mode-level error. Activated: Control element feedback error does not result in a mode-level error.
Comment	User text

13.10.7.2 Activation of control elements

Opening the Dialog Box

1. In the tree view in Route Control Engineering, select folder **Types > Control Elements**.
2. Select a type of control element.
3. Double-click on a line of the list.
   The dialog box opens.



Description

This dialog box displays the properties of a type of control element. The properties of the standard types can not be changed. You enter new activation values and names and modify them in this dialog box.

Meanings of Fields

Field	Meaning
Name	Name of command, for example, OPEN, CLOSED, OFF, ON
Activation	16-bit value, of which the 13 LSBs can be used. This value is shortened to 13 bits prior to output at the interface block.
Feedback	16-bit value linked to the feedback mask using an AND operation, which is used to indicate the real actual value from the process
Feedback mask	16-bit value that masks out certain bits of the feedback parameter by means of an AND operation
Comment	User text

Display language of the control commands and feedback texts

If the control commands for control elements or the feedback texts for sensor elements are not displayed in the language you set, proceed as follows:

1. Close Route Control Engineering.
2. Switch to a different language in SIMATIC Manager.
3. Start and close Route Control Engineering.
4. Set the required language again in SIMATIC Manager.
5. Immediately after, start Route Control Engineering.

13.10.7.3 Control Elements Cross-reference List

Introduction

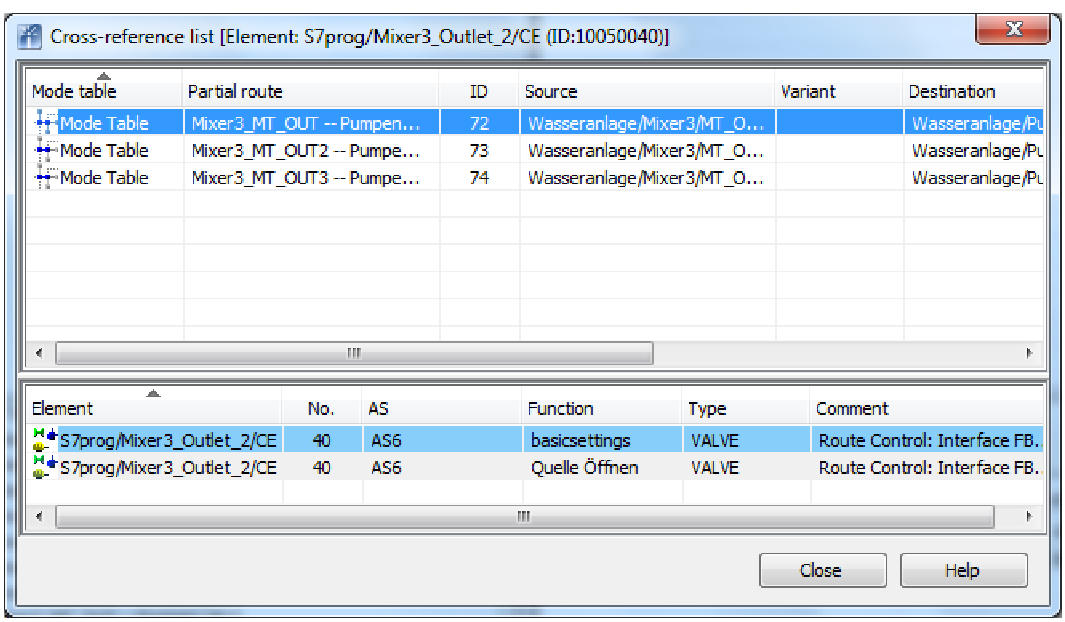
Open the cross-reference list via the shortcut menu in an interconnected element.

Partial Routes Tab

In the cross-reference list, also called the reference list, all partial routes are shown in which a searched element is installed.

The top list contains all partial routes and mode tables in which this element was found.

The list below shows all the elements of the partial route selected above, whereby the searched element is displayed with a blue background.



Meaning of the columns of the top list

Column	Meaning
Mode table	Mode table name
Partial route	Partial route name
ID	Partial route number that is unique from all others
Source	Source location of partial route
Variant	Fictitious locations for the description of alternative partial routes
Destination	Destination location of partial route
Bi-directional	Usability of partial route in both directions
Priority	Priority of partial route
Comment	User text

Meaning of the columns of the bottom list

Column	Meaning
Element	Element name
No.	Number of element
AS	Name of automation system
Function	Mode level in which the element is inserted in this partial route
Type	Type of element
Comment	User text

Open partial route

To select an element in its partial route, follow these steps:

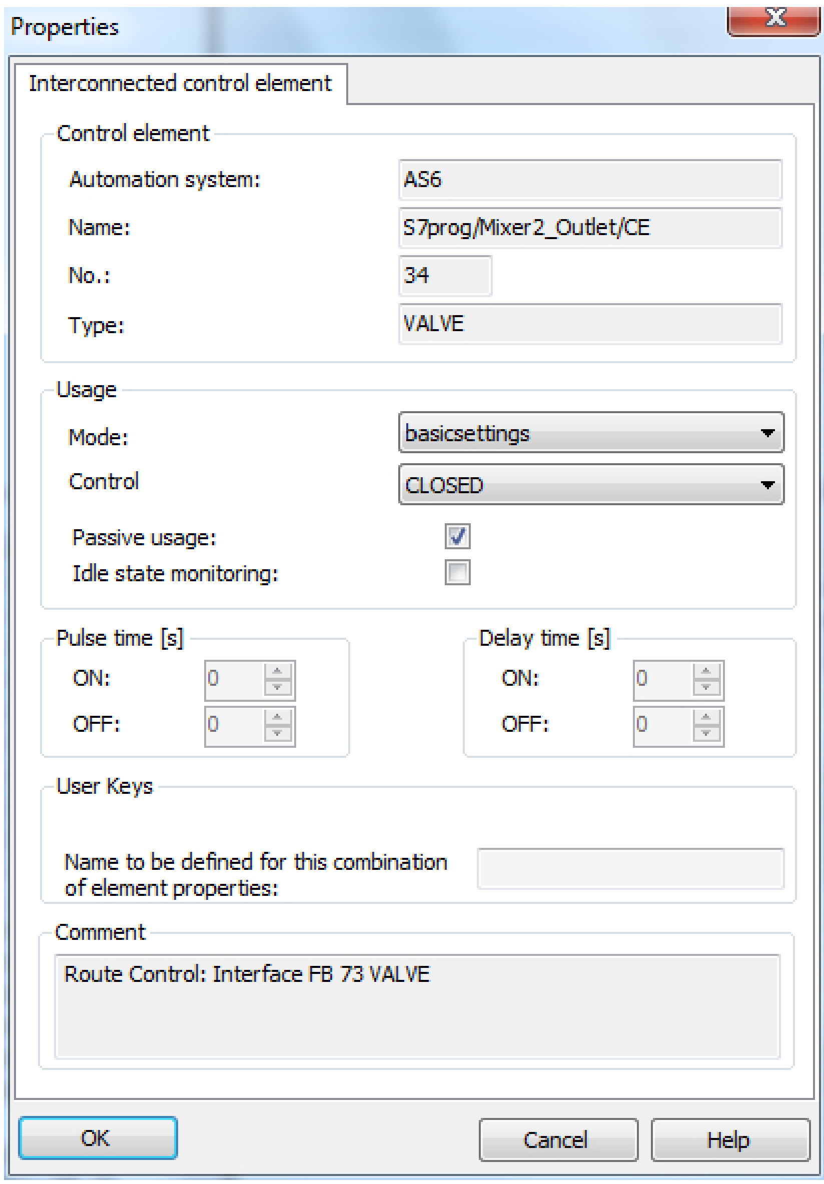
1. Select the item from the bottom list.
2. Right-click.
3. Select "Go to" in the shortcut menu.

In the relevant mode table, the corresponding partial route is opened and the element is selected.

13.10.7.4 Route Control Element Properties

Dialog box

This dialog will be displayed automatically if an element from an automation system is inserted in a partial route using a drag-and-drop operation.



Description

This dialog box is used to display, change or specify the properties of a control element installed in a partial route.

Meanings of Fields

Field	Meaning
Automation system, Name, No. and Type	Information about the automation system
Mode	Model level of the partial route to which the element is assigned
Activation	Activation command received by the element if the route activates this mode level during runtime
Passive usage	Yes: In this mode level, the element will only be polled for its position and not activated.
Monitor idle state	Yes: When the mode level is deactivated, the element is monitored to determine if it retains its idle state; for example, if a valve must remain closed.
Pulse time on	Duration of the HIGH signal in seconds with a pulsed element
Pulse time off	Duration of the HIGH signal in seconds with a pulsed element
Delay time on	Time elapsing after a mode level is activated before this element is activated
Delay time off	Time elapsing after a mode level is deactivated before this element is deactivated
User key	Name for the set of properties.

See also

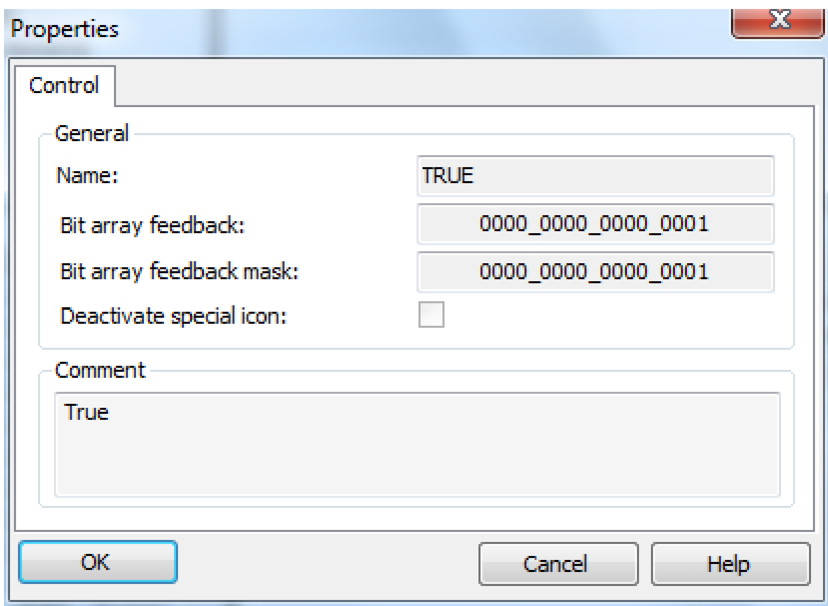
Idle-state monitoring (Page 124)

13.10.8 Sensor elements

13.10.8.1 Activation of Sensor Elements

Opening the Dialog Box

1. In the tree view in Route Control Engineering, select folder
   Types > Sensor Elements.
2. Select a type of sensor element.
3. Double-click on a line of the list.
   The dialog box opens.



Description

This dialog box displays the properties of a type of sensor element. The properties of the standard types can not be changed.

Meanings of Fields

Field	Meaning
Name	Name of feedback Note: These properties cannot be changed for standard types.
Feedback	16-bit value linked to the feedback mask using an AND operation, which is used to indicate the real actual value from the process
Feedback mask	16-bit value that masks out certain bits of the feedback parameter by means of an AND operation
Comment	User text

13.10.8.2 Sensor Elements Cross-reference List

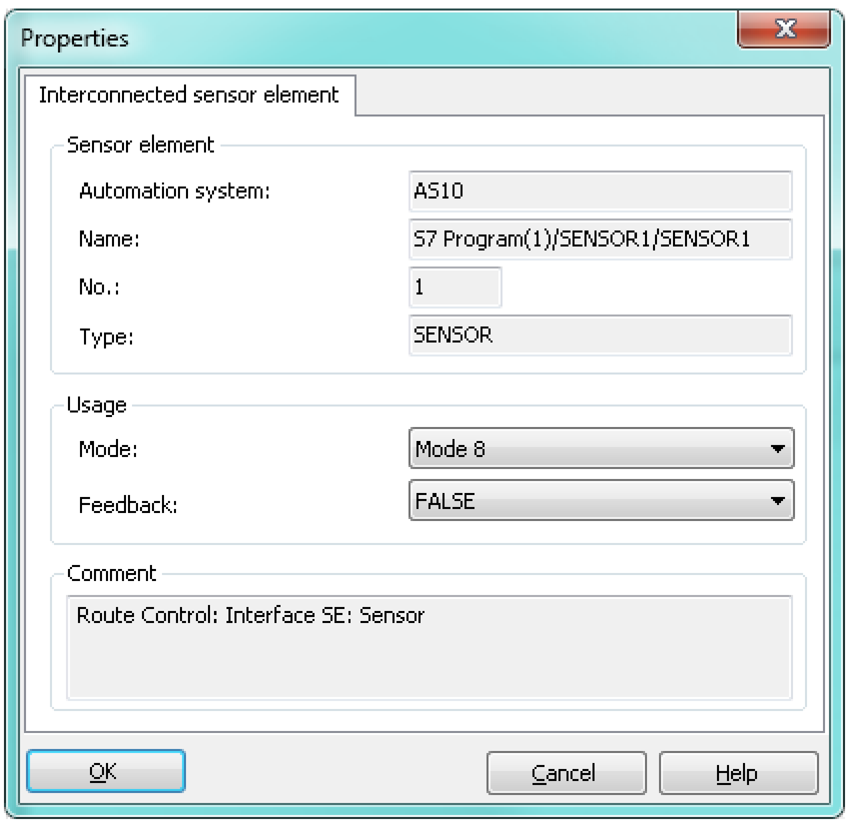
Additional Information About the Cross-reference List

- Section "Control Elements Cross-reference List" (Page 428)

13.10.8.3 Route Sensor Element Properties

Dialog box

This dialog will be displayed automatically if an element from an automation system is inserted in a partial route using a drag-and-drop operation.



Description

This dialog box is used to change or specify the properties of a sensor element inserted in a partial route.

Meanings of Fields

Field	Meaning
Automation system	Name of the automation system to which the element is assigned during configuration (S7 project engineering)
Name	Sensor element name
No.	Number of the sensor element as assigned in the CFC chart (for example, by the Route Control Wizard)
Type	Type of sensor element
Function	Mode level in which the sensor element is inserted in this partial route
Feedback	Expected feedback causing this sensor to switch over
Comment	User text

13.10.9 Parameter Elements

13.10.9.1 Parameter element subtypes

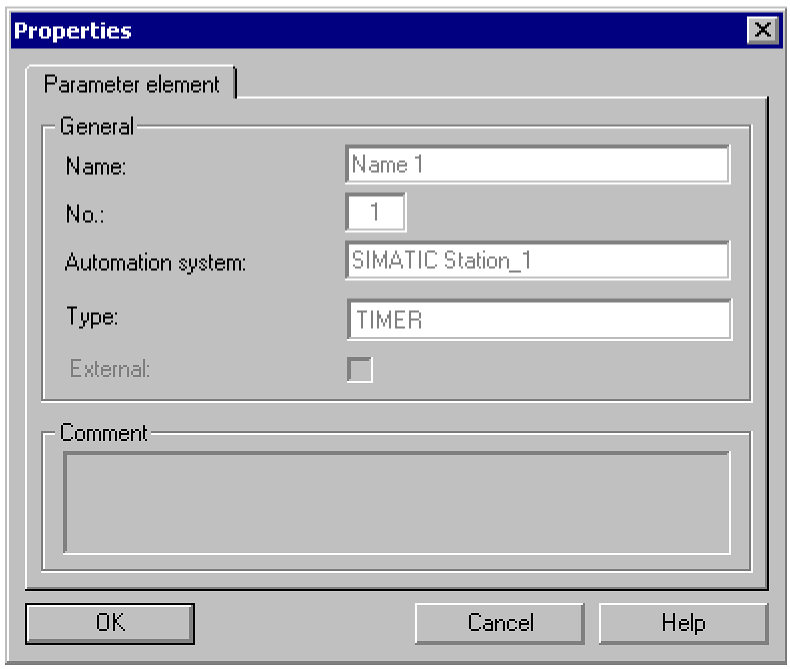
Note

While subtypes exist for the control and sensor elements in the tree view in Route Control Engineering, there are no commands for the VOLUME and TIMER subtypes for parameter elements. For this reason, additional levels can not be displayed in this case. VOLUME and TIMER are thus displayed only in the list view on the right.

13.10.9.2 Parameter Element Properties

Opening the Dialog Box

1. In the tree view in Route Control Engineering, select the "Parameter Elements" folder in an automation system.
2. Double-click on a line in the list.
   The "Properties" dialog box opens.



Description

This dialog box displays the properties of a parameter element. For reasons of consistency, the properties can not be changed (except for comments), as they have been imported from the S7 project. The properties have already been assigned in the appropriate blocks in the CFC. The "External" check box is operable as long as the element has not been integrated in a partial route.

Meanings of Fields

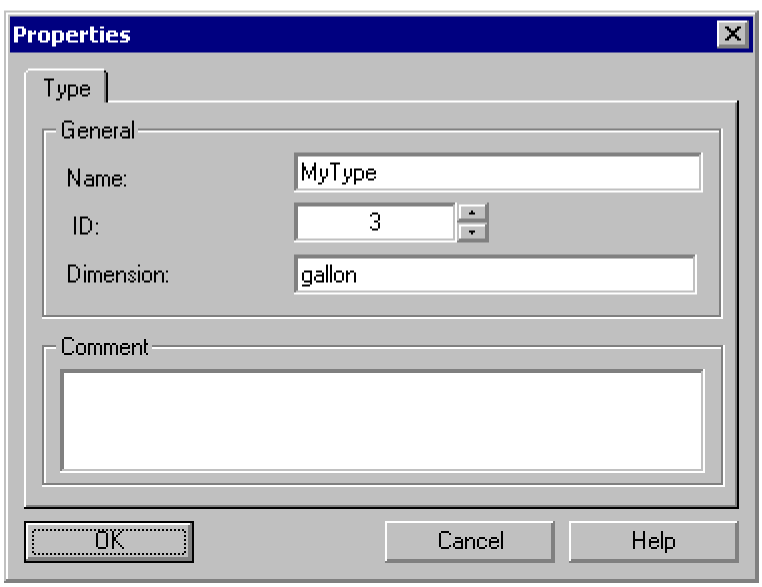
Field	Meaning
Name	Parameter element name
No.	Parameter element number that is unique from all others
Automation system	Name of automation system to which the parameter element is assigned through configuration
Type	Type of sensor element

Field	Meaning
External	Indicates whether this is an external parameter element (that is, setpoint will be transferred during runtime) Activated: External parameter element; index is assigned through configuration. Deactivated: Internal parameter element, value is assigned through configuration. You can find additional information in "Guide to External Parameter Elements" (Page 234).
Comment	User text

13.10.9.3 Parameter element types

Type properties

1. In the tree view in Route Control Engineering, select folder **Types > Parameter Elements.**
2. Double-click in the right pane on the desired parameter element type. The dialog box opens.



Description

The type properties of the parameter elements are displayed in the right window. The properties of standard types cannot be changed.

Meanings of Fields

Field	Meaning
Type	Name of the PE type
ID	Unique type number
Unit	Unit, such as seconds, liters, gallons
Comment	User text

13.10.9.4 Parameter Elements Cross-reference List

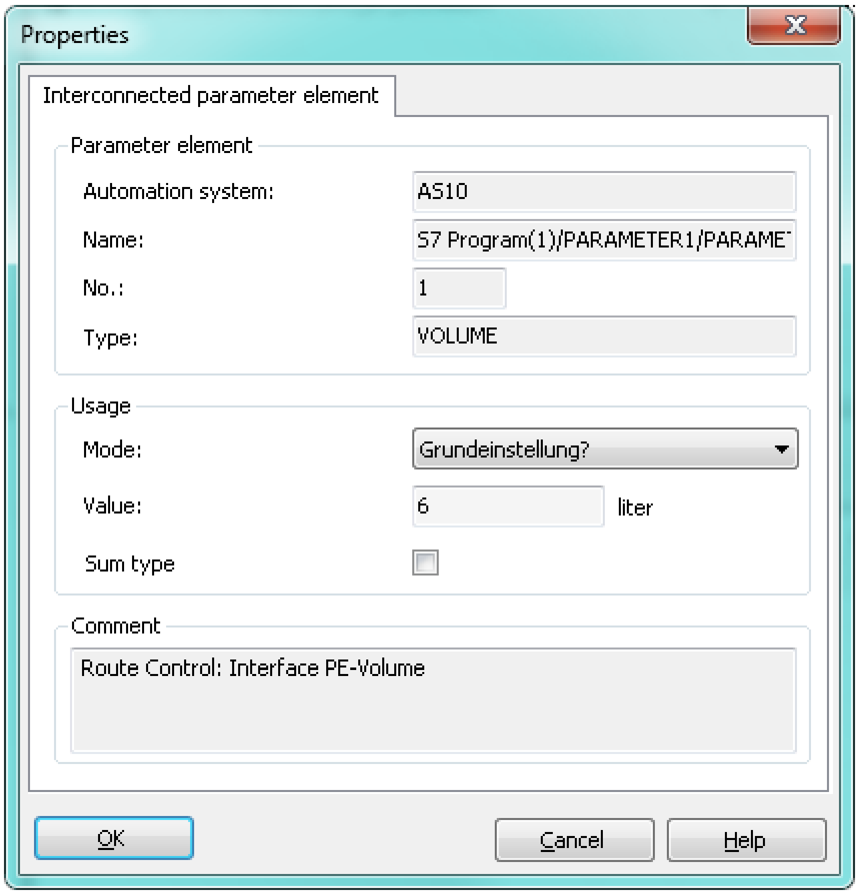
Additional Information About the Cross-reference List

- Section "Control Elements Cross-reference List" (Page 428)

13.10.9.5 Route parameter element properties

Dialog box

This dialog will be displayed automatically if an element from an automation system is inserted in a partial route using a drag-and-drop operation.



Description

This dialog box is used to change or specify the properties of a parameter element inserted in a partial route.

Meanings of Fields

Field	Meaning
Automation system	Name of the automation system to which the element is assigned during configuration (S7 project engineering)
Name	Parameter element name
No.	Number of the parameter element as assigned in the CFC chart (for example, by the Route Control Wizard)
Type	Type of the parameter element
Function	Mode level in which the parameter element is inserted in this partial route
Value	Setpoint
Index	For external parameter elements, a setting on one of the external setpoints at RC_IF_ROUTE. You can find additional information in "RC_IF_ROUTE (FB 800)" (Page 101) under parameters EXT_xxx_I and EXT_xxx_O.

Field	Meaning
Type sum	Activated: All setpoints of all of a route's parameter elements will be added during runtime and transferred to the automation systems. Example: When specifying volumes in pipes, if the total quantity of the product is used to calculate the discharge quantity and duration. This setting is only permitted for internal parameter elements.
Comment	User text

13.10.10 Link elements

13.10.10.1 Properties of link elements and route connection elements

Link element

A link element includes information on which material is used for a partial route.

If a connection element is installed in a partial route, we refer to it as a route connection element.

Route control checks if a specific material is permitted to follow a preceding material based on the material configuration and the information stored in the route connection element.

13.10.10.2 Link Elements Cross-reference List

Additional Information About the Cross-reference List

- Section "Control Elements Cross-reference List" (Page 428)

13.10.11 Wait elements

13.10.11.1 Wait element

Overview

The following functions can be implemented by inserting Wait elements in partial routes/routes.

- Activation sequence
  An activation sequence regulates the activation of the actuators of a mode.
- Deactivation sequence
  A deactivation sequence regulates the deactivation of elements.
- Single pulsing
  With a single pulsing, the element is activated once in active mode for the duration of the pulse time.

Wait elements form a separate element type and are not assigned to a process cell or AS. You have no interface block that must be installed in CFC charts.

The Wait element is always available and you can insert it in any partial routes for functions.

The following figure shows an example of a Wait element in RC Engineering:

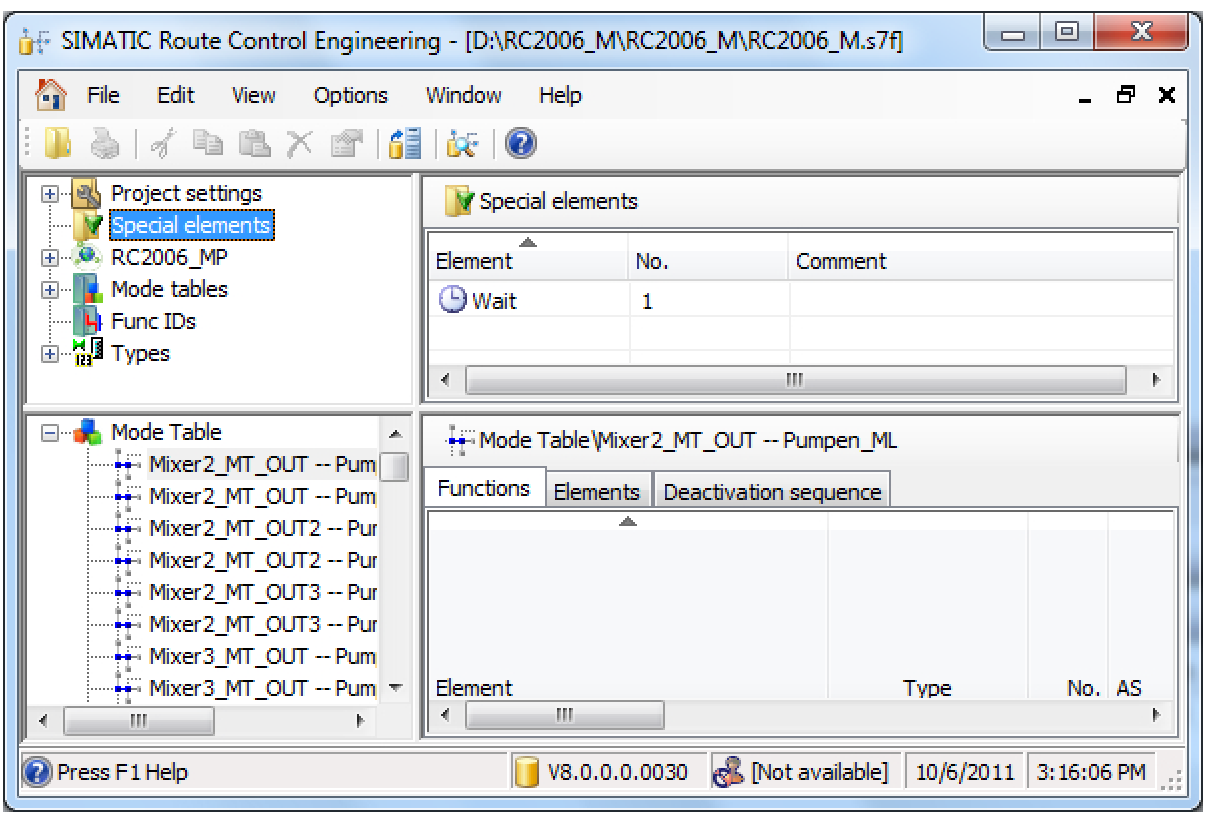


Image 13-1 Wait element

Note

Configuration of the process monitoring time

When using Wait elements, bear in mind that the mode can also be recognized as "achieved" only after all waiting times have expired. Take this into consideration when configuring the process monitoring time of the corresponding mode. If necessary, set the process monitoring time to "indefinite" (32767).

13.10.11.2 Configuring a Wait element

Requirement

You must be logged on and authorized to configure Wait elements.

Procedure

You insert a Wait element in a partial route/function using drag-and-drop. To do this, either the "Elements" or "Deactivation sequence" tab must be active.

This action is not possible in the function view, and no Wait elements are displayed in this view.

The figure below shows an example of the "Properties" dialog box of a Wait element. You can open the "Properties" dialog box by double-clicking the Wait element.

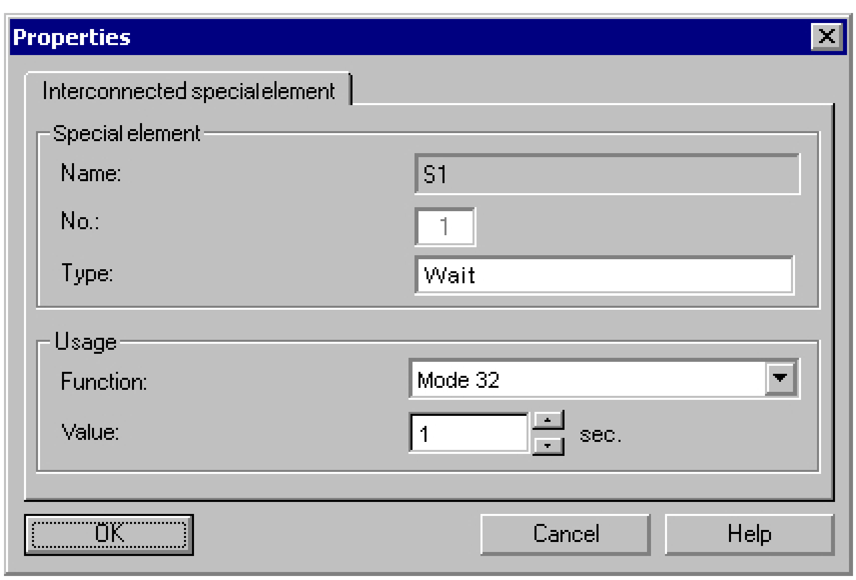


Image 13-2 Configuring a Wait element

1. Select either the "Elements" or "Deactivation sequence" tab.
2. Move the Wait element into a partial route/function using drag-and-drop.
   The "Properties" dialog box opens.

3. From the "Function" drop-down list, select the function in which the Wait element is to be inserted.
   The last edited function is the presetting.
4. Enter a value in seconds in the "Value" edit box.
   This value indicates how long program execution will be interrupted. The value 0 is not permitted.

13.10.11.3 Changing the processing sequence with Wait elements

Defining the sequence within a function

The sequence of the partial routes and the placement in the mode within this order determine the order of the elements.

After configuration of a Wait element, the Wait element in the selected function is displayed as the last element in the element list.

The following figure shows an example of positioned Wait elements within a function of a partial route:

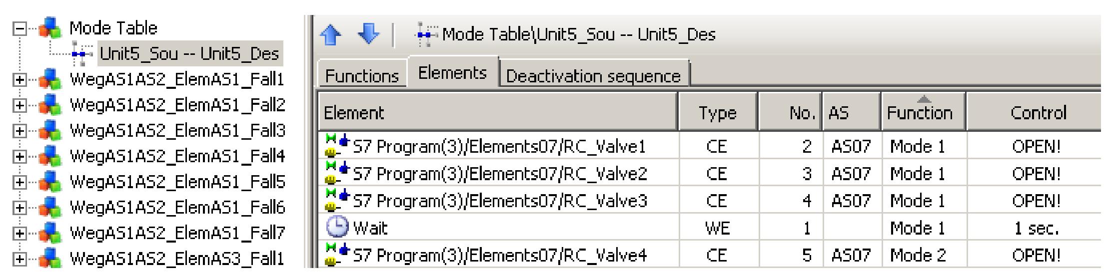


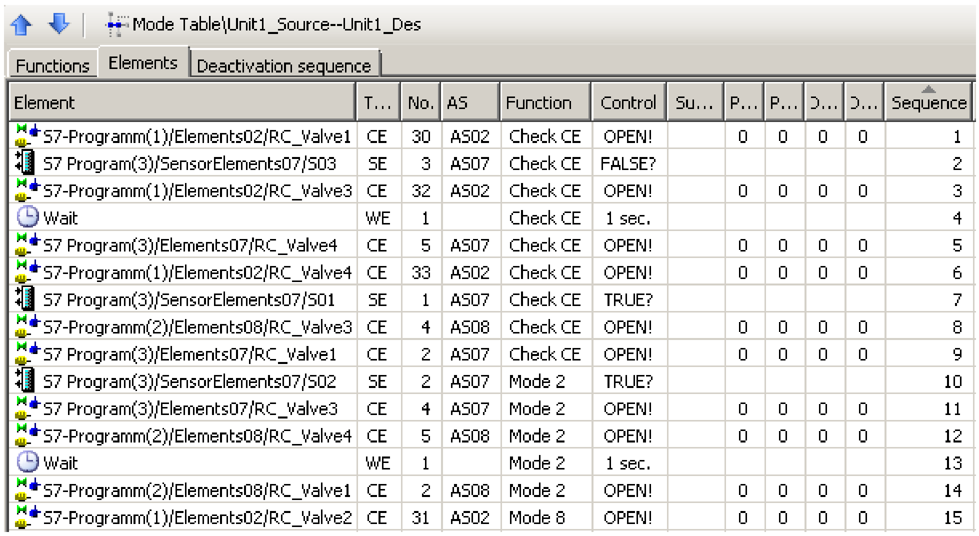
Image 13-3 Define sequence

1. Press the "Up" or "Down" key (arrow keys).
   The Wait element is moved to the appropriate position.

You can only move a Wait element within its function.

Define the sequence across all functions of a partial route

The following figure shows an example of the sequence of elements and their position across all configured functions of a partial route:



Element	T...	No.	AS	Function	Control	Su...	P...	P...	D...	D...	Sequence
S7-Programm(1)/Elements02/RC_Valve1	CE	30	AS02	Check CE	OPEN!		0	0	0	0	1
S7 Program(3)/SensorElements07/S03	SE	3	AS07	Check CE	FALSE?						2
S7-Programm(1)/Elements02/RC_Valve3	CE	32	AS02	Check CE	OPEN!		0	0	0	0	3
Wait	WE	1		Check CE	1 sec.						4
S7 Program(3)/Elements07/RC_Valve4	CE	5	AS07	Check CE	OPEN!		0	0	0	0	5
S7-Programm(1)/Elements02/RC_Valve4	CE	33	AS02	Check CE	OPEN!		0	0	0	0	6
S7 Program(3)/SensorElements07/S01	SE	1	AS07	Check CE	TRUE?						7
S7-Programm(2)/Elements08/RC_Valve3	CE	4	AS08	Check CE	OPEN!		0	0	0	0	8
S7 Program(3)/Elements07/RC_Valve1	CE	2	AS07	Check CE	OPEN!		0	0	0	0	9
S7 Program(3)/SensorElements07/S02	SE	2	AS07	Mode 2	TRUE?						10
S7 Program(3)/Elements07/RC_Valve3	CE	4	AS07	Mode 2	OPEN!		0	0	0	0	11
S7-Programm(2)/Elements08/RC_Valve4	CE	5	AS08	Mode 2	OPEN!		0	0	0	0	12
Wait	WE	1		Mode 2	1 sec.						13
S7-Programm(2)/Elements08/RC_Valve1	CE	2	AS08	Mode 2	OPEN!		0	0	0	0	14
S7-Programm(1)/Elements02/RC_Valve2	CE	31	AS02	Mode 8	OPEN!		0	0	0	0	15

Image 13-4 Define the sequence across all functions

The column "Sequence" indicates the position of the elements across all functions of the partial route.

The element "RC_Valve2" no."31" is installed in the function "Mode 8".

You cannot move this element with the arrow keys because it is the only element in this function.

This element will always remain at position 15 if no new elements or inserted or deleted. Even moving an element (e.g. wait) in the function "Check CE" does not change this position.

As, for example, "Check CE" is the first of thirty two functions, the elements inserted there will always appear before the elements from higher function numbers in the sequence.

Even though the overall route will not know any partial routes after route calculation, the overall sequence of the elements of this overall route is still defined in the same way. It is formed from the sequence of the partial routes, the sequence of the function and the sequence of elements contained therein.

Display sequence of elements filtered

To make the sequence of the elements somewhat clearer, in the element display, the "Function" column features a filter to enable display of selective elements of a single function only.

In the element display, the sequence of the elements for a filter function can be displayed.

The drop-down list box contains all the functions in which elements have been inserted. The entry "Filter off" deactivates the filter and shows the element display as before.

The figure below shows an example of the filter option:

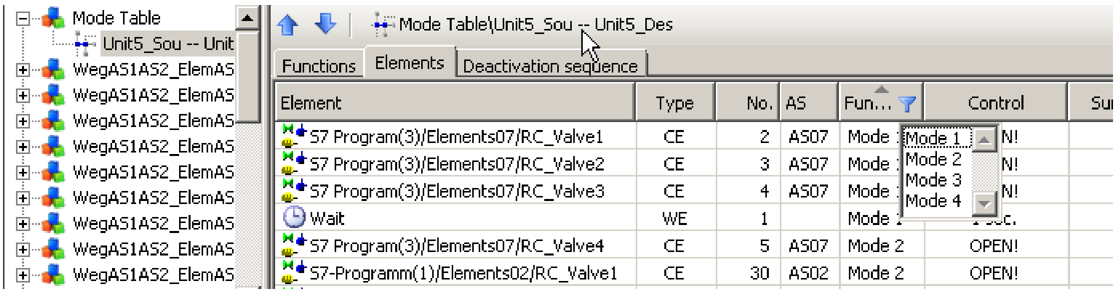


Image 13-5 Filter option

1. Right-click the "Functions" column name.
2. From the drop-down list box select the function for which you want to display the sequence of the elements.

Activated filter

To indicate that a filter is active, the filter symbol is marked with a yellow dot.

The figure below shows an example of an activated filter:

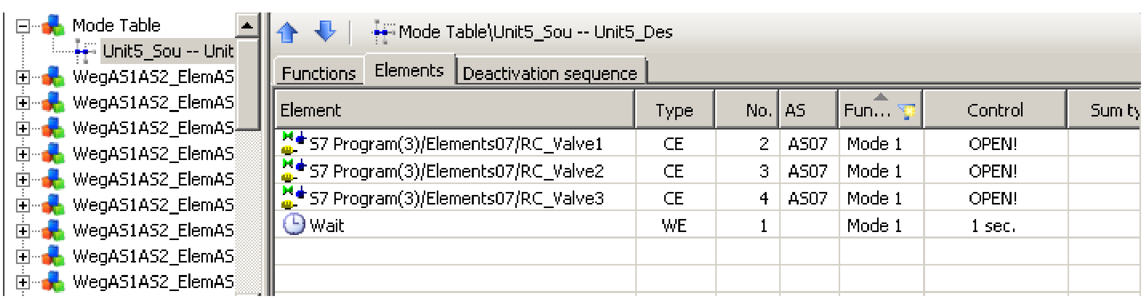


Image 13-6 Activated filter

13.10.11.4 Activation sequence

Activating the actuators of a function

An activation sequence activates the actuators of a function.

The description is based on the following figure:

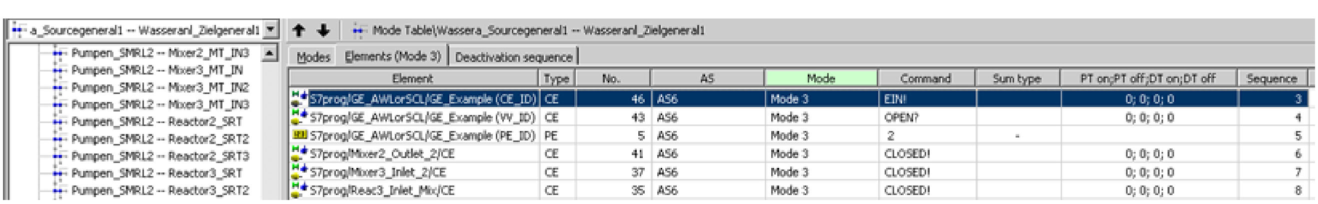


Image 13-7 Activation sequence

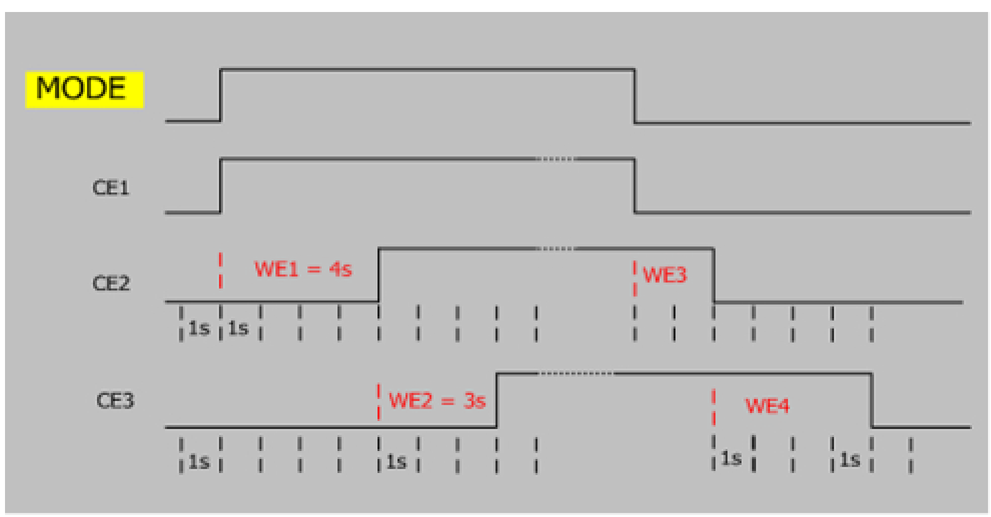
- The function "Check CE" is activated.
- Processing of the elements begins.
- The first element, in this example a Wait element, is processed.
  As the waiting time has been defined as 30 s, further processing is stopped for 30 s.
- After 30 s have passed, the first CE element will be activated.
  An activation or deactivation time for a specific element is retained and will be processed.
- The CE element is processed.
- The second Wait element is reached with a 5 s delay.
- All other elements are activated at the same time when these 5 s have passed. "Step control groups" of elements, for example, can be formed in this way.

At the time of configuration, it is often unclear which partial routes make up a route. If you assemble "Step control groups" across partial routes, you must verify and adapt them when necessary upon completion of the configuration.

Example of a activation sequence

Actuators can be activated with a time delay with the help of Wait elements.

The figure below illustrates this on the basis of an example:



- CE1 is activated when the mode is enabled, and deactivated when the mode is disabled.
- CE2 should be activated 4 s after the mode is enabled or after CE1, and deactivated 2 s after the mode is disabled.
- CE3, in turn, should be activated 3 s after CE2 and deactivated 4 s after CE2.

Note

If elements in different mode levels are being used and these mode levels are activated simultaneously, overlapping may occur. This is possible in particular when the function modes contain Wait elements in order to define activation or deactivation sequences.

The first activated mode level "occupies" the elements controlled therein and can thus lead, possibly in interaction with wait times in a subsequently activated mode level, to unexpected, delayed reactions of the elements.

This is prevented by not activating the two mode levels in succession rather than in parallel.

13.10.11.5 Deactivation sequence

Deactivating elements

A deactivation sequence deactivates the elements.

Usually, all the elements that were activated on activation of a function are deactivated again if the function is deactivated.

If elements are, however, not to be immediately deactivated when the mode is deactivated but with a delay, this can be achieved by configuring a deactivation sequence. This delay in deactivation of elements is defined by the insertion of Wait elements in the deactivation sequence.

Only those elements that were activated when activating a function will also be deactivated later.

Deactivation sequences only make sense if they contain at least one Wait element, because without a Wait element all elements will be deactivated simultaneously when the mode is deactivated.

Under certain circumstances it may be necessary, however, to configure a deactivation sequence without a Wait element for a partial route.

Without a deactivation sequence, all the elements of a partial route are immediately deactivated when the mode is deactivated, even if a deactivation sequence with Wait elements is configured in a partial route beforehand.
To now ensure that the elements are deactivated after previous partial routes, a deactivation sequence must be configured, possibly even without Wait elements.

Example 1: Route comprising 3 partial routes with a deactivation sequence

	Elements in mode X	
Partial routes and their sequence	**Activation sequence**	**Deactivation sequence**
Partial route 1	A	--
Partial route 4	B	Wait (4 s) B
Partial route 3	Wait (2 s) C	--

Activate mode X:

- A and B are activated immediately
- C is activated AFTER 2 seconds wait time

Deactivate mode X:

- **A and C are deactivated immediately**
- B is deactivated after 4 seconds wait time

Example 2: Route comprising three partial routes with a deactivation sequence

	Elements in mode X	
Partial routes and their sequence	**Activation sequence**	**Deactivation sequence**
Partial route 1	A	--
Partial route 4	B	Wait (4 s) B
Partial route 3	Wait (2 s) C	**C**

Activate mode X:

- A and B are activated immediately
- C is activated AFTER 2 seconds wait time

Deactivate mode X:

- A is deactivated immediately
- **B and C are deactivated after 4 seconds wait time**

Result:

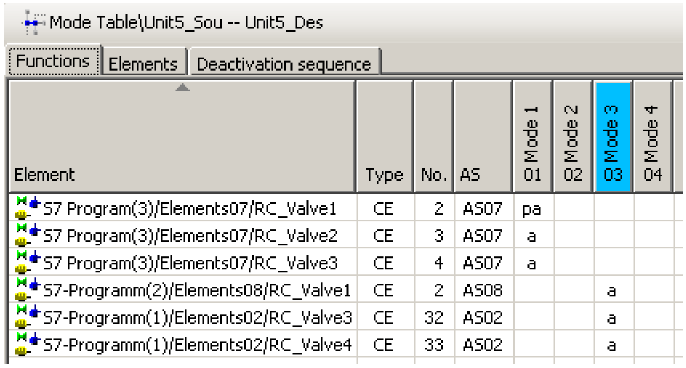
The configuring of a deactivation sequence for partial route 3 in the second example ensures that element *C is not deactivated immediately* but rather along with element B *only AFTER expiration of the wait time*.

The deactivation sequence (element sequence) can be configured regardless of the activation sequence. It is generally defined per function (mode).

The function is selected using the drop-down list box, as shown in Figure 6. The drop-down list is empty if no elements have been inserted in a function.

Functions for which deactivation sequences are defined are marked in color in the function view.

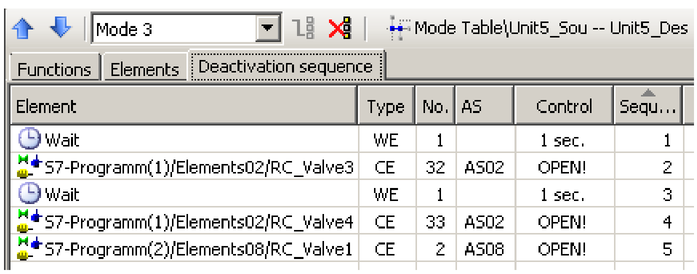
The following figure shows an example of the functions for which deactivation sequences have been defined:



Element	Type	No.	AS	Mode 1 01	Mode 2 02	Mode 3 03	Mode 4 04
S7 Program(3)/Elements07/RC_Valve1	CE	2	AS07	pa			
S7 Program(3)/Elements07/RC_Valve2	CE	3	AS07	a			
S7 Program(3)/Elements07/RC_Valve3	CE	4	AS07	a			
S7-Programm(2)/Elements08/RC_Valve1	CE	2	AS08			a	
S7-Programm(1)/Elements02/RC_Valve3	CE	32	AS02			a	
S7-Programm(1)/Elements02/RC_Valve4	CE	33	AS02			a	

Image 13-8 Functions with deactivation sequences

The figure below shows an example of deactivation sequences for a function:



Element	Type	No.	AS	Control	Sequ...
Wait	WE	1		1 sec.	1
S7-Programm(1)/Elements02/RC_Valve3	CE	32	AS02	OPEN!	2
Wait	WE	1		1 sec.	3
S7-Programm(1)/Elements02/RC_Valve4	CE	33	AS02	OPEN!	4
S7-Programm(2)/Elements08/RC_Valve1	CE	2	AS08	OPEN!	5

Image 13-9 Deactivation sequences of a function

Note

Displayed deactivation sequence

The deactivation sequence shown in the figure above only shows the elements of a function (Check CE).

The elements in the list are always sorted by the sequence of deactivation. The sequence of the elements can be changed by clicking one of the arrow keys.

Non-wait elements

The following applies to all non-Wait elements in this view:

- Only the position can be changed.
- Addition and deletion are not possible.
- Properties cannot be changed.

13.10.11.6 Configuring a deactivation sequence of a partial route

Procedure

Add a deactivation sequence to a partial route using the following icon:

1. Select the "Deactivation sequence" tab.
2. From the drop-down list box select the function for which you want to create a deactivation sequence.
3. Add a new deactivation sequence using the "Deactivation sequence" icon.

   If the element list is not empty and the "Deactivation sequence" icon is activated, you can add a new deactivation sequence.
   During an add operation, all elements except Link and Wait elements that were configured for this project are copied and inserted together with a new Wait element in the deactivation list.
4. You insert additional Wait elements with drag-and-drop.
5. Set the required sequence using the arrow keys.

13.10.11.7 Inserting or deleting Wait elements

Insertion with drag&drop

You can insert additional Wait elements in the deactivation list with drag-and-drop.

If you add a Wait element to the deactivation list, this element is automatically inserted at the last position.

See also

Deactivation sequence (Page 446)

13.10.11.8 Copying or deleting deactivation sequences

Copying the deactivation sequence of a partial route

When you copy a partial route, a box will open to prompt you if you want to copy all existing interconnections.

If your answer is yes, then all existing deactivation sequences will also be copied.

Deleting the deactivation sequence of a function in a partial route

You delete a deactivation sequence with the following icon:

13.10.11.9 Invert activation or deactivation sequence

The direction of processing when elements are switched on and off usually runs from the source to the destination. This direction can be inverted for both switching on and off.

During a route search the partial routes are then lined up together in the direction from the destination to the source instead of from the source to the destination.

This inversion only influences the sequence of the partial routes; the sequence of the elements within the partial routes will be the sequence you selected during configuration.

In manual mode select the direction of processing in the route properties.

In automatic mode this is done via the SWONINV and SWOFINV inputs at the FB800/ RC_IF_ROUTE.

13.10.11.10 CSV export/import

Overview

The CSV Import/Export supports the deactivation sequence with Wait elements.

The following points are affected:

- All partial routes with interconnected elements "ALLRouEL.csv"
- One partial route with interconnected elements

The following figure shows an example:

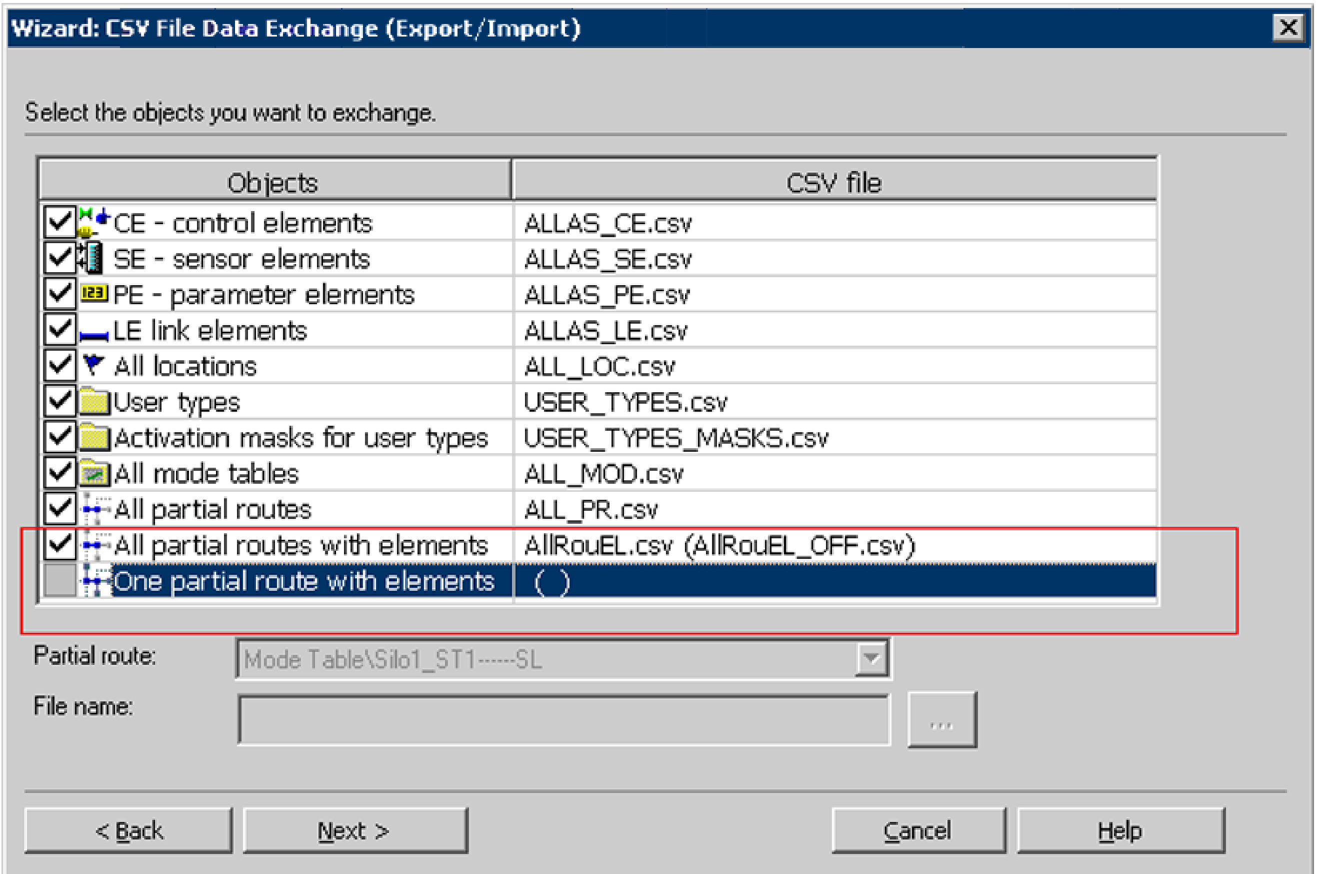


Image 13-10 CSV file

Adding a column for the sort order for the deactivation to the existing "AllRouEL.CSV" file is not sufficient due to the different Wait elements for the activation sequence.

For this reason, there is an additional CSV file type for the deactivation sequence with Wait elements.

This CSV file has the following columns:

- Table (the names Route_CE_OFF, Route_PE_OFF and Route_SE_OFF are permitted)
- Mode table
- Partial route
- Automation system
- Element name
- Wait time for Wait elements
- Sort number of the deactivation sequence

The following table shows an example of the structure of the CSV file.

Table	Mode table	Partial route	Automa-tion sys-tem	Element name	Mode level	PE val-ues	Sorting number
Route_CE_OFF	Mode table	ML2--MRL2	AS6	S7prog/V7/CE	basicsettings		1
Route_CE_OFF	Mode table	ML2---MRL2	AS6	S7prog/V7/CE	Open source		1
Route_SE_OFF	Mode table	ML2---MRL2	AS6	S7prog/PE1/ Sensor1	Mode 32		1
Route_SE_OFF	Mode table	ML2---MRL2	AS6	S7prog/PE1/ Sensor1	Open source		4
Route_SE_OFF	Mode table	PE SE test test	AS6	S7prog/PE1/ Sensor1	Open source		1
Route_PE_OFF	Mode table	ML2---MRL2	AS6	S7prog/PE1/PE1	Mode 32	0	3
Route_PE_OFF	Mode table	ML2---MRL2	AS6	S7prog/PE1/PE1	Open source	0	5
Route_PE_OFF	Mode table	PE SE test test	AS6	S7prog/PE1/PE1	Open source	9	2
Route_PE_OFF	Mode table	ML2---MRL2		Wait	basicsettings	1	2
Route_PE_OFF	Mode table	ML2---MRL2		Wait	Open source	20	2
Route_PE_OFF	Mode table	ML2---MRL2		Wait	Mode 32	320	2

This CSV file has the file name "AllRouEL_Off.csv". It is implicitly created on export of the file "AllRouEL.csv" or imported on import, if it exists.

On import, a check is carried out to determine whether the elements in the "OFF list" correspond to those in the main list:

- Only elements from "AllRouEL_Off.csv" that are found in "AllRouEL.csv" will be imported.
- All the elements (<>WE) that are entered in the activation list must also be found in the deactivation list.

The log for CSV import has been extended to include an addition section. This section is used for the completeness check of the deactivation sequence. All elements that are missing in the deactivation sequence will be listed here.

The following section shows an example of a completeness verification for the deactivation sequence:

Error: CE: 'S7prog/V8/CE' missing in partial route 'ML2---MRL2' in the mode 'basicsettings'

Error: SE: 'S7prog/PE1/Sensor1' missing in partial route 'ML2---MRL2' in the mode 'basicsettings'

Error: PE: 'S7prog/PE1/PE1' missing in partial route 'ML2---MRL2' in the mode 'basicsettings'

For the "One partial route with elements" function, there is a file for the deactivation sequence with Wait element with the extension "_off.csv".

If the file name "Brauhaus.csv" was selected, export and import of the deactivation sequence with Wait element is carried out implicitly with the file "Brauhaus_off.csv".

13.10.11.11 Pulse mode

Single pulsing

In pulse mode, a configurable pulse sequence is output at the appropriately configured elements in active mode.

With single pulsing, the pulse time of the element is set to the required duration (e.g. 1s) and the pulse pause is set to zero (i.e. 0 s).

Result: In active mode the element is activated once for the duration of the pulse time.

If you now also configure a deactivation sequence, all the elements of the activation list, including the elements for which you have selected "single pulsing", will be entered in the deactivation list.

This does **not** mean that a single pulse is also output on deactivation (of the mode).

If several elements are to be "pulsed" in a particular order and at particular intervals, you can do this by inserting Wait elements between the elements. The Wait element parameters are used to define the time "interval" from the previous element in this mode.

If there are several elements between two Wait elements, these are activated together and form a group. A group comprises all the elements between two consecutive Wait elements. If required, it is also possible to form "cross-partial route" groups, depending on the later composition of the route from partial routes.

The sequence of the elements and Wait elements within the partial route is configured.

The sequence in the path is formed from the sequence of the partial routes and the sequence of the elements in the partial routes. By default the direction from source to destination is used for the sequence of the partial routes in the route. The direction can be inverted, however, when a route is requested.

The Wait element (WE) is a "special" parameter element. There is no RC_IF block. The Wait element is not configured in the CFC. It only occurs in Route Control Engineering and can be used in partial routes.

The parameter value of a WE corresponds to a time in seconds. This time is interpreted as a pause between the end of the pulse (falling edge of the single pulse) and start of the pulse of the next element.

Note

With a pulse in combination with activation or deactivation sequences, the case may arise wherein the first element of the activation sequence (for example, a valve) is not triggered due to an unfavorable time configuration. This can be avoided by inserting a Wait element (e.g. 1 s) **before** this first element.

Pulse times

The following figure shows an example of the behavior of a CE with different configurations of pulse times (PT)/pulse pause(PE):

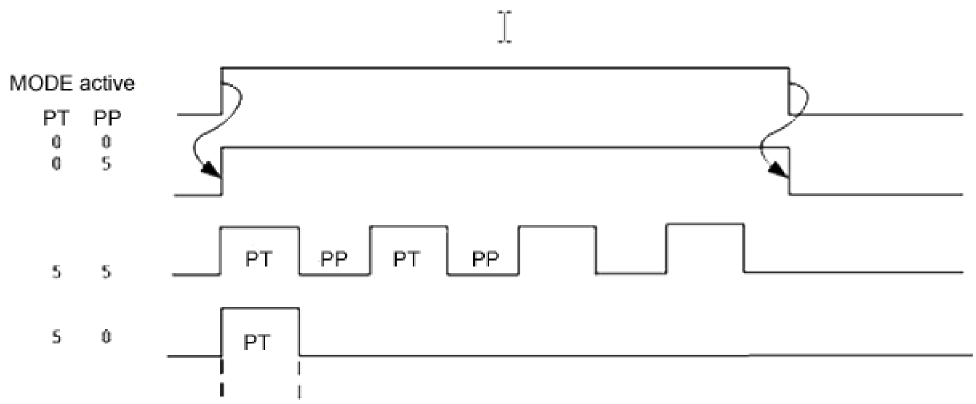


Image 13-11 Pulse times/pulse pause

The following table provides an overview:

Pulse time	Pulse pause	Operating mode
0 0	0 <>0	Normal mode The element is activated as long as the MODE is activate.
<>0	<>0	Pulse mode The element is activated by pulses with the specified pulse/pause ratio as long as the MODE is activate.
<>0	0	Single pulse The element is activated with a single pulse of the specified length if the MODE is active.

Example of defining the pulse time

Three elements are to be activated at intervals of 4 or 5 seconds for 1 or 2 seconds:

In the combination of the control elements with the Wait elements and the configuration pulse time > 0 / pulse pause = 0, the pulse mode is over several elements:

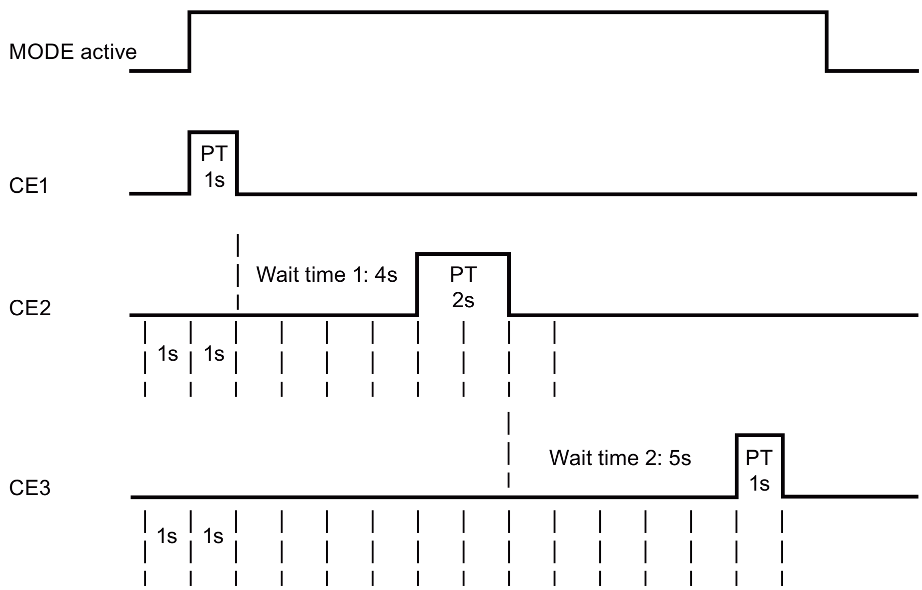


Image 13-12 Time diagram

Note

Start of waiting time

To simplify configuration of single pulsing, the waiting time begins after the **falling** edge of the pulse time. The waiting time of the control elements begins with the rising edge.

If several pulsed elements with different times are inserted in a switch group with a Wait element, then the negative edge of the pulse time of the control element positioned directly in front of the Wait element starts the wait time.

Configure pulse time

You configure the waiting time as an interval between the end of the pulse CEx and the start of the pulse CEy.

The following table provides an overview:

Mode n	Pulse time	Pulse pause	ESV*)	ASV*)	Waiting time
CE1	1	0	0	0	--
WE1	--	--	--	--	4
CE2	2	0	0	0	--
WE2	--	--	--	--	5
CE3	1	0	0	0	--

*) ESV/ASV may also be have a different value than 0.

Example for configuration of pulse time

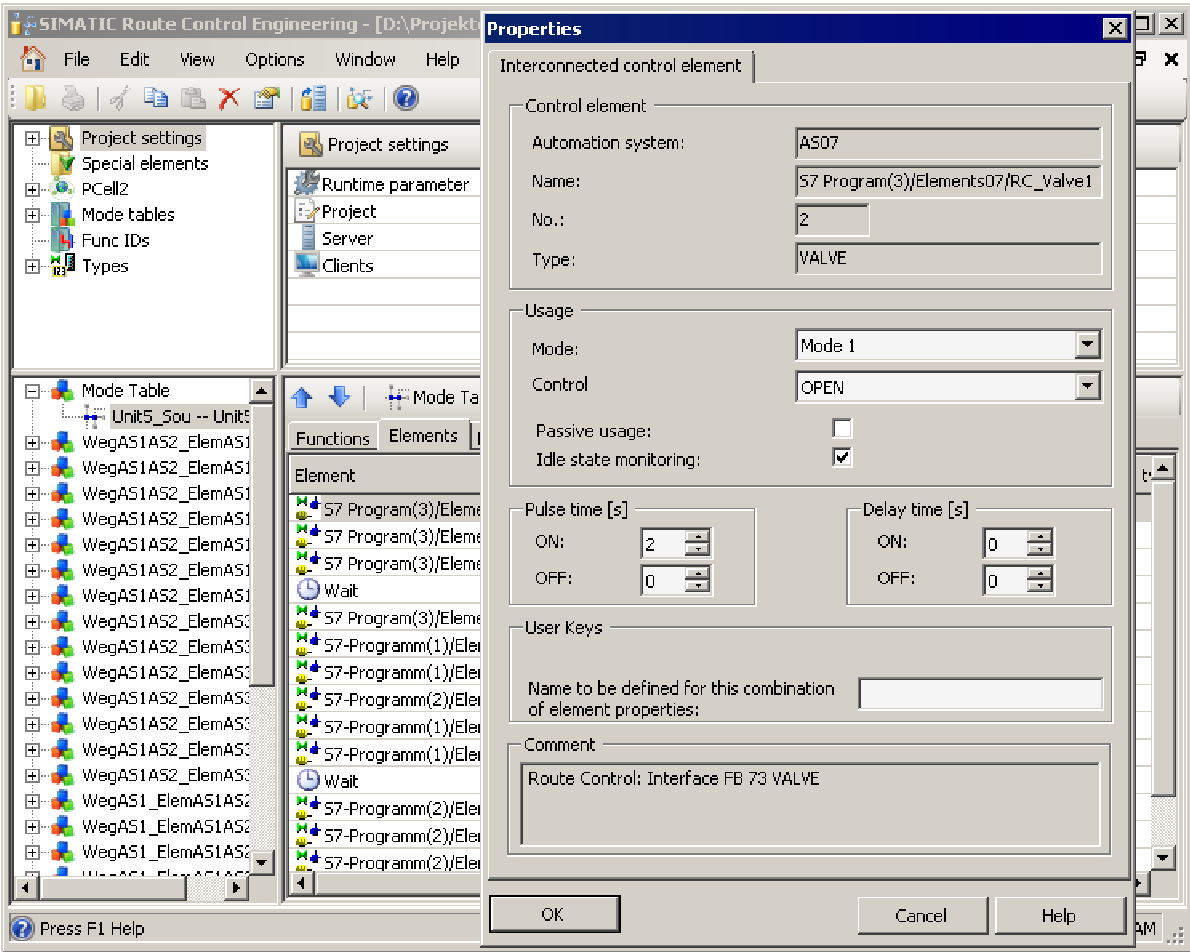


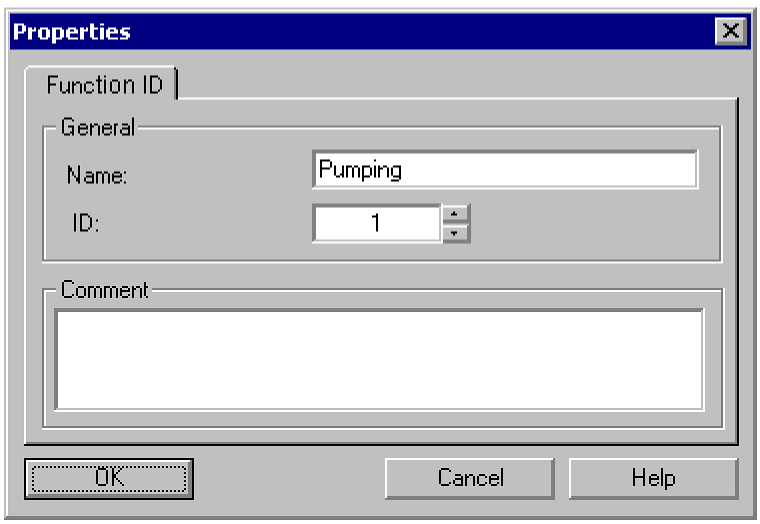
Image 13-13 Configuration of pulse time

13.11 Entering and Changing Parameter Values

13.11.1 Function ID Properties

Dialog box

1. In the tree view in Route Control Engineering, select the "Function IDs" folder.
2. Select the menu command **Add Function ID** from the shortcut menu.



Description

This dialog box is used for entering and changing the name and properties of a function ID. Function IDs are keys used for differentiating between routes. Each route operates with a different function ID, usually its own route ID.

However, if particular routes are supposed to operate together, they must use the same function ID. IDs assigned by the user should be higher than IDs assigned by the system, thus 301 or higher. This facilitates diagnostics during runtime because it can be instantly recognized whether a system function ID or a user function ID is involved.

Meanings of Fields

Field	Meaning
Name	Name of function ID
ID	Function ID number that is unique from all others 1...300: Numbers automatically assigned by the system, if RC_IF_ROUTE 0 is specified at the route block. You can find additional information in the section "RC_IF_ROUTE (FB 800)" (Page 101) Possible values: 301...32.000
Comment	User text

13.12 Materials

13.12.1 Overview of Materials

Introduction

In many industrial sectors, certain materials may not succeed each other or use the same transport route. For example, in the brewing industry, beer product must never follow an acid cleaning step directly, but must always be preceded by a water flush. For this reason, the routing system provides a parameter assignment option for material compatibility or material sequencing. Information about the material currently being used in a particular partial route is stored temporarily in an interconnected link element. The routing system uses this information to determine whether the successor material is permitted.

Significance of Materials

Materials are involved in SIMATIC Route Control in the following areas:

- Materials and material groups are configured in Route Control Engineering.
- Relationships to the permitted successor materials are entered in Route Control Engineering.
- During runtime, the user program can transfer a desired new material prior to a route request. This will be taken into consideration in the next route search. It is checked to determine whether or not it is a permitted successor material.
- The Route Control server checks whether the new material is permitted as a successor to the material that was transported previously. If the new material is not permitted, a route is not found when no alternative path is available.
  You can find additional information on this in the section
  "Material sequence diagram RC_IF_ROUTE" (Page 459)

The configuration of materials is presented in the following sections.

Note

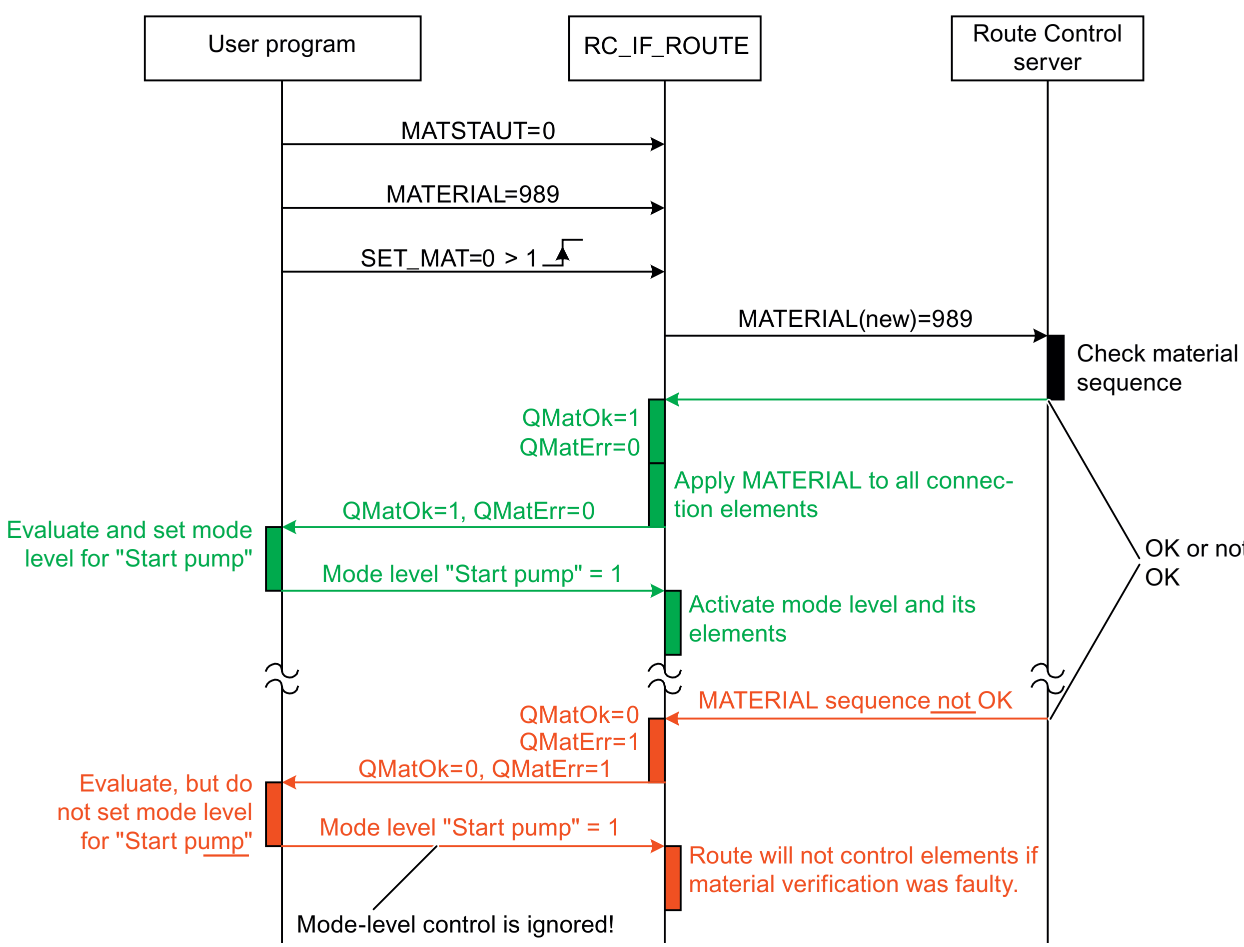
Material data can also be specified on the Route Control server during runtime.
You can find additional information in the section
"Material Interface" (Page 465)

Additional information

- Section "Configuring Materials and Material Groups" (Page 460)
- Section "Configuring Material Sequences" (Page 461)

13.12.2 Material sequence diagram for RC_IF_ROUTE

Material Sequence Diagram



The user program must evaluate the QMatOk and QMatErr outputs of the RC_IF_ROUTE block and respond accordingly. If a material error exists, requests from the user program are not accepted by RC_IF_ROUTE. Control elements cannot be activated. Neither can the new material be transferred to the link elements.

If the material verification was successful, there are two options:

- The new material is automatically transferred by RC_IF_ROUTE to the link elements if the value of input parameter MATSTAUT (material set automatically) is 1.
- The new material is not transferred by RC_IF_ROUTE to the link elements until the value of input parameter MATSTAUT (material set automatically) is 0 and the positive edge appears at input SET_MAT.

The first scenario is intended for applications in which the user program leaves the application of the material to the route.
The second scenario is used if the user program "knows" which mode level the actual material transport means.

13.12.3 Configuring Materials and Material Groups

Introduction

You can use the dialog box below to

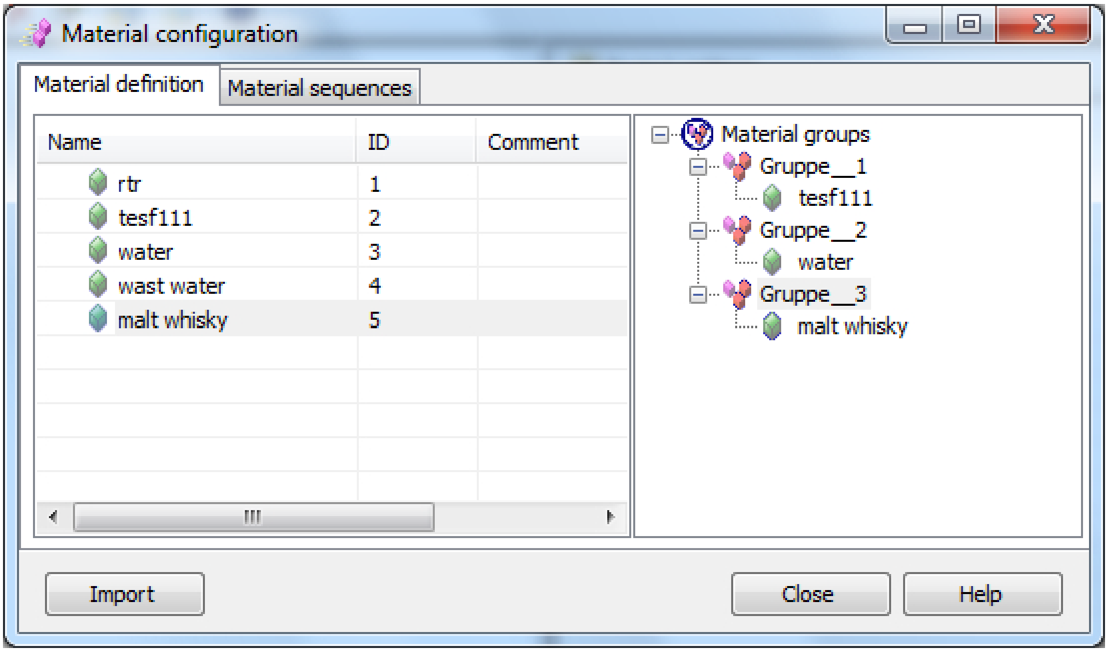
- Enter, change or delete materials
- Create, change or delete material groups
- Assign materials to material groups

Material Configuration Dialog Box

1. Select menu command **Options > Material**.
   You can choose between material and material groups.
   Materials and material groups can be processed via context menu.

   Note

   The name is always generated in German initially by the system when you create new materials or material groups. You can change this name.



Additional information

Section How to Assign Materials to a Material Group (Page 461)

Section How to Import Materials (Page 464)

13.12.4 How to Assign Materials to a Material Group

Procedure

1. Select menu command **Options > Material**.
2. Drag-and-drop materials from the "Material definition" list into a material group of the "Material groups" list.
   The materials are assigned to the material group.

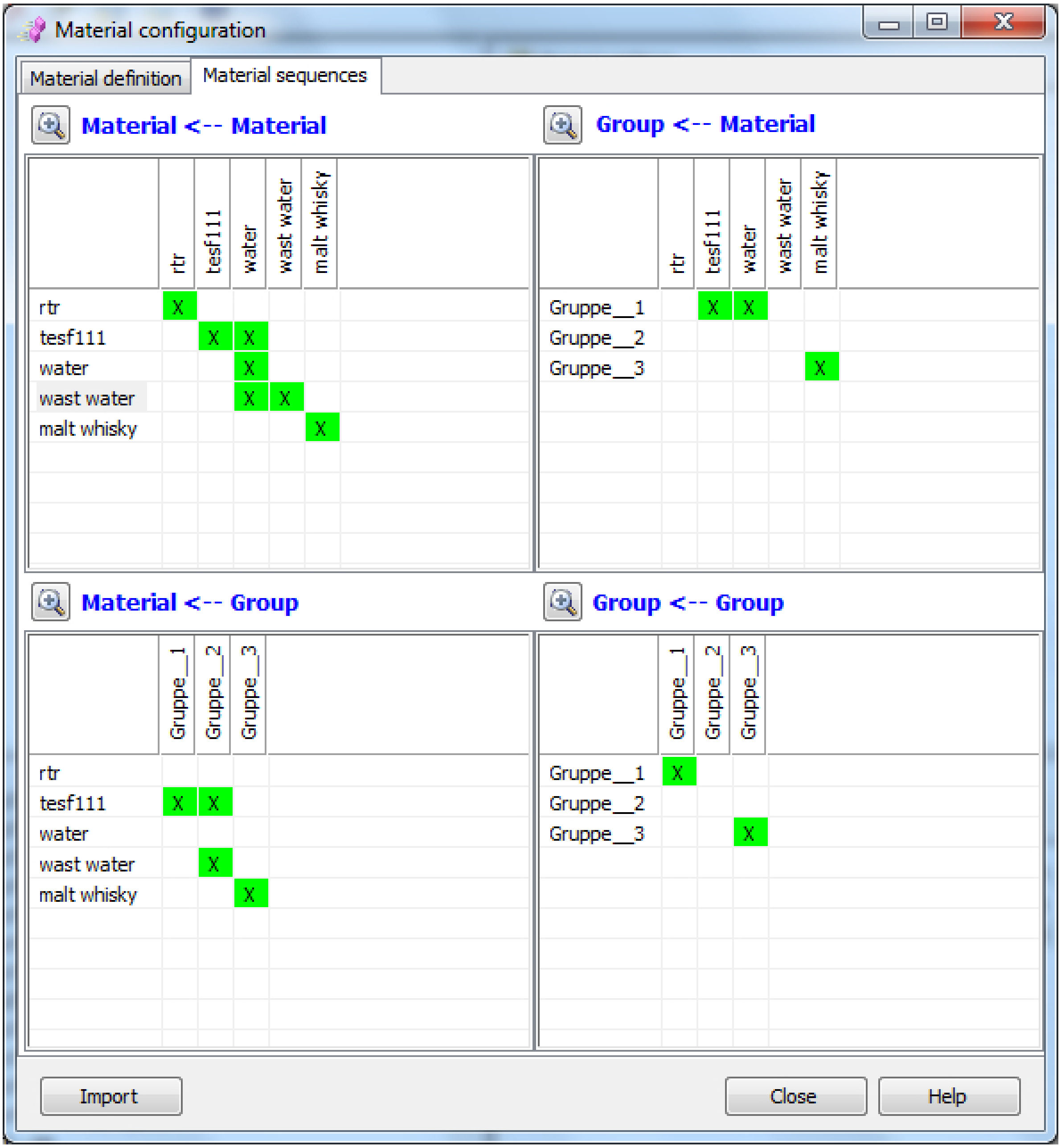
13.12.5 Configuring Material Sequences

Introduction

In configuring material sequences, you specify which materials or material groups may follow a specific material or material group.

Material Sequence Dialog

1. Select menu command **Options > Material**.
2. Open the "Material sequences" tab.



Field	Meaning
Material <-- Material	A material in the column can follow a material in the row if the row-column intersection is selected
Group <-- Material	A material in the column can follow a material of the group in the row if the row-column intersection is selected

Field	Meaning
Material <-- Group	Any material of the group in the column can follow a material in the row if the row-column intersection is selected
Group <-- Group	Any material of the group in the column can follow any material of the group in the row if the row-column intersection is selected

Example

The selection of the intersection of row 1 and column 1 in the "Material <-- group" field determines that water can be followed by all materials contained in Group_1.

Magnifying glass

When you click the magnifying glass button above a field, the field is enlarged and occupies the entire space of the window. The other fields are then no longer visible. Clicking once again on the magnifying glass button restores the original state.

Additional information

- Section How to Import Materials (Page 464)
- Section How to Specify Successors for a Material (Page 463)
- Section How to Specify Successors for a Material Group (Page 464)

13.12.6 How to Specify Successors for a Material

Procedure

1. Select menu command **Options > Material**.
2. Open the "Material sequences" tab.
3. If a material is specified as a successor: In the "Material <-- Material" field, select the intersection of the column of the material that can follow the material in the row, and the corresponding row.
4. If all materials of a group are specified as a successor: In the "Material <-- Group" field, select the intersection of the column of the group, whose materials can follow the material in the row, and the corresponding row.

Additional information

- Section "How to Specify Successors for a Material Group" (Page 464)

13.12.7 How to Specify Successors for a Material Group

Procedure

1. Select menu command **Options > Material**.
2. Open the "Material sequences" tab.
3. If a material is specified as a successor: In the "Group <-- Material" field, select the intersection of the column of the material that can follow all the materials of the group in the row, and the corresponding row.
4. If all materials of a group are specified as a successor: In the "Material <-- Group" field, select the intersection of the column of the group, whose materials can follow the all the materials of the group in the row, and the corresponding row.

Additional information

- Section "How to Specify Successors for a Material" (Page 463)

13.12.8 How to Import Materials

Importing materials

You can use the "IMPORT" button to import an external material and material sequence definition.

This consists of 2 ASCII files.

- MAT_EXT.TXT Definition of the materials as a list.
  Empty lines in this list correspond to undefined material IDs.
- MAT_EXT.CSV Sequence definition in matrix format.
  The "-" character represents unknown materials (equivalent to an empty line in MAT_EXT.TXT)

You can freely choose the names of these files. The extension TXT, CSV and the structure of the contents are fixed.

Importing irretrievably deletes all existing materials, groups and sequence definitions. Then, the materials and sequences from the ASCII files are imported.

Note

Material import via txt file only

If you only select the txt file in the material import dialog, the materials are imported. A default is entered for the material sequence. This means that every material has itself as its successor.

Additional information

- Section Material Master Data (Page 467)
- Section Successor Relationships (Page 467)

13.13 External Material Interface

13.13.1 Material interface

Overview

You have the following options:

- SIMATIC Route Control without material configuration or material verification
- SIMATIC Route Control with internal material configuration and material verification
- SIMATIC Route Control with external material configuration and material verification

Configure these settings in the global project settings \ runtime parameters in the material functions.
You can find more information on the global project settings in the section
"Overview of the project settings" (Page 390)

No Material Configuration

The default setting is a new Route Control configuration without material configuration or a runtime check.

External Material Interface on the Route Control Server

The material interface on the Route Control server was created to enable application of external master data in Route Control.

The external material interface is also supported, from Route Control version V8.0. However, with a redundantly set Route Control server **no** automatic synchronization of the data occurs. The data must be loaded on both computers (master and standby).

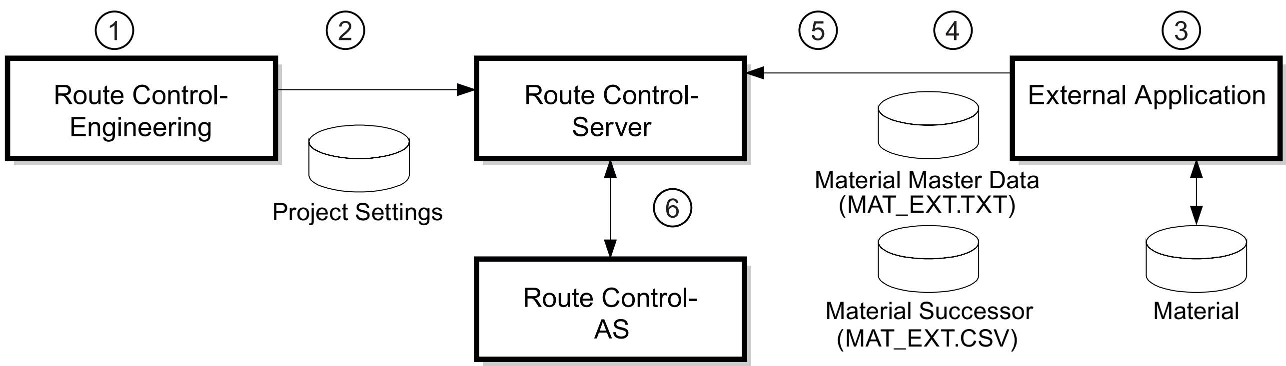
The interface was kept simple so that it can be supplied with existing applications. Two files (MAT_EXT.TXT and MAT_EXT.CSV) are sent to the interface.
You can find additional information in the section
"Process for Downloading the Material Configuration" (Page 466)

See also

Overview of Materials (Page 458)

13.13.2 Process for Downloading the Material Configuration

Run sequence



Step	Configuration Step
1	A setting in the Engineering Tool specifies whether the internal (Engineering Tool) material configuration, the external (Route Control server) material configuration or no material configuration is to be used. These three types are mutually exclusive. You can find additional information in the "Material Functions" (Page 394) section.
2	This setting is downloaded to the Route Control server from the engineering tool within the context of the project download procedure and activated via the Route Control Center.
3	In an external configuration application, material master data and successor relationships are configured. To prevent inconsistencies from occurring, the first line must be identical in both files ("Signature" from Project code; Date; Time; Classification number).
4	These material master data and successor relationships are placed in the transfer directory (two files: MAT_EXT.TXT and MAT_EXT.CSV).
5	The Route Control server detects changes in the transfer directory and reads in the data. Activation via the Route Control Center is not required. **Content** changes in the files are **only detected** and loaded if **the signatures** have also **changed** relative to the last version read (e.g., the date or the time).
6	The new data will be taken into account during the next route request.

Note

Downloading of a new material configuration is recorded in the route log.

13.13.3 Material Interface Transfer Files

Transfer files

The following files are transferred to the interface (LOAD directory on the Route Control Server):

- Specification of material master data (MAT_EXT.TXT)
- Specification of material successor relationships (MAT_EXT.CSV)

Note

These files are only read automatically by the Route Control server if the first line (signature) matches in both files! This prevents inconsistencies from occurring and also prevents inconsistent successor and material master data settings.

13.13.4 Material Master Data

Structure of Material Master Data

The MAT_EXT.TXT transfer file is in normal text format (ASCII) and has the following structure:

Basic structure	Example
<Project name>; <Date and time>; <Code>	Fermentation and Storage Cellar; 2004-12-01 15:34; 2746388496
Material 1	Lager_Light
Material 2	Lager_Stout
...	...
Material 1024	Yeast

Note

It is not necessary to fill in all 1,024 lines with material names.

13.13.5 Successor Relationships

Layout

The second transfer file (MAT_EXT.CSV) contains information about which materials are allowed to follow other materials. The general file structure is as follows:

Basic structure	Example
<Project name>; <Date and time>;<Code>	Fermentation and Storage Cellar; 2004-12-01 15:34; 2746388496
<NF1.1>;<NF1.2>;<NF1.3>;...;<NF1.1024>	1;0;0

Basic structure	Example
<NF2.1>;<NF2.2>;<NF2.3>;...;<NF2.1024>	1;1;1
...	...
<NF1024.1>;<NF1024.2>;<NF1024.3>;...;<NF1024.1024>	0;1;1

A 1X1 to 1024x1024 matrix is specified in each instance. SRx.y stands for the successor relationship between the predecessor material x and the successor material y.

The successor relationship is specified with the following meanings:

- 0: The material is not permitted as a successor material.
- 1: The material is permitted as a successor material.
- -: The configured global setting should be used.

13.13.6 Material Interface Example

User Tasks

Three materials are to be transferred as master data (water, detergent, product) with the following applicable successor rules:

- Water may only follow detergent.
- Detergent may follow product and water.
- Product may only follow water and may not directly follow detergent.
- Of course, each material may be followed by more of the same material.

File Structure

Material master data file (MAT_EXT.TXT)	Successor file (MAT_EXT.CSV)	Meaning
Fermentation and storage cellar; 2004-12-01 15:34; 2746388496	Fermentation and storage cellar; 2004-12-01 15:34; 2746388496	
Water	1;1;1	All three materials may follow water.
Detergent	1;1;0	Only water and detergent, but not product, may follow detergent.
Product	0;1;1	Detergent and product, but not water, may follow product.

13.13.7 Material Data Test

Overview of Procedure

Execution of a route request is now recommended to check the data that have been downloaded.

Step	Procedure
1	Transfer the predecessor material to the route via the Route Control Center.
2	Select a route in the Route Control Center.
3	Enter the source, destination and current (successor) material.
4	Execute a route request, do not yet start the route.
5	Evaluation of the result If a material error occurs, this will be indicated in the Route Control Center.
6	Check these results against the configuration.

13.14 Consistency Check

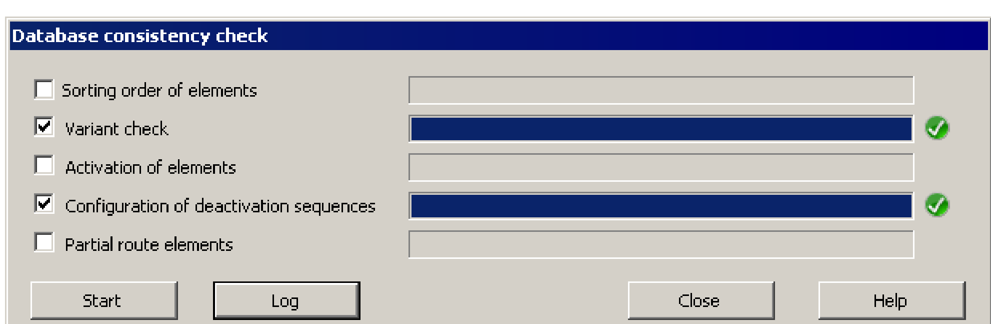
13.14.1 How to Start the Consistency Check

Description

You can check the Route Control configuration for consistency in this dialog box.
The progress bar on the right indicates the result of each individual step.

Procedure

1. In Route Control Engineering, select the menu command **Options > Check Consistency**.
2. Activate the desired check box.
3. Click "Start".



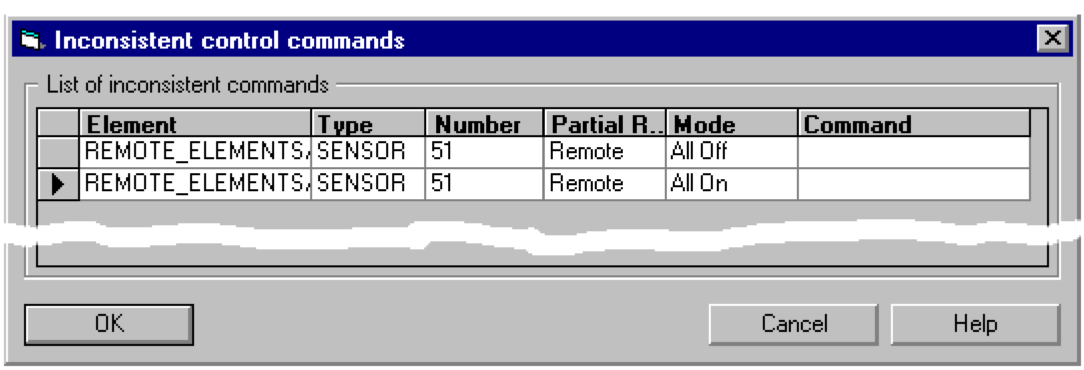
You can start the consistency check by double-clicking on the database icon in Route Control Engineering.

Meanings of operator control elements

Operator control element	Meaning
Sorting order of elements	Checks the sorting order of elements The sorting order is of no relevance in Route Control V7.0. The sorting order only becomes important when solid material transport is involved, because the interlocking of elements is dependent on it.
Variant check	Checks the locations designated as variants in the configuration.
Activation of elements	Checks whether elements are to be activated with commands that are not available for or are incompatible with their type. Example: A motor with OPEN/CLOSED instead of ON/OFF.
Configuration of deactivation sequences	Checks whether the deactivation sequence is complete. All elements of the activation sequence must also occur in the deactivation sequence.
Partial route elements	Checks for multiple configuration of the individual partial route elements.
Start	Starts the check operation after the options have been selected
Log...	Displays a log once the check has been completed You can find information about the log file in "Consistency Check Log" (Page 471).
Close	Closes the dialog box
Help	Calls online help

13.14.2 Consistency Check Result

Dialog box



Description

This dialog box is displayed automatically if the consistency check finds elements with inconsistent commands.

Meanings of Operator-Control Elements

Column	Meaning
Element	Name of interconnected elements having inconsistent commands.
Type	Type of element, such as MOTOR, SENSOR
Number	Number (ID) of element
Partial route	Name of partial route in which this element is interconnected
Mode	Mode level in which the element is activated
Activation	Inconsistent activation command

13.14.3 Consistency Check Log

File Name

RC_CONSISTENCY.LOG

File Location

The log file is stored in the same path where the Route Control project database is located. You can find additional information about this in the section
"Saving a Route Control Project" (Page 388)

File Sections

- Verification log
  - S7 project name: Name of S7 project containing the Route Control project
  - S7 project path: Path to the S7 project
  - Route Control project name: Name of Route Control project (database file name)
  - Route Control project path: Path to the Route Control project
  - User: User who initiated the export operation.
  - Verification date: Time stamp indicating date of consistency check
- Options
  - Settings you have made
  - ID conventions: Yes/No
  - Sorting order of elements: Yes/No
  - Variant check: Yes/No
  - Activation of elements: Yes/No
  - Configuration of deactivation sequences: Yes/No
  - Partial route elements: Yes/No

- Verify sorting order of elements
  – Checks that the element numbers are in ascending order within the partial route mode levels.
- Check variants
  – Checks whether locations that are used as variants are only of the VIA type.
- Verify activation of elements:
  – Checks to determine whether an element command exists at all in the element type in a partial route.
- Check configuration of deactivation sequences
  – Checks whether the deactivation sequence is complete. All elements of the activation sequence must also occur in the deactivation sequence.
- Check partial route elements
  – Checks for multiple configuration of the individual partial route elements.

13.15 Transfer to the Server

13.15.1 Downloading the Route Control Server

Initial Download to the Route Control Server

Proceed as follows the first time you download the Route Control configuration:

Step	Action
1	Start the Route Control server via the Windows Start menu by selecting the menu command **Start > SIMATIC > Route Control > Server**. The Route Control server attempts to read a configuration in. As no configuration is available yet, it assumes error status.
2	Download the Route Control configuration to the server via Route Control Engineering by selecting the menu command **Options > Download to Server.** Specify whether it should also be downloaded to the clients (this selection only needs to be made once).
3	Open the Route Control Center.
4	Select the menu command **View > Server Status**.
5	Update the Route Control server. The server retains its error status.
6	Restart the Route Control server. The Route Control server finds the configuration and starts up without errors.

Now download the configuration to the clients just once.
Proceed as follows:

Step	Action
1	In the Component view of SIMATIC Manager, select the "RC Application Client" object in the PC station.
2	Open the shortcut menu of the "Route Control" object and select the menu command **PLC > Download**. The configuration is downloaded to the client.

Updating (Subsequent Download to) the Route Control Server

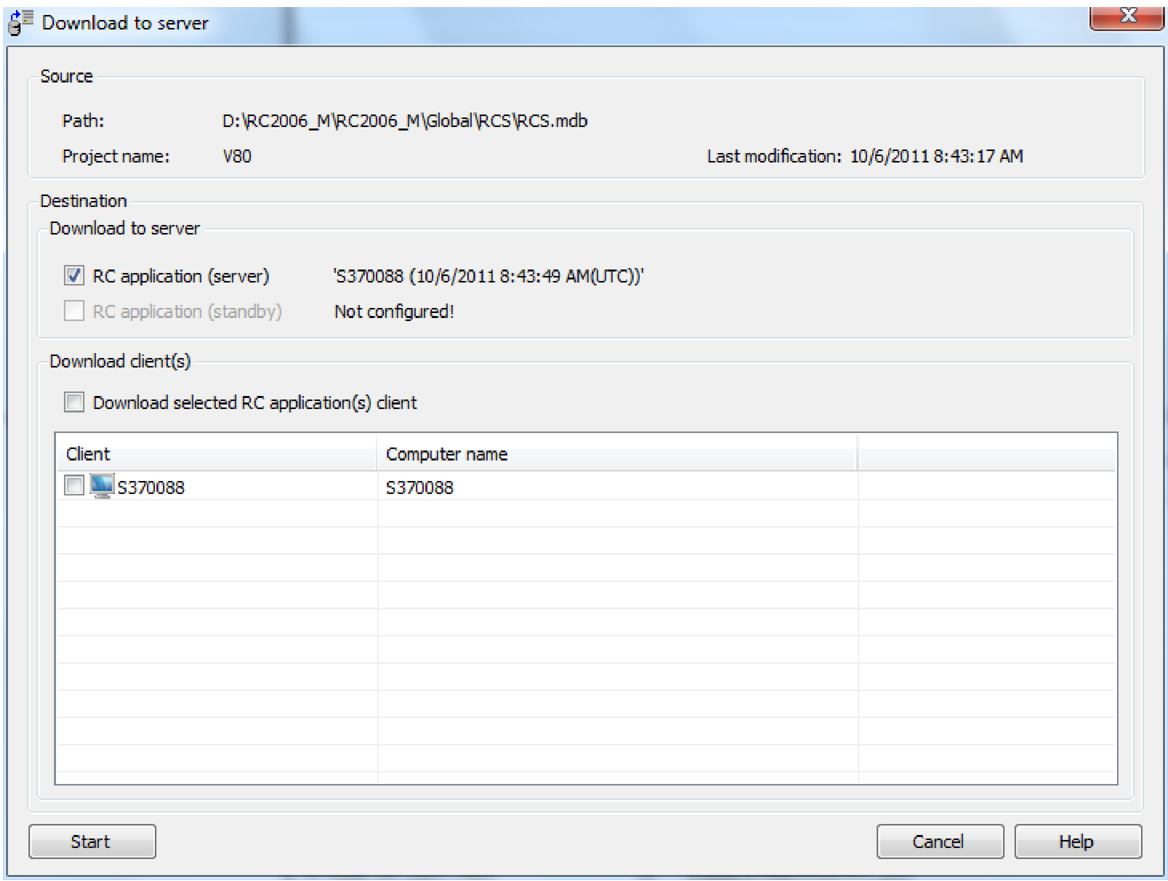
To transfer the Route Control configuration to the Route Control server and make it active after changes have been made, proceed as follows:

Step	Action
1	Download the Route Control configuration to the server via Route Control Engineering using the menu command **Options > Download to Server**. This is only a preparatory step; the changes have not yet been made effective.
2	Open the Route Control Center.
3	Select the menu command **View > Server Status**.
4	Update the Route Control server. The previous configuration is replaced with the new one.

13.15.2 Dialog Box for Downloading to the Route Control Server

Dialog box

In Route Control Engineering, select the menu command **Options > Download to Server**.



Description

This dialog box is used to download the Route Control configuration to the Route Control server computer(s). You also have the option to download to RC clients. All configured RC clients appear in a list box. There is an optional check box for activating the download to RC clients function. You can download individual clients by selecting the appropriate stations. During a server download when the material function is activated, the material data is exported and sent to the server.

Please note that the new configuration will not become active immediately. Rather, it must first be updated using the Route Control Center.
You can find additional information in the section "Server Status" (Page 492).

Meanings of Operator-Control Elements

Operator-control element	Meaning
Path	Route Control configuration (path and file) to be copied to the server
Project name	Name of the project
RC application (server)	Name of the computer configured as the Route Control master If the computer is non-redundant, this is the single server.
RC application (standby)	Name of the computer configured as the Route Control standby Only applies in the case of a redundant pair of computers
Start	Starts the copy operation; a progress bar is displayed. Once the process is complete, a message will appear indicating the result of the copy operation.
Download selected RC application(s) (client)	Check box for selecting whether selected RC clients are to be downloaded.
Cancel	Exits this dialog box without making any changes. Configuration is not copied.
Help	Opens the online help

13.15.3 Downloading the Redundant Route Control Server

Overview

The following four cases exist for downloading a new configuration to the Route Control server (without activation):

1. "Server 1 can be downloaded, but not server 2" (Page 476) (for example, it is not available, the path is not enabled).
2. "Server 2 can be downloaded, but not server 1" (Page 476) (for example, it is not available, the path is not enabled).
3. "Both servers can be downloaded" (Page 477)
4. "Neither server can be downloaded" (Page 477)

When the Route Control Center is started (or, if it is already open, when this function is called from the menu), it checks to determine whether the Route Control server to which it is connected has a new configuration B that can be activated.

The Route Control Center prompts you to perform this activation. If you cancel the procedure, the configuration is not activated. However, if you confirm that the procedure should go ahead, the available configuration B is activated and replaces configuration A. The Route Control server then starts up again in order to read in this configuration.

If the Route Control Center does not find any different configurations, the user does not receive a prompt.

The operation to download the configuration to the Route Control server is successful if it can be downloaded to at least one of the two servers.

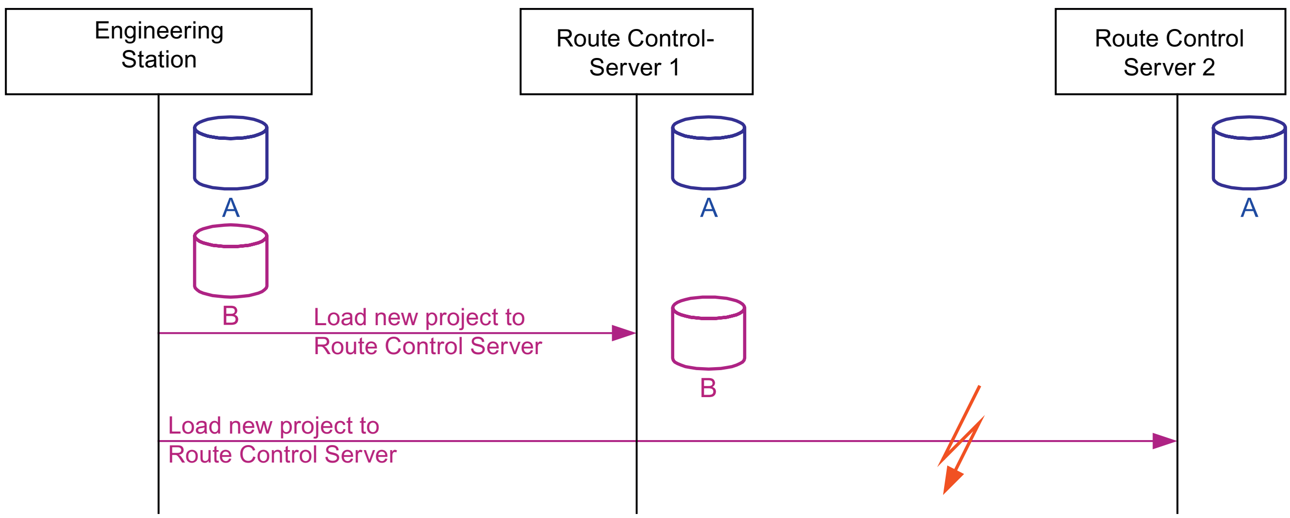
13.15.4 Server 1 Can Be Downloaded, But Not Server 2

Scenario 1

The configuration can only be downloaded to Route Control server 1 from a configuration station.

System Behavior

Both Route Control servers attempt to synchronize the configuration on both sides. As soon as this is possible, configuration B is copied to server 2, but not yet activated.



13.15.5 Server 2 Can Be Downloaded, But Not Server 1

Scenario 2

The configuration can only be downloaded to Route Control server 2 from a configuration station.

System Behavior

Same behavior as in case 1, but server 1 and 2 are reversed.

13.15.6 Both Servers Can Be Downloaded

Scenario 3

The configuration can be downloaded to Route Control servers 1 and 2 from a configuration station.

System Behavior

Same status as following synchronization of scenarios 1 and 2.

Additional information

- Section "Server 1 Can Be Downloaded, But Not Server 2" (Page 476)
- Section "Server 2 Can Be Downloaded, But Not Server 1" (Page 476)

13.15.7 Neither Server Can Be Downloaded

Scenario 4

The configuration cannot be downloaded to Route Control servers 1 or 2 from a configuration station.

System Behavior

The system can not synchronize any of the databases; you must correct the error (missing share attribute for the directory on the server computer, for example) and reload.

Operator Control and Monitoring 14

14.1 Operator Control and Monitoring Overview

Overview

Operator control and monitoring of the objects relevant to Route Control can be performed using:

- Route Control block icon for a route
- Route Control faceplate for a route
- Route Control Center for a route or multiple routes
  Additional information:
  - Section "Route Control Center" (Page 488)
- Route Control server
  Additional information:
  - Section "Calling the Route Control Server" (Page 529)

Route Control faceplates, APL style

Since RC Version 8.1, the RC faceplates are supplied in the familiar Classic style as well as in the style of the Advanced Process Library APL (APL style).

- You decide which version of the faceplates should be installed during setup. You can only install one style at a time, but you can change the style by running Setup again.
- The APL faceplates are matched to the look and feel and operating philosophy of the Advanced Process Library. The result is, for example, that operator input using the keys previously known from RC is no longer possible. These "keys" are retained anyway, but only serve to display the route status and the possible operator inputs.
- If a Classic style version is installed, it is removed before the installation of the APL style version. Some of the APL style files have the same names as the Classic style files so that internal calls continue to function.
- The APL style version is specified as the default installation in the setup.

Migration from Classic style to APL style

If you want to migrate to the APL style faceplates, select this variant during setup.

- If you also want to use the APL faceplates in your projects, you need to migrate these projects. This means that you have to exchange the block icons placed in your pictures with the APL block icons. To do this, use the OS project editor and the functions "Compile OS" and "Create/Update Block Icons". The "@PCS7TypicalsRC.PDL" picture is the source for exchanging the block icons.
- Correct exchange requires the structure of the project (plant hierarchy, etc.) to correspond to the PCS 7 guidelines.
- Block icons that you have manually placed from the default picture "@Template_RC.PDL" into your own pictures also have to be manually exchanged.

Note

Changing to Classic style

- If you want to downgrade back to the Classic style faceplates from the APL style faceplates, you have to follow the same steps (installation and migration).
- When you change from APL style to Classic style or vice versa, you must perform an OS Compile **with memory reset**.

Dynamic Wizard

If you have interconnected the RC block icons with an SFC using the Route Control Dynamic Wizard in addition to the interconnection with the RC_IF_Route block, you must re-configure this interconnection.

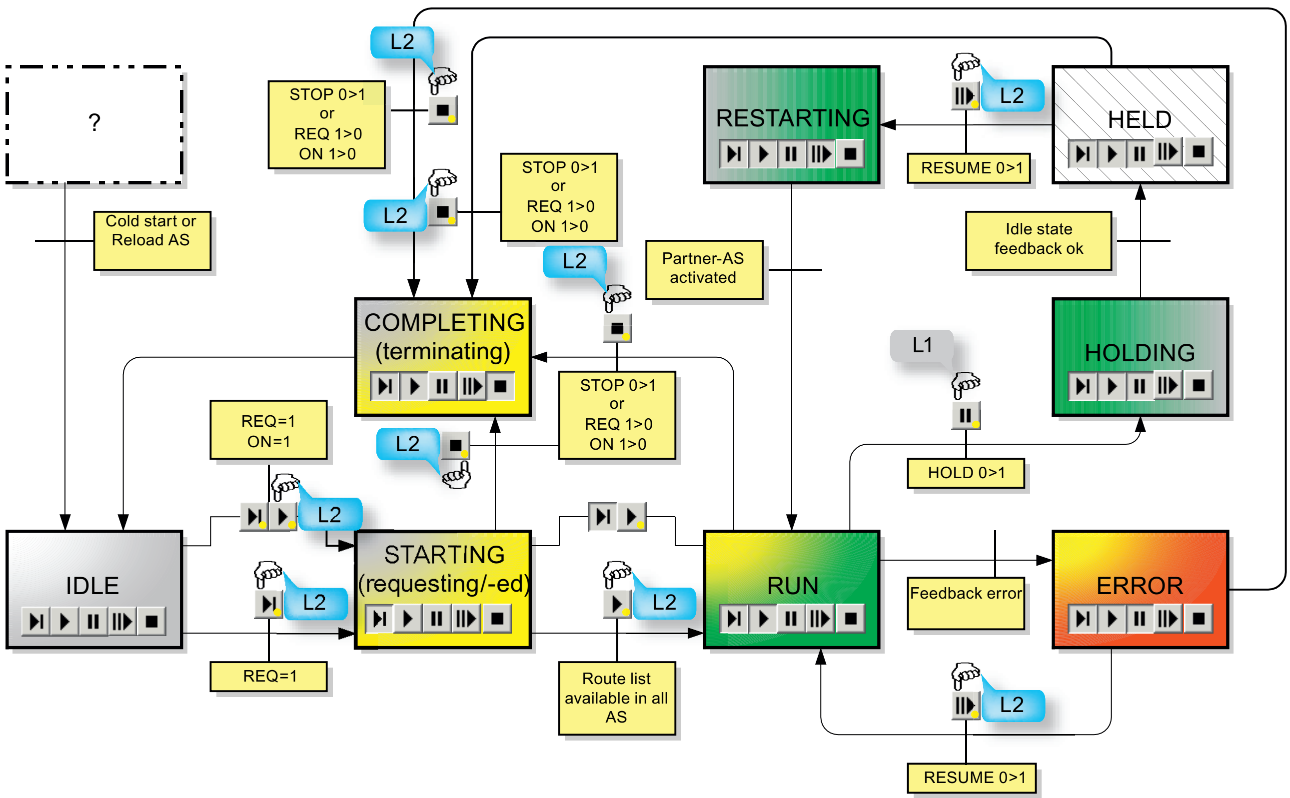
14.2 Route Status

Status diagram

The Route Control status diagram displays the individual S88 statuses and their transition conditions.

In manual mode, actions are responsible for transitions between the statuses. These transitions are represented by a hand icon with the corresponding operator-control element.

In automatic mode, the user program (or the SFC) activates the route and thus triggers the status transitions. L1 and L2 stand for the required user authorization levels.



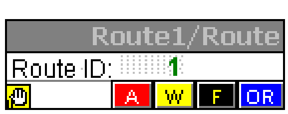
You can find additional information in
"User Roles for Route Control" (Page 46).

14.3 Route Control Block Icon

14.3.1 Block icon, Classic style

Block icon of a route

The block icon displays the main statuses of a route.



Route Name

The name of the route is displayed in the header line. This is the instance name of the block in the CFC chart type RC_IF_ROUTE to which this block icon was interconnected.

Route ID

Route ID: 1

The route ID used to operate this route is displayed in this line.

Route ID	Meaning
0	A route ID has not yet been assigned for this route.
1...300	Route ID for this route

Display elements of the block icon

Route status

You can find the meaning of the status displays in the following table:

Picture	Meaning
	Route is deactivated and inactive (automatic mode)
	Route is deactivated and inactive (manual mode)
	Route request is active (automatic mode)
	Route request is active (manual mode)
	Route is active and running (automatic mode)
	Route is active and running (manual mode)
	Route is held (automatic mode)
	Route is held (manual mode)
	Route is in error state (automatic mode)
	Route is in error state (manual mode)

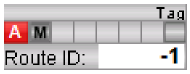
Pending messages (group display)

You can find the meaning of the group displays in the following table:

General	RC	Meaning
A		One or more alarm messages are pending for this route
W		One or more warning messages are pending for this route
F	F	One or more error messages are pending for this route
OR		One or more operator prompt messages are pending for this route

 Route Control does not send messages of this type.

14.3.2 Block icon, APL style



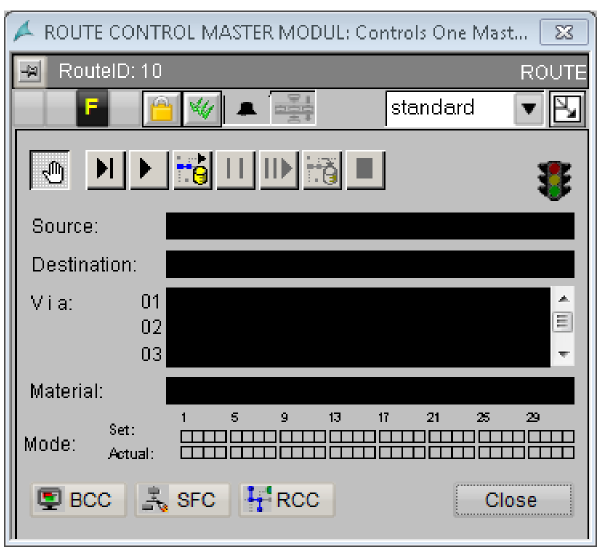
You can find additional information in the section "Block icon, Classic style (Page 481)"

14.4 Route Control faceplate

14.4.1 Faceplate, Classic style

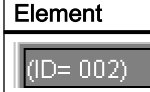
Route Control faceplate

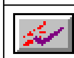
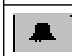
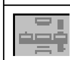
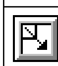
Click the block icon to open the Route Control faceplate.
The Route Control faceplate displays additional information and permits route operations in accordance with the authorization level in PCS 7 OS.



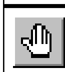
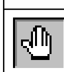
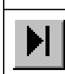
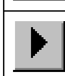
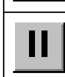
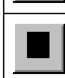
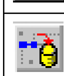
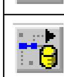
You can find additional information about this in the section "Route Status" (Page 480).

Higher-level display elements

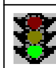
Element	Meaning
 (ID= 002)	Route ID Dynamic route IDs can change after each new route request.
 Route/Route34	Name of the route block instance of type RC_IF_ROUTE to which the block icon is interconnected.

Element	Meaning
A W F O	Group display for messages pertaining to this route.
A	Route Control does not generate any alarm messages.
W	Route Control does not generate any warning messages.
F	At least one error message is active for this route.
O	Route Control does not generate any operator prompts.
	Acknowledgment of messages.
	Messages cannot be suppressed in Route Control.
	SIMATIC BATCH
Standard	Selection of the display scope: Standard: Normal display with route information Messages: expanded display with Route Control messages BATCH: advanced display with BATCH information.
	Expand faceplate.

Operator control elements

Element	Meaning
	Route is in automatic mode.
	Route is in manual mode.
	In manual mode: Request route (IDLE > STARTING)
	In manual mode: Start route (IDLE > STARTING > RUN)
	In manual mode: Hold route (HOLD > HELD)
	In manual mode: Complete route (COMPLETE)
	Acknowledge error and continue executing the route (RESUME, i.e. HELD > RUN)
	In manual mode: Start a saved route
	In manual mode: Save the active route

You can find the meaning of the icon for the faceplate in the following table:

Icon	Meaning
	Route is inactive (IDLE)
	Route is in error state (ERROR)
	Route request is in progress, or route is ready to start (STARTING) or is held (HELD)
	Route is active and elements are being controlled (RUN)

Locations

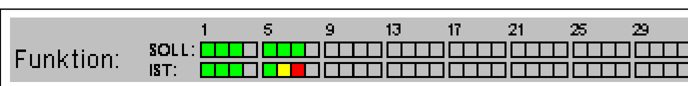
Element	Meaning
Source:	SourceLocation Fully qualified name of the source location.
Destination:	DestLocation Fully qualified name of the destination location.
Via:	01 Via1-Location 02 Via2-Location Fully qualified name of the Via location.

Fully qualified names have the syntax "processcell\unit\location".

Note

The locations cannot be changed using this faceplate. Open the Route Control Center to make such changes. The scroll bar on the right can be used to view the other "Via" locations.

Mode levels

Mode:	 The individual mode levels (32 in 8 blocks containing 4 bits each) are represented as small squares. The upper line indicates the control, i.e. the setpoint. The lower line indicates the actual value, i.e. the mode levels actually achieved.

You can find the meaning of display elements for the mode levels in the following table:

Element	Meaning
	The upper line indicates the specified status, i.e. the status of each individual mode level from 1 to 32.
Green:	Mode level is activated and all elements are being controlled.

Element	Meaning
Gray:	This mode level is not activated or is deactivated and elements are deactivated.
Yel-low:	Not used
Red:	Not used
	The lower line indicates feedback for the 32 mode levels.
Yel-low:	Mode level is currently being activated
Green:	Mode level is achieved
Red:	Mode level could not be activated within the monitoring time (error state)
Gray:	This mode level is not controlled and therefore not supplying any feedback.
	Mode level is not being controlled
	Mode level is currently being controlled; an attempt will be made to activate the elements according to their placement.
	Mode level could not be activated because the specified position of one or more of the elements involved could not be assumed within the activation monitoring time.
	The mode level and elements contained therein have been activated and have assumed their specified position.
	Element has left its idle state position and the fault-tolerance time has elapsed.

Additional operator control elements

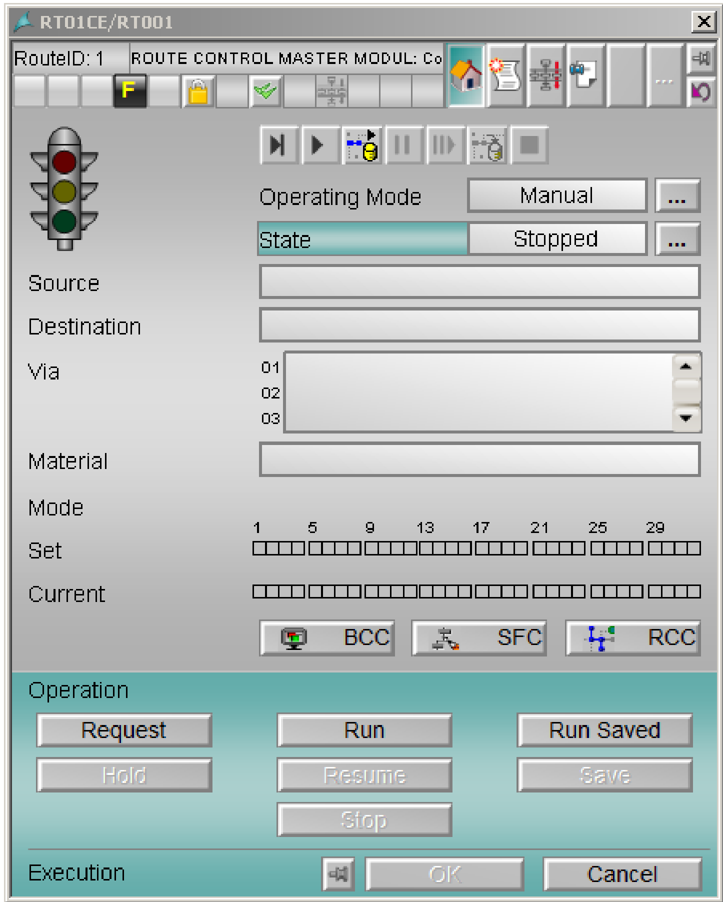
Element	Meaning
BCC	Opens the BATCH Control Center, provided it is installed on this computer.
SFC	Opens the SFC dialog and indicates the current status of the SFC controlling this route. The path to the corresponding SFC must have been configured on the Route Control faceplate beforehand.
RCC	Opens the Route Control Center containing additional details on this route (in-cluding all of the elements and the status of each element).
Close	Closes this dialog box.

14.4.2 Faceplate, APL style

Route Control faceplate, APL style

If you have installed the Route Control faceplate in APL style, the Route Control faceplate in APL style opens when the RC block icon is clicked.

The figure shows the RC APL faceplate after pressing the Manual/Automatic key.



The operating philosophy familiar from the APL block library is implemented here. Each operator input opens a dialog in the bottom part of the faceplate in which the desired operator input must be confirmed.

This is the main difference from the faceplate in Classic style.

This also means, however, that the route controls (also known from the RC Center) are now used **only for displaying** the route status and no longer for operator input.

All other areas or elements correspond to those of the Classic style faceplates. A detailed description is therefore not provided here. See also section Faceplate, Classic style (Page 483)

14.5 Route Control Center

14.5.1 General

14.5.1.1 Route Control Center Overview

Open the Route Control Center.

The following options of opening the Route Control Center are available:

- Using the Windows Start menu
- Using the PCS 7 OS keyset
- Using the Route Control faceplate from a PCS 7 OS picture

Route information

The Route Control Center provides information about a route and its elements. The user interface of the Route Control Center is divided into two areas. The upper area displays the route data.

If the Route Control Center is started from a PCS 7 OS picture by means of the Route Control faceplate, only the route associated with this faceplate is displayed. If several routes use the same function ID, all of these routes are displayed.

If the Route Control Center is not started using the Route Control faceplate, all routes are displayed.

Note

Parallel operation (e.g. START) of a route

Parallel operation of the same route via two different Route Control Centers can lead to conflicts:

The first operation of this route that occurs after this parallel operation has no effect.

Three views

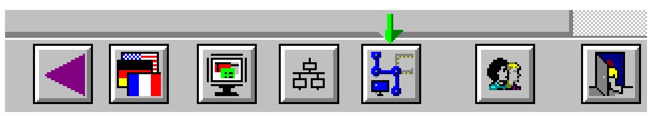
The lower area of the window displays the elements of the route selected in the upper area.

You can choose among three views:

- "Modes" tab:
  Each element and its type of control at the different mode levels is displayed in a row. Unused mode levels are hidden.
- "Elements" tab:
  Displays all route elements, including the actual position and the position setpoint.
  An element controlled at several mode levels is displayed in a corresponding number of rows.
- "Partial routes" tab
  If the selected route is active, all partial routes of this route are shown here.

14.5.1.2 Using the PCS 7 OS Keyset to Call the Route Control Center

PCS 7 OS Keyset

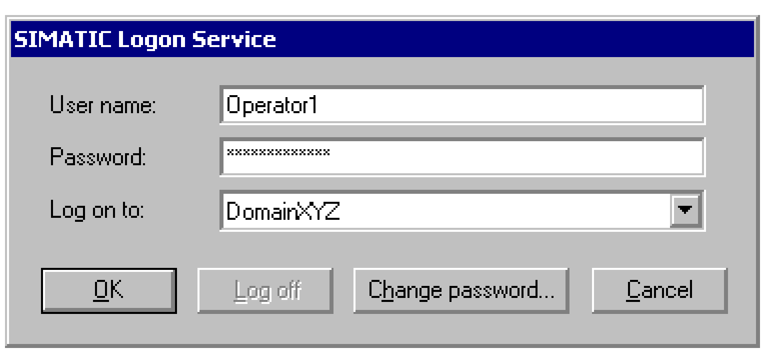


Description

You can use the "Route Control Center" key in the PCS 7 OS keyset to call the Route Control Center. As no route ID is transferred in this case, the Route Control Center displays all routes (as is the case when the Route Control Center is called via the Windows start bar).

14.5.1.3 Route Control Center, Logon

If you use SIMATIC Logon, your identity must be authenticated before you can perform functions in the Route Control Center.



14.5.1.4 Selecting a Route Control Server

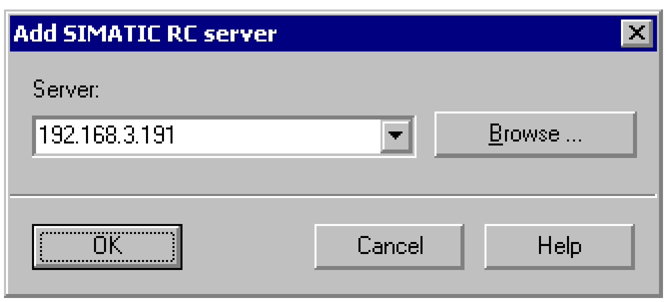
Note

If you have configured the station on which a Route Control Center is running as an "RC application client" in HW Config and downloaded this configuration from SIMATIC Manager to the client station, you no longer have to select the Route Control server in the following dialog boxes.

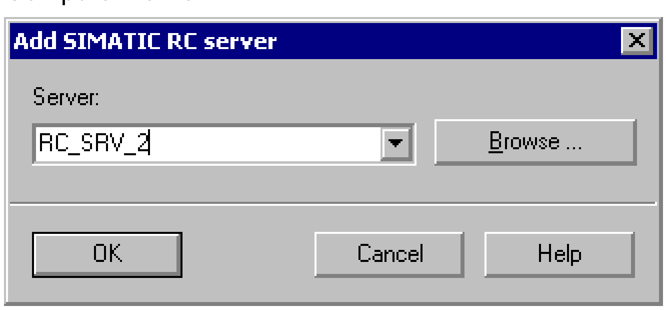
Selecting the Route Control Server

If you have downloaded the configuration from the engineering system to the Route Control client then the Route Control Center automatically selects one of the Route Control servers at startup. If the configuration has not yet been downloaded, you can select a Route Control server manually. Select the Route Control server using the following information:

- IP address of computer



- Computer name



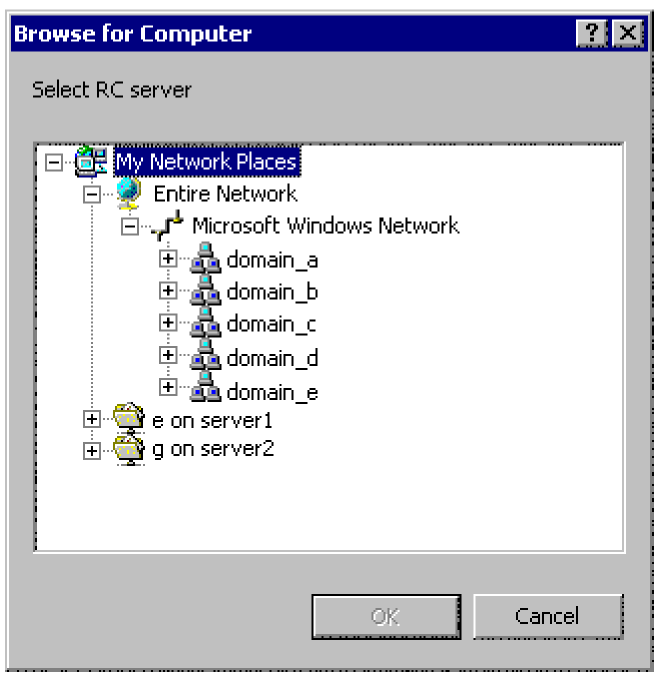
14.5.1.5 Finding a Server

Finding a Server

Note

If you have configured the station on which a Route Control Center is running as an "RC application client" in HW Config and downloaded this configuration from SIMATIC Manager to the client station, you no longer have to select the Route Control server in the following dialog boxes.

Click the following button to select a computer on your network:



14.5.1.6 Adding and Removing the Server

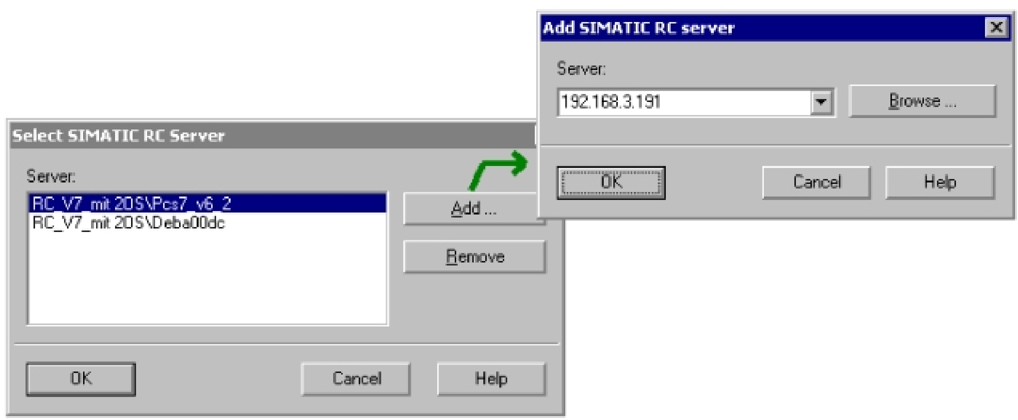
Adding and Removing Servers

Note

If you have configured the station on which a Route Control Center is running as a "Route Control application client" in HW Config and downloaded this configuration from SIMATIC Manager to the client station, you no longer have to select the Route Control server in the following dialog boxes.

If a Route Control server has been selected before and you reopen the selection dialog box using "Program/Server Selection," the previously known servers are offered.

You can expand the list with "Add", or shorten it by selecting a server and clicking "Remove".

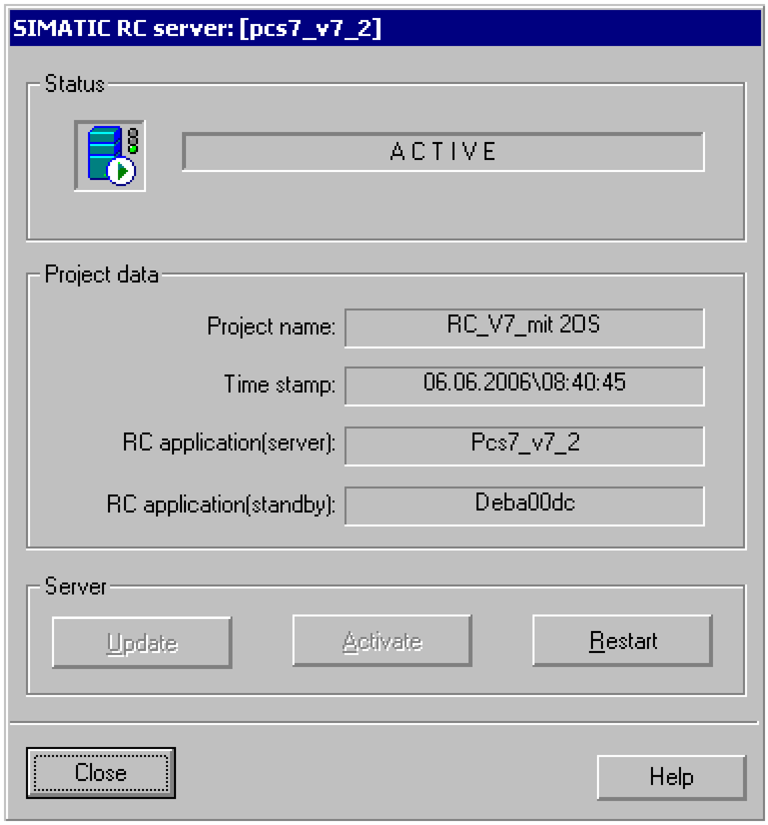


14.5.1.7 Server status

Procedure

In the Route Control Center, select the menu command **View > Server Status**.
A dialog box opens displaying the status of the Route Control server to which the Route Control Center is connected.

Structure of the Server Status Dialog Box



Meanings of Operator-Control Elements

The meanings of the operator-control elements in the "Server status" dialog box are listed in the following table:

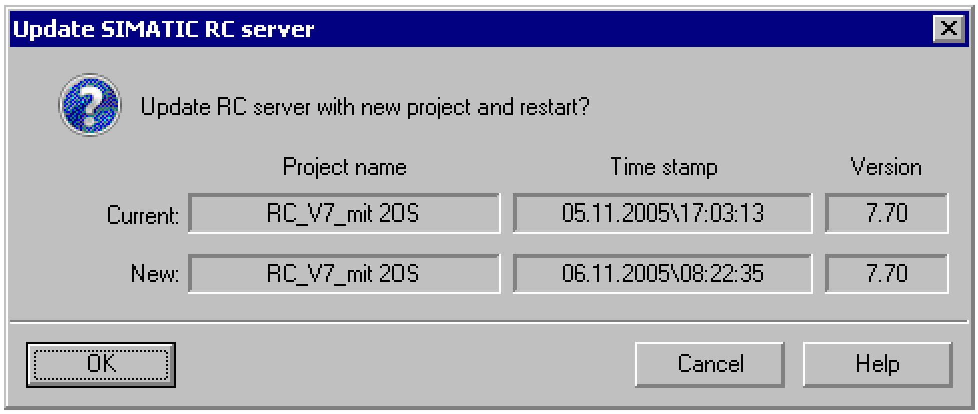
Operator-control element	Meaning
Update	Copies a modified Route Control Configuration that was previously copied to the server to the active area of the server and activates a restart once confirmation is received. You can find additional information in "Updating the Route Control Server" (Page 494)
Activate	Activates the standby computer as the master computer. This operator input is only available if the server is currently running in standby mode.
Restart	Shuts the Route Control server down, then rereads the configuration and executes a general request. Telegram processing is then enabled again.

Additional information

- Section: "Route Control Server User Interface Dialog" (Page 531)

14.5.1.8 Updating the Route Control Server

Dialog box



Meaning

The meanings of the elements in the "Update server" dialog box are listed in the following table:

Element	Meaning
Current	Displays the Route Control project that is currently active in the server, i.e., the most recently downloaded project, using its name and time stamp. You can also see an internal version number. This version number only changes if structural changes are made to the database when a new Route Control version is installed.
New	This shows the name and time stamp of a new configuration, which has been downloaded to the server via Route Control Engineering, but which has not yet been updated.
OK	Updates the configuration; the old configuration is replaced by the new one. This change cannot be undone.
Cancel	This cancels the update procedure, the new configuration is not downloaded.
Help	Opens the online help

14.5.1.9 Errors During Route Request

Detailed View

The Route Control Center switches to this view automatically if an error occurs when a route is requested.

The following errors that occur during a route request are displayed in detail:

- Locked elements
- Locked partial routes
- Inconsistent commands
- Material error

It is possible to display all four tabs at once:

locked elements | locked partial routes | inconsistent commands | material error

Element name	AS	No.	Function	Function no.	Subroute	Operating mode	Control

Restricted View

This view is restricted to the cause of the error occurring during a route request.

Example: Material error (successor material not permitted)

material error

Element name	AS	No.	Subroute	Material
LE/RC_IF	PCU2_MPI17 (2)	1	Material ueber 2 AS	Mat3

Example: Element error (locked element)

locked elements

element	AS	Nr.	Function	Function no.	Subroute	Operating mo	mode	sum	command
L...	P...	2	--	2	Material ...	Fehler	0	---	OPEN
L...	P...	2	--	1	Material ...	Fehler	0	---	CLOSE

Example: Partial route error (locked partial route)

locked elements | **locked partial routes**

Element name	Function	mode table	source	variant	destination
GTM...	3	Pumping	GTM1V (5)		GTM3H (11)
GTM...	3	Pumping	GTM3H (11)		P2 (14)
P2 _ ...	3	Pumping	P2 (14)		LTM1H (23)
LTM1...	3	Pumping	LTM1H (23)		LTM4V (22)

Note

You can sort the lists by clicking on one of the column headings. Clicking again on a column heading changes the sorting order.

14.5.1.10 SIMATIC Route Control Support for Maintenance Work

Support for Maintenance Work

To ensure safe maintenance work on automation systems, as of V6.1, SIMATIC Route Control provides an overview of the material transports in connection with those automation systems that are controlling them. You can trigger a specific request to an automation system to set it "in maintenance". First, ongoing material transports that affect this automation system are completed - no new routes are allowed by the system, however. All routes are eventually completed and the automation system goes "in maintenance" as soon as the final route is completed. Now maintenance personnel can perform the required updates and changes to the automation system and then restart the system. If you recall the maintenance request before the material transports are complete, restart the RC server. You can start new material transports after restart of the RC server.

14.5.1.11 AS in Maintenance

Introduction

Route Control supports your AS maintenance.
An AS must be set to "Maintenance" state for

- Updating single blocks
- Updating all AS blocks (initial download after hardware has been replaced)

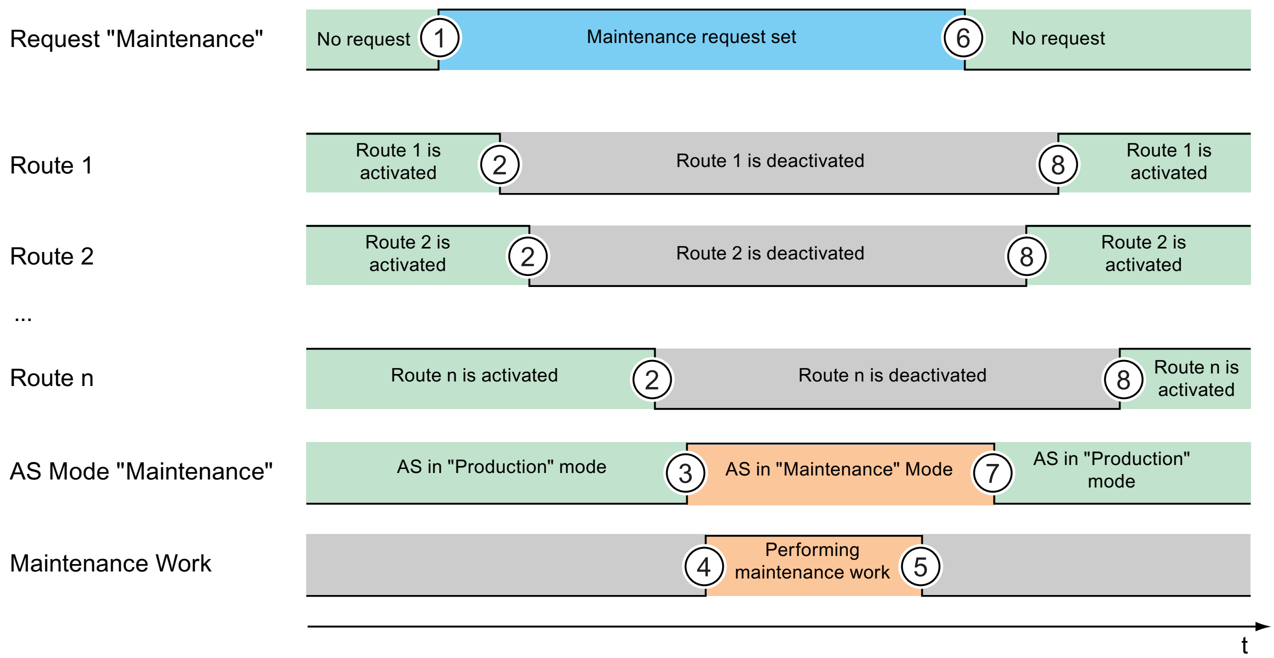
Sequence of Steps

Since an AS can control routes actively as well as participate passively in the route (as a slave), an AS can not simply be stopped. This could lead to the product being lost in the process cell. Therefore, you must perform the steps below:

Step	Action
1	Requesting the "Maintenance" state For further information, refer to the section "Route Control Center: Maintenance View" (Page 506).
2	The system stops after all active routes are completed and does not permit any new routes. You can intervene here and complete the routes or stop them manually.
3	Once all routes have been completed on this AS, the Route Control AS switches to "Maintenance" status.
4	Now make the required changes on this AS (e.g., replace hardware and/or software).
5	The maintenance work is completed.
6	The maintenance request is canceled in the Route Control Center For further information, refer to the section "Route Control Center: Maintenance View". (Page 506).
7	As soon as the AS is back in "Production" status...
8	... routes (material transports) can be started again.

A message (PCS 7 OS status message of the Route Control Server) is output to the alarm system at each transition between the "Production" and "Maintenance" states.
For further information, refer to the section "OS messages (system, server)". (Page 553).

The following figure shows the response as a signal curve:



14.5.2 User interface

14.5.2.1 Route Control Center Menu

Overview

The meanings of the menu items in the Route Control Center are listed in the following table:

Program

Subitem	Meaning
Server selection	Opens a dialog box for selection of the Route Control server to which the Route Control Center is to be connected. You can find additional information in the section "Adding and Removing Servers" (Page 492)
Log on	Opens a dialog box for a user to log on. Access to this function is not available when a user is logged on. You can find additional information in the section "Route Control Center: Login" (Page 489).

Subitem	Meaning
Log off	Opens a dialog box for a user to log off and log on again. Access to this function is only available when a user is logged on. You can find additional information in the section "Route Control Center: Login" (Page 489).
Close	Closes the Route Control Center application. The user will not be logged off unless Route Control Center is the last application still connected to the SIMATIC Logon.

Function

Subitem	Meaning
Manual	Switches from manual to automatic mode for the selected route, and vice versa.
Set route request	Initiates a route request (STARTING).
Set route start	Starts the route; no mode levels will be activated at first (RUN).
Set route hold	Places the route on hold (HOLD)
Resume route	Allows a held route (with or without errors) to be restarted. If the route was in ERROR status, this error is acknowledged simultaneously.
Set route stop	Route is stopped (STOP)
Update route	Updates the list of elements and the route status; data will be downloaded from the Route Control server again for this purpose.
Update elements	Updates the list of elements; data will be downloaded from the Route Control server again for this purpose.
Route properties	Opens a dialog box containing the properties of the route. These properties can only be changed if the route is not running (IDLE). You can find additional information in the section "Route Control Center: Route Properties" (Page 511).
Apply Material	You can find additional information in the section "Route Control Center: General Operator-Control Elements" (Page 500)

View

Subitem	Meaning
Element list	The lower area of the Route Control Center switches to the "Elements" view. The "Elements" and "Modes" tabs are displayed here.
Request details	The lower area of the Route Control Center switches to the view showing the result of a route request: • Locked elements • Locked partial routes • Inconsistent commands • Material error You can find additional information in the section "Route Control Center: Error During Route Request" (Page 494).
Toolbar	Displays or hides the toolbar 

Subitem	Meaning
Status bar	Displays or hides the status bar. 
Always on top	The Route Control Center will always be displayed on top and can not be sent to the background even when the user switches to another application or window.
Server status	Opens a dialog box containing the display of the Route Control server status.
Update	Reloads the data for the display from the Route Control server and reconfigures the view.
Maintenance on/ off	The maintenance view for the AS is displayed/hidden. You can find additional information in the section "AS in Maintenance" (Page 496).

Options

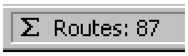
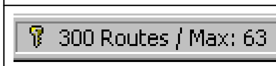
Subitem	Meaning
Settings	You can find additional information in the section "Route Control Center: Options/Settings". (Page 501)
Route log	Opens the route log program
Language	Changes the user interface language

Help

Subitem	Meaning
Contents	Opens Help
Context-Sensitive Help F1	Opens the Help system and jumps to a description of the active dialog box.
Introduction	Opens Help and jumps to the introduction
Getting Started	Opens Help and jumps to the description for getting started.
Using Help	Opens the Help system and jumps to a description of how it can be used to find information.
About	Opens a dialog box containing, for example, the following information: • Product name • Product version • Copyright • Company

14.5.2.2 Route Control Center Status Bar

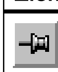
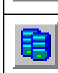
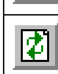
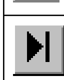
Overview

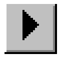
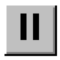
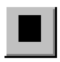
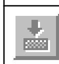
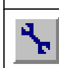
Element	Meaning
	Maximum number of simultaneous material transports: This number is derived from the configuration of route blocks.
	AS status: Details are shown in the corresponding ToolTip. The maintenance view is activated by double-clicking the icon.
	Status of the Route Control Server to which the Route Control Center is connected. The possible states of the Route Control Server are listed in the section "Route Control Server status" (Page 532). Double-click the icon to open a dialog box that displays the status of the Route Control Server.
	Station name of the Route Control Server.
	Display of the route log. The small green triangle indicates the active state of the route log. The corresponding ToolTip returns the log file path. The route log is opened by double-clicking the icon.
	The license for 300 simultaneous routes is installed. A maximum of 63 routes have been active simultaneously since the last server startup.
	The SIMATIC Logon component is not installed.
	The SIMATIC Logon component is installed: name of the user currently logged on to this station. The "[unknown]" message is output if no users are logged on. Double-click this box to open the logon dialog box.

14.5.2.3 General operator control elements of the Route Control Center

Overview

The meanings of the operator-control elements in the Route Control Center are listed in the following table:

Element	Meaning
	Locks the Route Control Center in position. When changing over to another application, it will not be moved to the background or closed.
	Opens the dialog box for selecting a Route Control server. For example, this enables another Route Control server to be selected on a multiclient.
	Opens the dialog box displaying the status of the Route Control server.
	Updates the view. The data for the display are explicitly downloaded from the server again.
	Switches the route operating mode over to the mode that is not activated, either "manual" or "automatic".
	In manual mode only: Requests the route.

Element	Meaning
	In manual mode only: Starts the route. Mode levels are not active at this point.
	In manual mode only: Interrupts the route. Mode levels are deactivated, the route itself remains activated and the route lists are downloaded. Elements of the route list are not enabled.
	In manual mode only: Terminates the route. Mode levels are deactivated. Elements of the route list are enabled.
	Acknowledges errors and continues executing the route (RESUME, HELD > RUN).
	Start a saved route.
	Save the current route.
	As of V6.1, material can be set to a route if the route is already active. The specification of the material is made in two steps: 1. Specification of the material is made .You can find additional information in the section "Route Control Center: Route Properties" (Page 511). 2. Application of the material (this icon) Note: This icon can only be used if at least one link elementof the route differs from the specified material of the route.
	Shows the Route Control Center maintenance view (activated) Shows the Route Control Center route overview (not activated)

14.5.2.4 Options > Settings Menu

Options on the "General" Tab

The meanings of the options on the "General" tab in the **Options > Settings** menu in the Route Control Center are listed in the following table:

Parameter	Range of values	Meaning
Time until a tooltip appears	10 to 1000	Time in milliseconds that the mouse pointer must rest on a location in the working window before a tooltip is displayed
Duration for which the tooltip remains visible	10 to 5000	Duration, in milliseconds, for which the tooltip is visible
React to position limits	Yes/No	Yes: The working area of PCS 7 OS restricts the position of the Route Control Center; it cannot be moved beyond the working area. No: The Route Control Center can be positioned freely.

"Control key" tab

A table displays the meanings of the abbreviations for the activation key. You can find additional information in section
"Key for the type of activation" (Page 502).

14.5.2.5 Keys for the Type of Activation

Introduction

The manner in which an element is used in a mode level (whether it is activated or just passively requested, for example) is represented using activation keys. These keys consist of icons.

Act.	Deact.	Check	PC	DT ON	DT OFF	Idle state Off	**Abbrev.**
X							a
	X						d
X		X					a?
	X	X					d?
X			X				p
X				X			a1
X					X		a2
X				X	X		a3
X			X	X			pa1
X			X		X		pa2
X			X	X	X		pa3
						X	-

Meanings of Keys

The meanings of the activation keys are listed in the following table:

Key	Meaning
a	This element will be activated in this mode level.
d	This element will be deactivated in this mode level.
a?	The actual position of this element is requested (checked).
d?	The actual position of this element is requested (checked).
p	This element will be activated in this mode level in pulse mode.
a1	This element will be activated in this mode level with a switch-on delay time > 0.
a2	This element will be activated in this mode level with a switch-off delay time > 0.
a3	This element will be activated in this mode level with a switch-on and switch-off delay time > 0.
pa1	As a1 but with pulse time.
pa2	As a2 but with pulse time.
pa3	As a3 but with pulse time.
-	The idle-state position will also be monitored. When the mode level is deactivated, monitoring will be performed to determine whether the element is also switched off (motor) or closed (valve).

Note

From V7.0 and higher you can no longer change the activation key in the Route Control Center. Change the icons in Route Control Engineering.
You can also create your own user keys there.

Additional information

- "How to Change the Activation Key Icons" (Page 423)
- "How to Create User Keys" (Page 423)

14.5.2.6 Route Control Center Route Overview

Content of the route view

When you launch the Route Control Center from the RC faceplate, all routes with the same function ID (FuncID) as the route whose faceplate is open are displayed. Normally, if no FuncID is explicitly specified (at FB800/RC_IF_ROUTE), this is the route ID and therefore only one route is displayed.

When you launch the Route Control Center from the Windows Start menu or via the icon in the menu bar of WinCC, all routes in the project will be displayed.

Overview

The meanings of the display elements in the Route Control Center are listed in the following table:

Column	Meaning
Route	Displays the route ID used for this route.
Master AS	Displays the automation system that controls this route. That is the AS, in which RC_IF_ROUTE is activated from the user program.
Function ID	When there are multiple routes, the function ID is normally different so that elements assigned by a route can not be used for another route (exclusive access). In certain cases, multiple routes share elements and use the same function ID. In the route overview, all routes with the same function ID are displayed even if they use different route IDs. This enables you to easily switch to the element lists of other routes, as they can also influence the behavior of your own route (commands).
Mode table	The mode table used to execute this route was specified by the user program in RC_IF_ROUTE.
Material	Displays the material that is transported by this route
Step	Batch recipe step that activates this route. The step will be specified by the RC_IF_ROUTE user program.
Batch name	Name of batch that activates this route The step will be specified by the RC_IF_ROUTE user program.

Column	Meaning
Source	Material transport source location
Destination	Material transport destination location
Description	Information about the current status of the route The list below includes examples of the most frequently occurring status or error messages.

List of most frequently occurring status or error messages

- Route inactive
- Send batch data
- Request frame
- Route request in progress
- Initializing route list
- Send job data via XC
- Route ready to start
- Send route start frame to RC server
- Waiting for feedback of route elements
- No response from remote elements. Route enters error.
- Route running
- Holding route
- Route held
- Holding route (error)
- Route held (error)
- Releasing route elements.
- Route enters error, remote elements are in error state.
- Route held with XC error
- Route list could not be sent to the master or slave AS.
- Timeout waiting for the route list
- No route found for this source/via/destination combination
- Element(s) or partial route(s) already in use
- Incorrect parameters for locations
- Error in route list: incorrect number of elements or data record length
- Element(s) with incorrect status
- License exceeded
- Error in route list

- Master AS is not "RUN" mode
- Cannot access master AS
- Unknown mode table
- Route DB does not exist

A detailed summary of the possible causes of the error is available in section "RC_IF_ROUTE.QRET_VAL (Page 119)"

Meaning of the colors and symbols

Upper pane of the route view:

Color	Meaning
White	Route is inactive, material transport is not taking place within this route.
Yellow	The list of elements for this route is currently being requested. The automation systems are waiting for the route list. The Route Control server is looking for a suitable route with the specified locations and parameters. The route is being held. The route list has been downloaded to the AS and the route is ready to start.
Green	The route is running. Mode levels can be activated or deactivated.
Orange	The route is disrupted (see below), but "Ignore error" is set.
Red	The route is faulty. One of the monitoring times has expired and at least one of the elements has not reached its set position, so the mode level has not been achieved.

Icon	Icon	Meaning
Automatic mode	Manual	
		Route is idle; this route ID or route will not be used. This ID must first be assigned to an instance using dynamic ID assignment.
		Route is idle; route ID is assigned to an instance.
		Route request is in progress, or route list is available in the automation systems involved and the route is waiting for a RUN signal. Status = STARTING
		Route is running (RUN)
		Route is held (HELD).
		Route is faulty (ERROR)

Lower pane with function view (mode title column and mode column) and element view:

Color	Meaning
Light gray	Mode not activated and not achieved
Yellow	Mode activated, but not achieved
Green	Mode activated and achieved

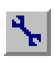
Color	Meaning
Dark gray	• Mode activated, but not (yet) achieved • Route request is present
Orange	Element/mode in error, but "Ignore error" is set
Red	Error, e.g. fault tolerance time exceeded

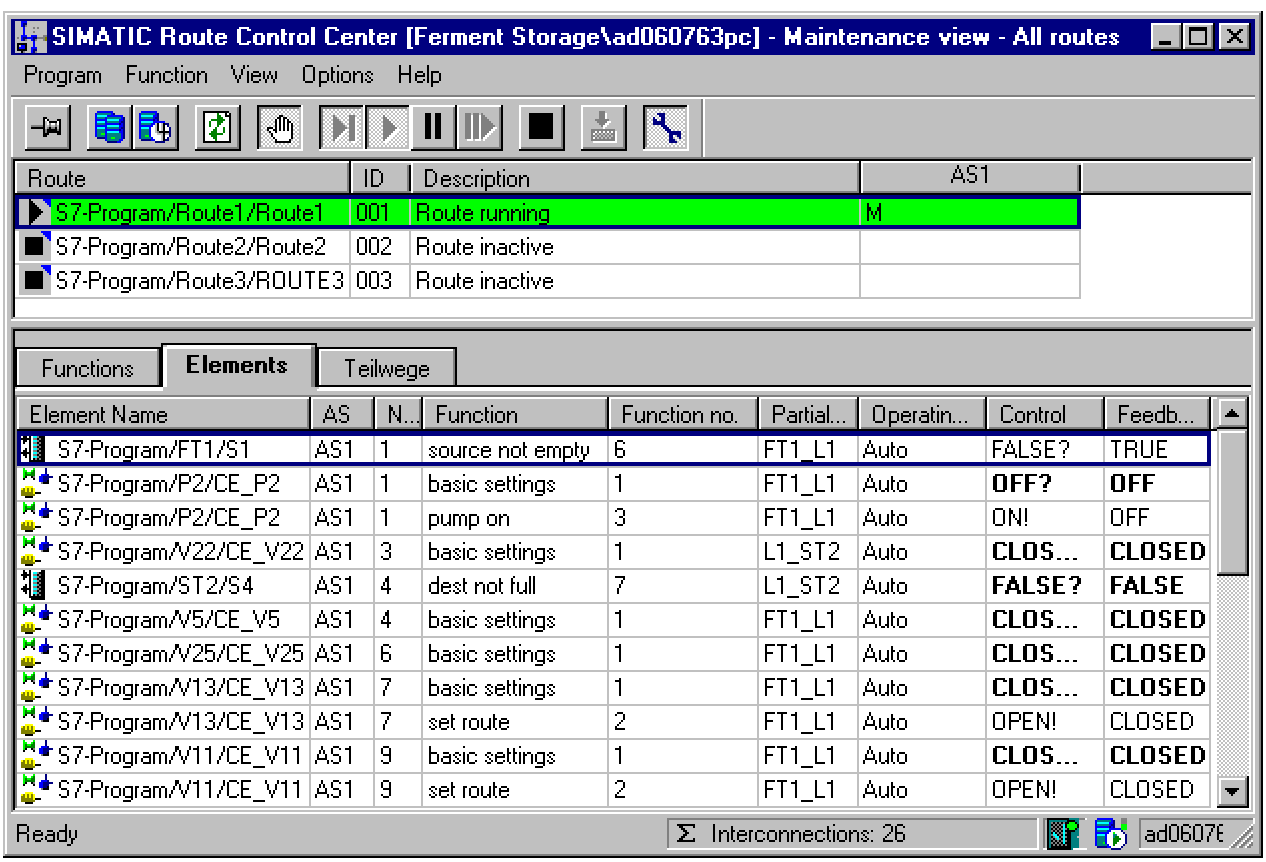
If the feedback for controlling an element is correct, the control key (e.g. d?) is shown in bold, regardless of the status of the mode.

14.5.2.7 Route Control Center Maintenance View

Overview

Activate the maintenance view by clicking the following toolbar icon:





Column	Meaning
Route	Route name
ID	Route ID used by the route. This ID can change if a dynamic route ID is used.
Description	Current route status
AS1 ... ASn	M = this AS controls the route as a master. S = this AS participates in the route as a slave.
ASx*	"Maintenance" state is requested for this AS. Any new requests and start of material transports are saved and are only executed after the AS was re-enabled for route requests. The AS goes into "Maintenance" state after all material transports in which this AS was involved were completed.
ASx**	This AS is in "Maintenance" state. All material transports involving this AS are completed. New material-transport requests and starts are saved and are not executed until route requests are re-enabled at the AS.
AS...?	This AS has been enabled for route requests and will be initialized.
AS ... (H)	This is a fault-tolerant AS, for example, CPU 417-4H.

Operator input

You can execute the following actions in the upper window partition by calling the shortcut menu in the column header of an AS:

- Set the AS to maintenance state (request of the "Maintenance" state in manual mode)
- Enable the AS for route requests (reset of the manual request)
- Enable maintenance requests by program
- Disable maintenance by program

Only two of these menu commands are available at a time, depending on the AS state.

Note

An AS is re-enabled for route requests after both maintenance requests were reset.

Colors

Meaning of the background color of the Route, ID and Description columns:

Color	Meaning
White	Route is inactive.
Yellow	Route is requested or in hold state.
Green	Route is in active state.

Color	Meaning
Orange	Route in error, but "Ignore error" is set
Red	Route is in error state.

Visualization of the column for an AS

Meaning of the background colors of the AS column:

Color	Meaning
Light gray	Mode is not activated and not achieved
Yellow	Mode is activated, but not achieved
Green	Mode is activated and achieved
Dark gray	• Mode is not activated, but still achieved • Route request is present
Orange	Element/mode in error, but "Ignore error" is set
Red	Error e.g. fault tolerance time exceeded

Additional information

- "AS in maintenance" (Page 496) section

14.5.2.8 "Functions" Tab in the Route Control Center

Overview

The meanings of the columns on the Route Control Center "Functions" tab are listed in the following table:

Column	Meaning
Element	Name of element
AS	Name of automation system controlling this route (master AS)
No.	Number of element corresponding to the AS (1 to 1,024)
Operating mode	Auto = Route is activated automatically, by the user program in the AS. Manual = Route is activated manually via the faceplate or the Route Control Center.
Feedback	Current feedback for element
01 Function level 1*	Blank: This element is not used in this function level. The meanings of the symbols are explained in "Meanings of Activation Key Symbols" (Page 422).
...	- " -
32 Function level 32*	- " -

* The number of function levels and their names depend on Route Control Configuration. The function levels displayed are limited to those containing elements present in this route.

14.5.2.9 "Elements" Tab in the Route Control Center

Overview

The meanings of the columns on the Route Control Center "Elements" tab are listed in the following table:

Column	Meaning
Name	Name of element
AS	Name of automation system controlling this route (master AS)
No.	Number of element corresponding to the AS (1 to 1,024)
Function	Name of function level in which this element has been inserted and will be activated
Function No.	Number of function level (1 to 32)
Partial route	Name of partial route in which the element is inserted
Operating mode	Automatic or manual
Feedback	Current return value (actual value) for the element
Control	Current control value (setpoint) for the element
(!) after the expected feedback	The element will be activated and the routing system will wait for this feedback.
(?) after the expected feedback	The element will only be asked whether it is supplying this feedback.

Note

Limited number of displayed elements

Approximately 450 elements can be displayed and updated in the element display of the Route Control Center.

If a route contains more elements than this, all elements are still controlled correctly, even if they are not all displayed in the Route Control Center.

14.5.2.10 "Partial Routes" tab in the Route Control Center

Overview

The table below shows the meaning of the columns in the "Partial Routes" tab of the Route Control Center:

Column	Meaning
Name	Partial route name
ID	Partial route ID.
Source	Fully qualified name of the source location.
Variant	Fully qualified name of the location of the variant

Column	Meaning
Destination	Fully qualified name of the destination location.
Bi-directional	No: The partial route can only be used in the direction source -> destination. Yes: The partial route can be used bi-directionally.
Priority	1 ... 9999 low number - high priority: The partial route is preferred for the route search. high number - low priority.
Comment	Comment text input that was entered when the partial route was created.

14.5.2.11 Route Control Center Sorting

Changing the sorting mode

All the lists in the Route Control Center can be sorted by clicking on the column heading. Clicking again on a column heading changes the sorting order. The list sorting is maintained until it is changed.

The following shows the special features of some of the lists.

"Functions" tab

You cannot sort according to columns with mode levels.

"Elements" tab

By clicking on the column headings you can also sort this list according to the following criteria:

- Element type (e.g. motor, valve)
- Type (example: CE, SE, PE, LE)
- Elements to control
- Elements to check
- Faulty elements

You can display the sequence of the elements by selecting "Sequential sorting" in the shortcut menu. Display is sorted by mode and within the mode in the processing sequence.

"Partial route" tab

By clicking on the column headings you can sort the partial routes sequentially from the source to the destination. Reselecting this menu command then changes the sorting order.

14.5.3 Configuring a Material Transport

14.5.3.1 How to Configure Route Properties

Introduction

In order to enable material transport in manual mode you have to program a route block in the Route Control Center.

You can save the route properties as a route template, or select a route template from an archive.

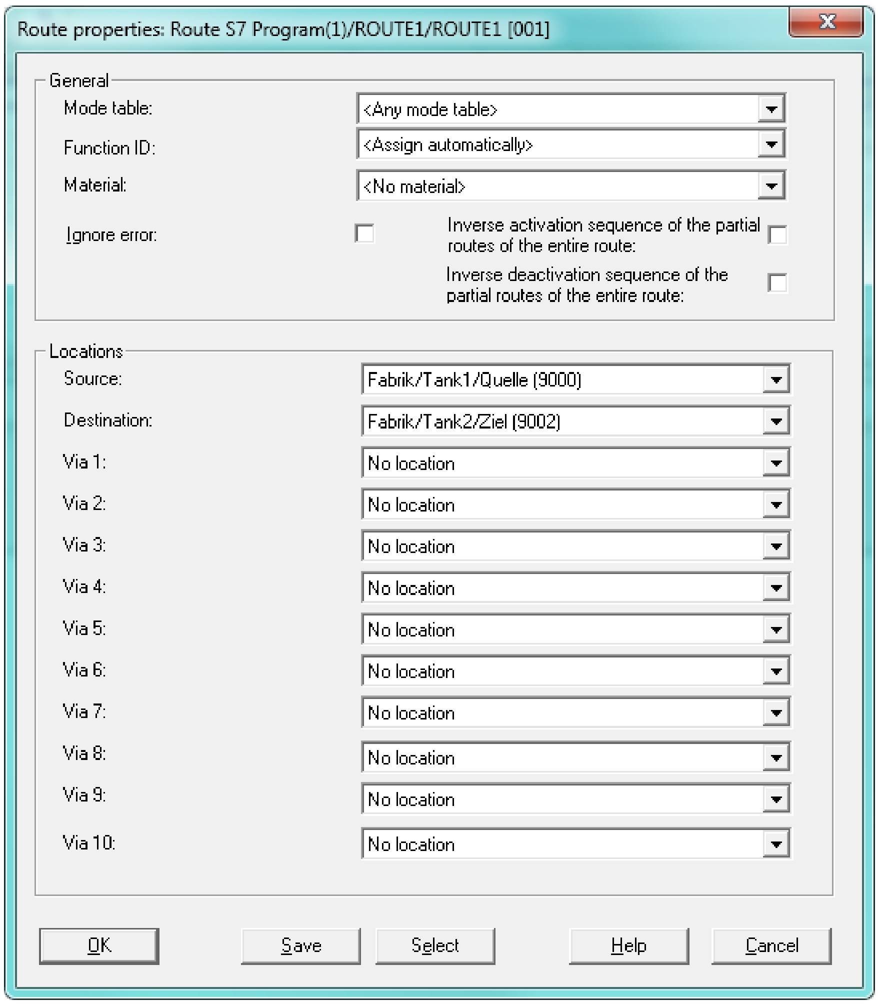
Additional information is available in the section "Working with route templates" (Page 513).

Requirement

The route is inactive.

Procedure

1. Open the shortcut menu of the required route block in the Route Control Center, and then select the**Route Properties** command.
   The "Route Properties" dialog box opens.



2. Program the input boxes.
3. Click "OK".
   The program saves your entries and the route block is configured accordingly.

Input boxes

The table below describes the input boxes (drop-down list boxes, check boxes):

Input box	Meaning
Mode table	Mode table to which the partial routes of the route must belong
Function ID	For individual routes: assign automatically, for concurrent routes: select ID.
Material	Material to be transported (can also be set if the route is active).

Input box	Meaning
Ignore error	Deactivated: If an error occurs, the route is stopped and all elements are deactivated. Activated: The error is ignored and no elements are deactivated.
Source	Location of the source of material transport.
Destination	Location of the destination of material transport.
Via 1 ... Via 10	Via locations (optional).

Note

The drop-down list boxes used to select the source, destination and Via only offer the locations of the type to be selected.

Buttons

The table below describes the buttons:

Button	Meaning
OK	Activates the properties that have been set.
Save	Opens the dialog box for saving the properties as a route template.
Select	Opens the dialog box for selecting a route template.
Help	Opens the online help.
Cancel	Cancels the entry.

14.5.3.2 Working with Route Templates

Introduction

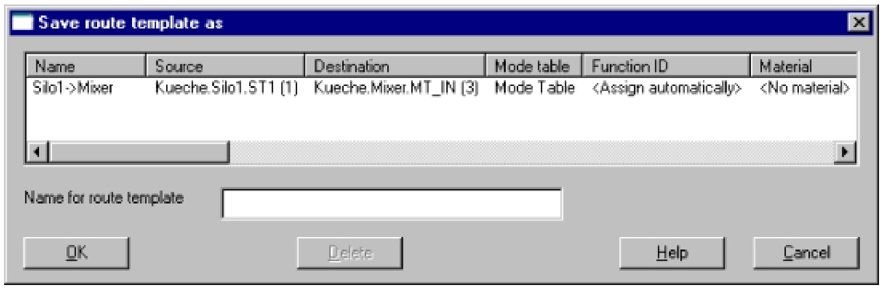
If you want to perform certain material transports on a regular basis, save the properties of these routes as route templates.

When you want to perform a material transport that has been saved in this way again, select it from the list of route templates.

You can delete route templates that are no longer required.

Procedure for Saving Route Properties as Route Templates

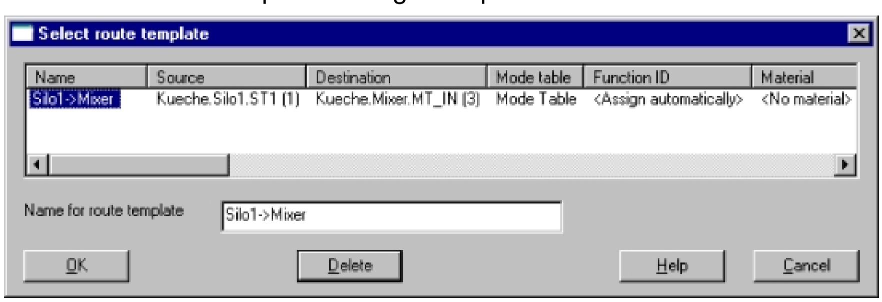
1. Configure the properties of a route.
2. Click "Save" in the "Route properties" dialog box.
   The "Save route template as" dialog box opens.



3. Enter a name for the route template in the input box.
4. Click "OK".
   The properties that were configured earlier are saved in the list of route templates under the name specified.

Procedure for Selecting Route Templates

1. Click "Select" in the "Route properties" dialog box.
   The "Select route template" dialog box opens.



2. Select a name from the list.
3. Click "OK".
   The route-template parameters are entered in the "Route Properties" dialog box.

Procedure for Deleting Route Templates

1. Select the name of the template to be deleted from the list of route templates.
   The "Delete" button is no longer grayed out.
2. You can select other templates by holding down the <Ctrl> key.
3. Click "Delete".
   A prompt dialog box opens.
4. Click "Yes".
   The selected route templates are deleted.

14.6 Route Control Route Log

14.6.1 Overview

14.6.1.1 Route Log

Route Log

The route log is available in SIMATIC Route Control V6.0 SP1 and higher.

The route log contains all of the information concerning material-transport processes:

- Route status: Start, Stop, Hold, Restart, Error
- Activation and deactivation of mode levels
- Information about starting up and shutting down the Route Control server

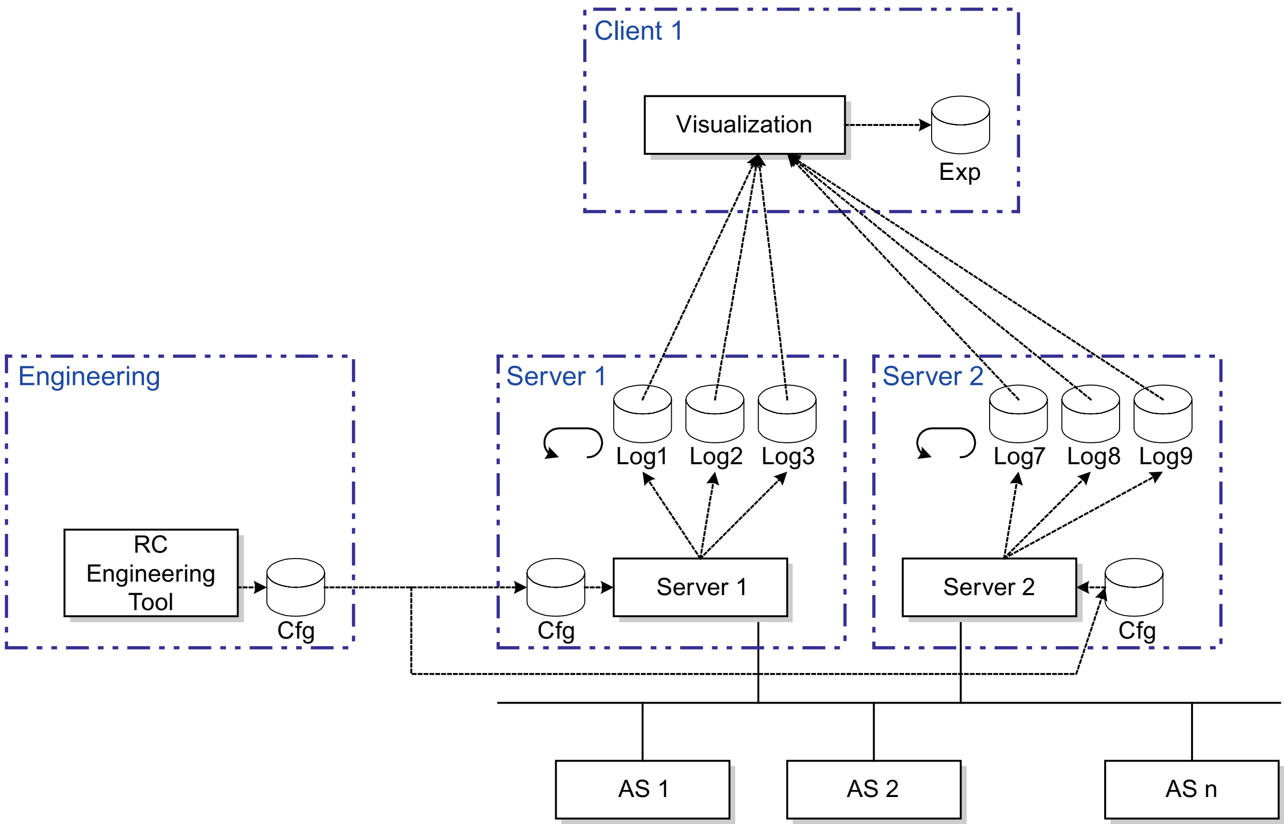
Every day, the Route Control server creates a log file that can be opened with a separate "Route Log User Interface" application.

This application provides the following options:

- Filtering according to specific columns, e. g., the batch name or the source or destination of the material transport
- Searching for specific texts in columns
- Exporting the filtered result to a CSV file, which can then be edited and evaluated using other media, such as Microsoft Excel

14.6.1.2 Structure and Function of Route Logs

Functionality



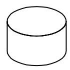
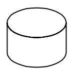
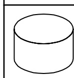
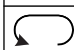
Depending on the configuration, the Route Control server creates route log data in files either with a cyclic buffer or continuously. The factory settings provide a 30-day cyclic buffer. If not configured otherwise, the log files are stored in the Route Control server directory under ... \Programs\Siemens\rcs\log.

These files are opened via the route log user interface. This can even be achieved from another computer, such as a client computer. However, you can also first copy the files and work from the copies.

Note

Opening log files from another computer can inhibit performance, especially if relatively large files are transferred.

The user interface icons have the following meanings:

Icon	Meaning
 Cfg	Configuration file Settings are made in Route Control Engineering and then downloaded to and activated on the Route Control server.
 Log7	Log File One or more files, depending on the setting. Each Route Control server creates its own log files in TXT format.
 Exp	Export file Optionally, route log data can also be exported and edited and evaluated with external media. The export file is created in CSV format.
	Cyclic buffer Unless configured otherwise, the Route Control server uses a cyclic buffer for the logs. A new file is created each day and logs are available from the last 30 days, according to the default setting.

14.6.1.3 Log File

Log File

Once the Route Control server has restarted, e.g., because the configuration has been activated via the Route Control Center, it has already applied the new settings and stored a new log file during startup.

Format

The names of log files take the following format:
RC_LOG_<Server_computer_name>_YYYY-MM-DD.TXT

The <server computer name> is the name of the computer.

YYYY-MM-DD is the year, month and day on which this file was created.
Because a new file is created each day, the file name indicates the day associated with this log.

14.6.2 Route Log Dialogs and User Interfaces

14.6.2.1 Rights for Operating the User Interface

User Rights

Special user rights are not required to start and operate the Route Control routes log user interface.

14.6.2.2 Route Log User Interface

Definition

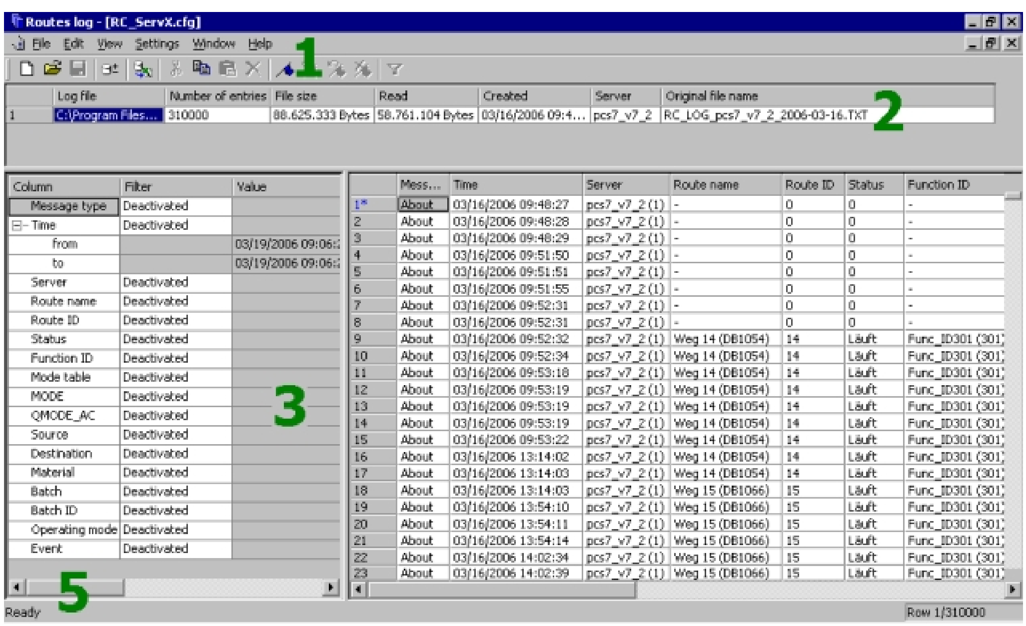
The route log is a standalone, executable application, which is used to display, evaluate and save routing system logs.

Opening the Route Log

Open the route log by double-clicking the following icon in the status bar in the Route Control server or the Route Control Center.

You can also open the route log using the Windows menu command
Start > SIMATIC > ROUTE CONTROL > Route Log
.

Route Log User Interface



The user interface is divided into five areas:

Area within a site	Meaning
1	Menu and toolbar
2	List of log files
3	Filter Functions
4	Table of log data
5	Status bar

Note

This is a view-oriented application. You first create a frame and the view, then open the log files inside this view. View properties include whether columns are to be shown or hidden and whether or not the current log data should be read in again when a view is opened. These views are saved in the configuration files (CFG files).

You can open one or several log files simultaneously. Area 2 displays the names of the opened log files. Area 4 displays the contents of **all** opened log files **at the same time**.

14.6.2.3 Menu, Toolbar and Keyboard Controls

Route Log Menu

File

Subitem	Meaning
New Log View	Creates a new log view
Open	Opens an existing log view
Close	Empties the window
Save	Saves the current log view
Save As...	Saves the log view under a name of your choice
Add/Remove Log	Adds or removes log files to/from the current view
Export...	Export a route log in CSV format
1 ...	Opens the last view selected
Close	Terminate the application

Edit

Subitem	Meaning
Cut	Cuts the selected text
Copy	Copies the selected text
Paste	Pastes cut or copied text
Delete	Deletes selected text
Find	Find a specific character string: Up/down, with/without case matching **Note:** Looking for complete character strings in the "Time" column can be very time-consuming where large files are concerned. If you are looking for a specific time of day, enter just hour and minute, e.g., "14:57".

Subitem	Meaning
Filter	• Activates the filters • Resets the filters. All filter settings are deactivated.
Bookmark	• Sets/resets a bookmark • Next: Jumps to next bookmark • Previous: Jumps to previous bookmark • Delete All: Deletes all bookmarks

View

Subitem	Meaning
Update	Updates, after changes have been made to the log file, for example
Log Files	Shows/hides the "Log Files" window
Filter	Shows/hides the "Filter" window
Select Columns	Opens the dialog box for selecting visible columns.

Settings

Subitem	Meaning
Language	Sets the language
Auto Save	Saves the current view when closing or ending
Load Last Log View	Opens the last view loaded the next time the program starts up

Window

Subitem	Meaning
Arrange	Changes the arrangement of several views: • Overlapping • Horizontally • Vertically
Arrange Icons	Rearranges the icons of several minimized views at the bottom of the window
1 ...	Activates the window for one of the loaded views

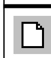
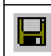
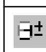
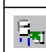
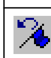
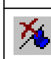
Help

Subitem	Meaning
Contents	Opens the help.
Context-Sensitive Help F1	Opens the help and displays a description of the active dialog box.
Introduction	Opens the help and displays the introduction.

Subitem	Meaning
Getting Started	Opens the help and displays the description the initial steps.
Using Help	Opens the help and displays the description about how additional information can be found using the help system.
About	Opens the dialog box with information about Route Control

Icons on the Toolbar and Keyboard Controls

You can also perform the following actions via the icons on the toolbar or using keyboard controls:

Icon	Keyboard control	Description
	Ctrl + N	Creates a new log view
	Ctrl + O	Opens an existing log view
	Ctrl + S	Saves the current log view
	Ctrl + P	Adds or removes log files from the view
	Ctrl + E	Exports data from the view to a CSV file for editing in external tools
	Ctrl + F2	Sets or deletes a bookmark
	F2	Jumps to next bookmark
	Shift + F2	Jumps to previous bookmark
	Ctrl + Shift + F2	Deletes all bookmarks
	F7	Activates the filters
	Ctrl + R	Resets the filters All filter settings are deactivated. All lines in the log will reappear. You can now proceed to set new filter criteria.
	Ctrl + F	Find a specific character string: Up/down, with/without case matching
	Ctrl + 1	Shows/hides the "Log Files" window
	Ctrl + 2	Shows/hides the "Filter" window
	F1	Calls the online help
	F5	Updates, after changes have been made to the log file, for example
	ALT + F4	Terminate the application

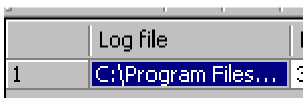
Additional information

- Section: "How to Select Visible Columns" (Page 526)

14.6.2.4 List of log files

List of log files

A list of the files contained in the log can be seen underneath the toolbar.



You can add one or more log files to the view or remove them from it. Initially, these files are sorted according to time.

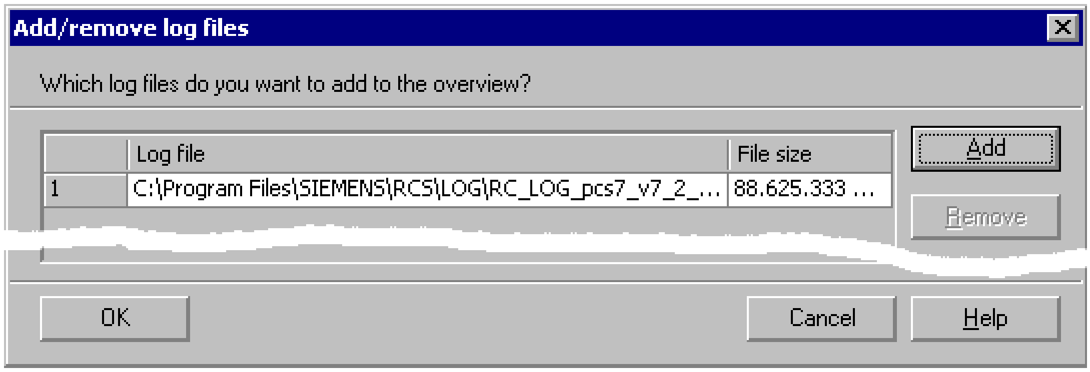
If the file has been modified on the server, this is indicated by yellow highlighting to the left of the log-file path name.

In this case, update the list by pressing F5.

14.6.2.5 Adding or Removing Log Files

You can display several logs in a view simultaneously.

Procedure

1. In the route log, select the menu command **File > Add/Remove Log**or click the icon on the toolbar.
   The "Add/Remove log files" dialog box opens.
   

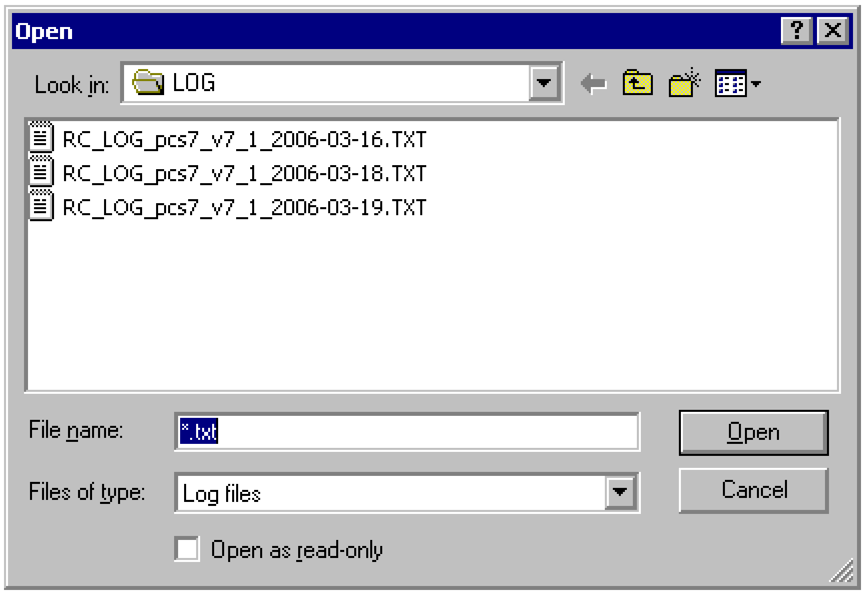
2. To add a log file, click **"Add"**.
   Another dialog box opens.
   You can find additional information in the section:
   "Adding a Log File" (Page 524)
3. To remove a log file, click the number field that precedes the file you want to remove in the list and click **"Remove"**.
   The log files are removed from the list and the data disappear from the display.

Note

No data are deleted when the files are removed.
They are simply removed from the current view.

14.6.2.6 Adding a Log File

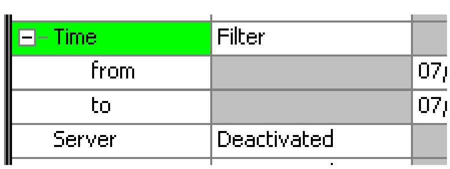
Dialog box



Select a file to be displayed in the route log.

14.6.2.7 Filter Functions

Filter Functions



You can use the filter settings to determine how the rows are displayed in the "Table of log data" area. There are the following filter options:

- Deactivated: The filter is not active in this column.
- Filter: Enter a character string or date to restrict the data to be displayed. Sections of text are also permitted.
- Highlight: If the specified character string is found in the corresponding column, the cell is highlighted in color.

Note

Multiple search strings must be separated by a semicolon, e.g., batch: "ch10200; ch10201".

14.6.2.8 Display of Log Data

Display of Data

	Mess...	Time	Server	Route name	Route ID
1*	About	03/16/2006 09:48:27	pcs7_v7_2 (1)	-	0
2	About	03/16/2006 09:48:28	pcs7_v7_2 (1)	-	0
3	About	03/16/2006 09:48:29	pcs7_v7_2 (1)	-	0
4	About	03/16/2006 09:51:50	pcs7_v7_2 (1)	-	0
5	About	03/16/2006 09:51:51	pcs7_v7_2 (1)	-	0
6	About	03/16/2006 09:51:55	pcs7_v7_2 (1)	-	0

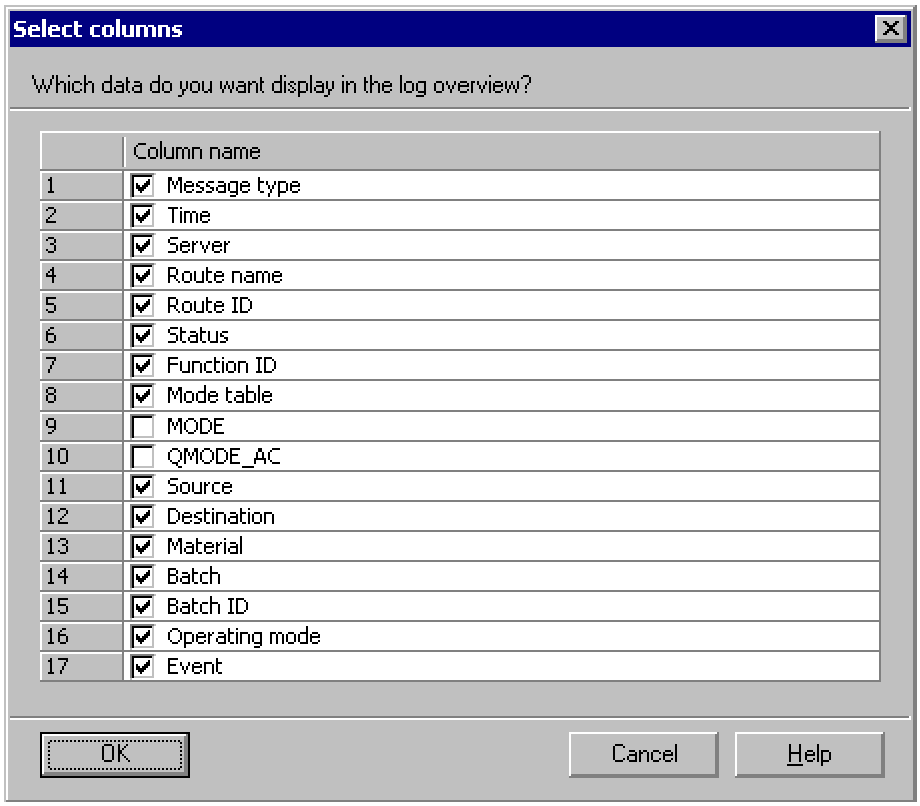
The individual table rows are displayed in different colors:

- Black letters on a red background: Error messages
- Black letters on a blue background: Warnings
- Black letters on a white background: Information

14.6.2.9 How to Select Visible Columns

Procedure

1. Select the menu command **View > Select Columns**.
   The "Select columns" dialog box opens.



2. Select or deselect the required check boxes.
3. Click "OK"
   The selected columns are displayed in the table.

Note

Note that during an export operation, only the visible columns are transferred.

14.6.2.10 Meanings of Columns

Columns

The meaning of each column in the log view is explained in the following table:

Column	Description
Message Type	Information, warning or error You can find additional information about this in " Display of Log Data" (Page 525).
Time	Date and time the message was generated. The time stamp is generated on the Route Control server.
Server	Name of computer on which the Route Control server process has created this route log.
Route Name	RC_IF_ROUTE instance name
Route ID	Number that is unique throughout the project and with which this route works. If IDs are assigned dynamically, this number may differ for each material transport.
Status	Current route status: e.g., not active, running, held
Function ID	Usually, the function ID is the same as the route ID. If several routes are executing overlapping material transports, they use the same function ID.
Mode table	Group containing all mode levels of a route, e.g., "Production" or "Cleaning"
Mode	Mode level (user program setpoint) for the route, information under Note 1
QMODE_AC	Mode level (actual value of route), information under Note 1
Source	Source of material transport
Destination	Destination of material transport
Material	Material being transported You can find information under the MATERIAL input at RC_IF_ROUTE.
Batch name	Name of batch that activates this route. This is only displayed if the BATCHNAME input parameter at RC_IF_ROUTE has been interconnected.
Batch ID	Batch ID You can find information under "Batch name".
Operating mode	If an event has been triggered by the automation system, "Automatic" or "Manual" will appear here. If an operation has been executed via the Route Control Center, the "Computer name\User" will be displayed.
Event	Plain text message

Note 1:
These values are only displayed as binary numbers and are used for diagnostics for configuration and process-cell maintenance. You must refer to the configuration to obtain the mode level names.

Activation and deactivation of a mode level is displayed along with the mode level name in the "Event" column and is thus easier to read.

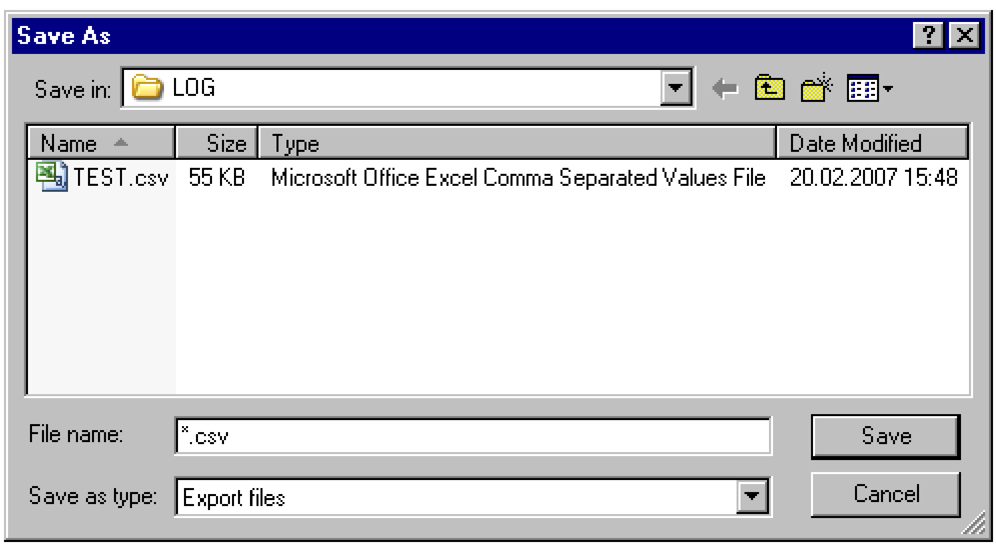
14.6.2.11 Status bar

Status bar

- The current row number is displayed in the area on the left when a new log file is read in.
- The current row number and total number of rows currently open in the application are displayed in the area on the right.

14.6.2.12 Exporting Log Data

Procedure

1. In the route log, select the menu command **File > Export**or click the following icon on the toolbar: 
   The dialog box for exporting log files opens.
   

2. Enter a file name in the "File name" edit box.
3. Click "Save".
   The program applies and saves your entries.

Note

The columns that are currently visible are always exported.

Layout

The structure of the export file is similar to that of the log file. The individual columns are all separated by a semicolon. Because of its format, an export file can be used in other media, such as Microsoft Excel.

Opening with Microsoft Excel

When working with Microsoft Excel, the CSV file must not be opened by double-clicking, but rather by selecting:

- File -> Open
- A converter opens.
- Select semicolons to act as separators.
- The import takes place for display and evaluation purposes.

Currently, each Excel sheet can only open or import files with a maximum of 65,535 lines. This number may well be exceeded if you are dealing with large route logs. In such cases, you can reduce the number of lines in the exported file using the appropriate filtering methods referred to previously.

14.7 Route Control server

14.7.1 Route Control server functionality overview

The Route Control server functionality is provided by the following components:

- Route Control server service
  The service includes the actual server function (rc_serverhostx.exe).
- Route Control server dialog
  The server dialog is used for operator control and monitoring of the server function (rc_serverdialogx.exe).

14.7.2 Route Control server service

If a computer is installed as Route Control server, the Route Control server service is automatically started during startup of the computer. The Route Control server service must be activated so that it can take on the Route Control server functionality and operate the Route Control Center.

For additional information on startup, see section "Route Control server start options (Page 534)".

14.7.3 Route Control server dialog

The Route Control server dialog is required to view the status of the Route Control server functionality and to operate it.

Procedure

In the Windows Start menu, for example, select the menu command

Start > ... > SIMATIC > Route Control > Server.

If the Route Control server is already running, but has been minimized, click the icon on the task bar:

The "SIMATIC RC SERVERDIALOG" dialog box opens.

For additional information on the dialog box see section "Route Control server dialog user interface (Page 531)".

Parameter

You can call the Route Control server dialog "rc_serverdialog.exe" in the WinCC startup list, for example, with the following parameters:

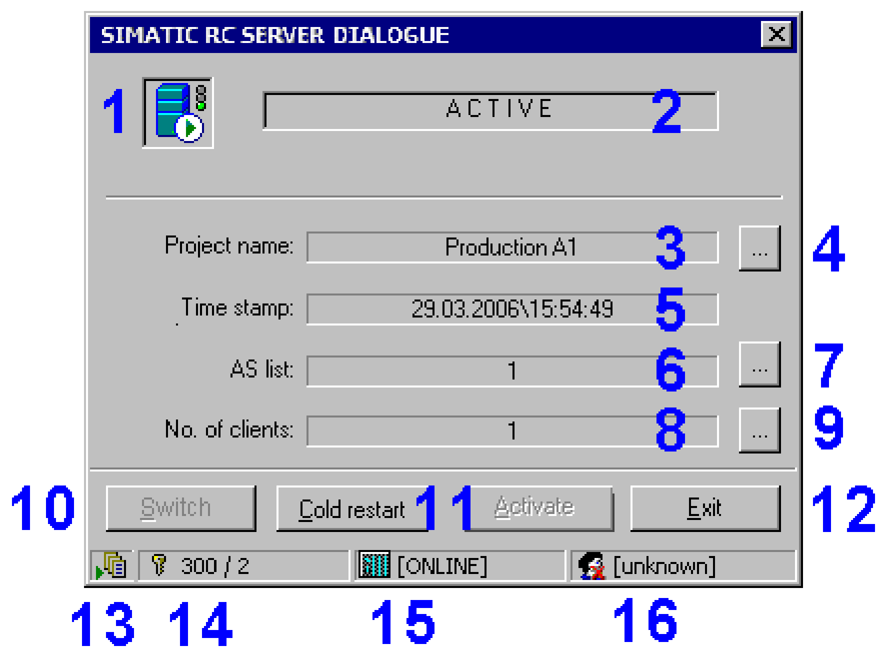
- /Activate
  Starts the server function in the "Service rc_serverhostx.exe".
- /Deactivate
  Terminates the server function in the "Service rc_serverhostx.exe".
- /NoDialog
  The server dialog terminates again after the call - no dialog.

The way in which parameters are stored depends on the particular implementation of the launch and needs to be specifically configured for each user.

14.7.4 Route Control server dialog user interface

Overview

The dialog box provides information about the current status of the Route Control server and options to change the status:



1	Status of the Route Control server. You can find additional information in the section "Route Control Server Status" (Page 532)
2	Status of the Route Control server in plain text
3	Currently downloaded project You can find additional information in the section "Attribute Properties" (Page 391)
4	Opens the dialog box which displays route information in the server. You can find additional information about this in the sections "Expanded Diagnostic Information (AS List)" (Page 536) "Expanded Diagnostic Information (Route List)" (Page 538)
5	Time stamp of the currently downloaded project-engineering data
6	List of automation systems that are connected to the Route Control server or to which an attempt was made to establish a connection. Unreachable automation systems are identified by two dots "..". If another program is running on an AS, a minus sign is displayed "-".
7	Opens the dialog box which displays the list of AS connections. You can find additional information in the section: "Expanded Diagnostic Information (AS Connections)" (Page 539)
8	Number of clients (Route Control Center) that are connected to the server
9	Opens the dialog box which displays the list of client connections. You can find additional information in the section: "Expanded Diagnostic Information (Client Connections)" (Page 540)

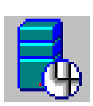
10	Button to switch the Route Control server.
11	Left: Button for restarting the server: Reads the configuration in again and performs a general request for the automation systems. Right: Button for activating the Route Control server when it is running in standby mode: The computer then becomes the master. **Note:** Update the project-engineering data that have previously been downloaded to the server via Route Control Engineering in the Route Control Center server status. You can find additional information in the section "Server Status" (Page 492).
12	Button for terminating the Route Control server. **Notice:** This will terminate the Route Control server. Route control operation can no longer be guaranteed as a result (unless a redundant server takes over control). An application restart via menu command **Start > SIMATIC > Route Control > Server** is required.
13	Displays the route log. A small green triangle indicates that the route log is active (file is being written). The tooltip shows the path for the log file. Double-click the icon to open the route log
14	Information about licenses: • A key symbol that is not crossed out indicates an existing server license. • The numerical value on the left indicates the number of installed route licenses. • The numerical value on the right indicates the number of simultaneously active routes since the last startup of the server.
15	Indicates whether or not the automation systems are connected
16	Indicates whether a user is logged on. You can find additional information in the section "Route Control Center Status Bar" (Page 499).

Additional information

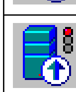
You can find the individual Route Control server startup and shutdown levels in section "Route Control server start options (Page 534)".

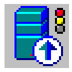
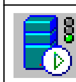
14.7.5 Route Control Server Status

Overview



The Route Control server can adopt the following statuses:

	**Start:** The Route Control server application (EXE process) is starting.
	**Started:** The Route Control server is running as a process, but is not executing any actions. The Route Control server has started and is waiting for initialization to be enabled by the activation controller.

	**Initializing:** The steps below are carried out to initialize the Route Control server: Establishing a connection to the redundancy control Establishing a connection to the PCS 7 OS message system (message OS) Establishing connections to the configured automation systems relevant to Route Control Reading in of user configuration (e.g., route network, elements) Determining, which server will be the master and which server will be the standby, unless this information was already provided to the redundancy control during logon General request to all Route Control automation systems (on the master only)
	**Initialized:** The Route Control server is initialized and is waiting for the activation to be enabled by the activation controller.
	**Activating:** Telegram processing will be activated (enabled) on the master only.
	**Activated (master):** The Route Control server is active and is processing telegrams from the AS. Route Control clients (Route Control Center) can connect to the server and exchange data.
	**Activated (standby):** The Route Control server is active, but as a standby it can not process any route telegrams from the AS. It is prepared to assume the master function in an emergency or as a result of manual failover. Redundancy monitoring is active.
	**Deactivating:** Telegram processing will be interrupted in the master.
	**Deactivated:** The Route Control server is deactivated; no telegrams will be processed.
	**Deinitializing:** The Route Control server will be shut down: Connections to the AS will be closed. The connection to the PCS 7 OS message server will be removed. The connection to the redundancy control will be terminated.
	**Deinitialized:** The Route Control server is not initialized, only the EXE process is running, and no activity is taking place. The server is waiting for the activation controller termination signal.
	**Terminating:** The Route Control application (EXE process) will be terminated and removed from the main memory.
	**Special case error:** A Route Control server can switch to error status from each status indicated above. The server (EXE) must then be restarted.

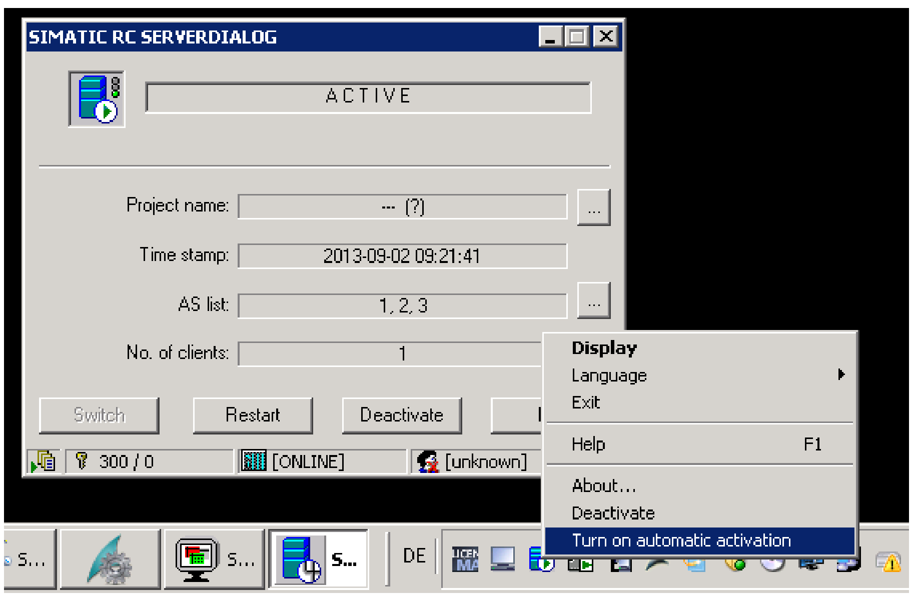
14.7.6 Route Control server start options

No user is logged on to the operating system (service mode)

Automatic activation must be enabled to also use the Route Control server functionality in service mode.

You set automatic activation in the shortcut menu of the server dialog.

The figure below shows an example of a dialog:



NOTICE
Parameter "Route Control server startup dependent on WinCC Runtime"
Note that the parameter "Route Control server startup dependent on WinCC runtime" must be disabled (see RC Engineering: Project settings-Runtime parameters-General).

User is logged on to the operating system

You have the following options to activate the server functionality:

- Manual
  Using Route Control server dialog
- Automatic
  Using the WinCC startup list

The parameter "Route Control server startup dependent on WinCC runtime" determines whether or not the start is linked to WinCC.

Manual

Open the Route Control server dialog and select "Activate".

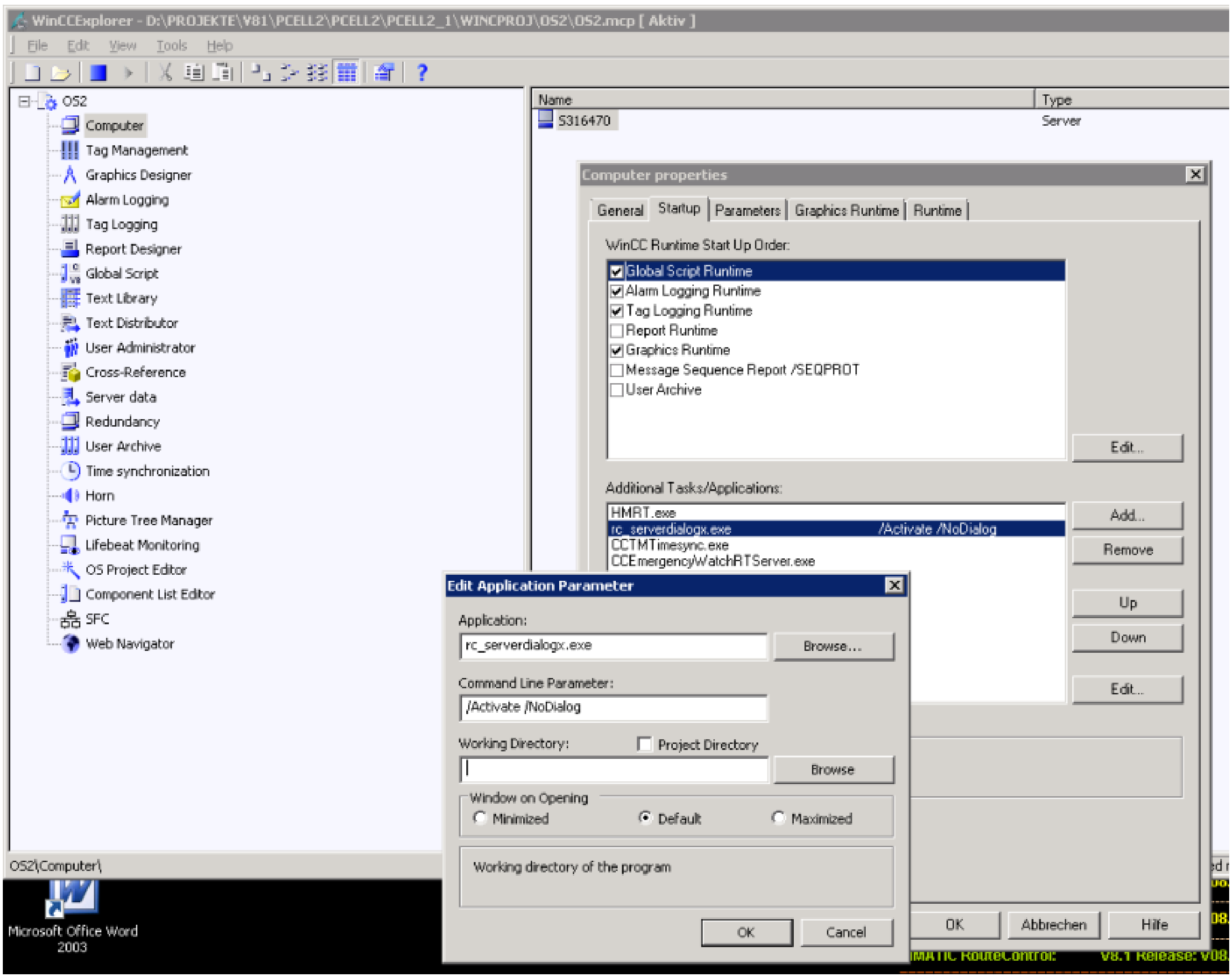
The logged on user needs the relevant rights when using SIMATIC Logon.

Automatic

You can start the Route Control server functionality with WinCC by entering the Route Control server dialog in the WinCC startup list.

Select "/Activate /Nodialog" as command line parameter.

The figure below shows an example of a WinCC startup list:



Dependencies

A Route Control server has dependencies on the following other components:

- PCS 7 OS message server
- Redundancy control

Sequence

Observe the following startup sequence when the WinCC server and the Route Control server are installed on one computer:

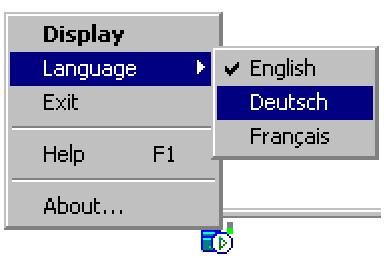
Step	Procedure
1	Start PCS 7 OS process mode so that the message server is available
2	Start the redundancy control If redundancy control is used, it is activated automatically when PCS 7 OS starts.
3	Start the Route Control server

When you exit PCS 7 OS process mode, the Route Control server

shuts down or not depending on the parameter "Route Control server startup dependent on WinCC runtime".

14.7.7 Switching Languages in the Route Control Server

General



Procedure

1. Open the server icon shortcut menu from the Windows task bar.
2. Select the required language for the Route Control server.
   The languages installed on the computer by the Route Control setup program determine which languages are available for selection.

14.7.8 Expanded Diagnostic Information (AS List)

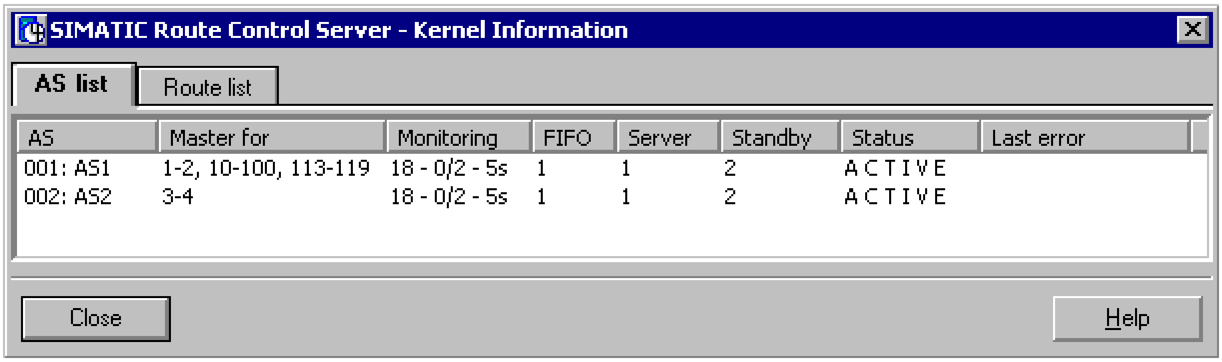
Opening the Dialog Box

In the Route Control server dialog box, click "..." to the right of the "Project name" field.
The "Kernel information" dialog box opens.
The "AS list" tab is selected.

You can find information about the "Route list" tab in the section "Expanded Diagnostic Information (Route List)" (Page 538)

Description

The "AS list" tab indicates all of the automation systems configured for Route Control and the properties and current statuses of these automation systems.



Column	Value	Meaning
AS	001… 239	AS ID
Master for	1 ... 300	Route IDs assigned to this AS (fixed or dynamic assignment)
Monitoring	<dg> - <miss>/<max> - <cy> Example: 39 - 1/10 - 15 39 = last received telegram number 1 = one missing telegram 10 = maximum of 10 telegrams may be missing 15 = 15 seconds of cycle time, that is, timeframe between two telegrams	<dg> 00 ... 99 Received telegram number; starts over at 00 after an overflow (99) (datagrams) <miss> 00 ... 99 Number of missing telegrams (missing datagrams) <max> 00 ... 99 Maximum permissible number of missing telegrams (maximum missing datagrams) <cy> 1 ... 999 Cycle time You can find information about this in "Global Settings" (Page 390).
FIFO	1 or 4	Number of the FIFO in the AS that is used to connect to this server
Server	1 or 2	1: First configured computer is the master (Route Control application (master)). 2: Second configured computer is the master (Route Control application (standby)).
Standby	0, 1, or 2	0: Second computer is not available; this is a non-redundant Route Control server. 1: First configured computer is the standby (Route Control application (master)). 2: Second configured computer is the standby (Route Control application (standby)).

Column	Value	Meaning
Status	ACTIVE STANDBY STARTUP In Maintenance	Computer is the master relative to the connected AS. Computer is the standby relative to the connected AS. Computer is starting up Computer is in maintenance. This status is only displayed on the master RC server. In case of STANDBY the status remains STANDBY when the automation system is in maintenance.
Last error	<Text>	Last error that occurred

Additional information

You can find information about the "Route list" tab in:

- "Expanded Diagnostic Information (Route List)" (Page 538)

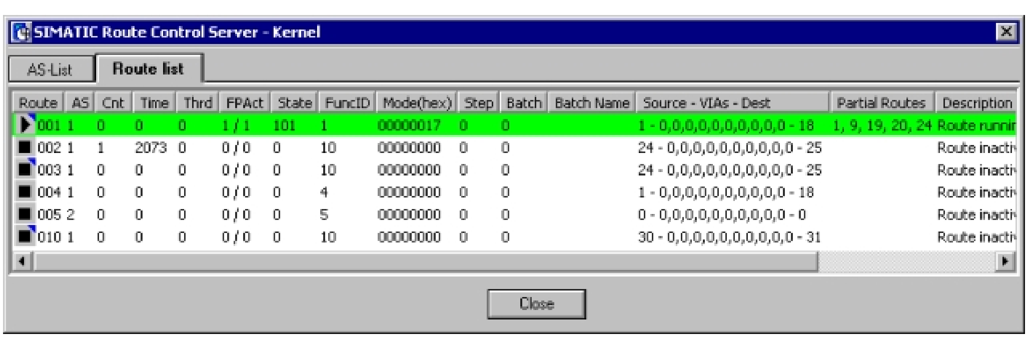
14.7.9 Expanded Diagnostic Information (Route List)

General

In the Route Control server dialog box, click the "..." button to the right of the "Project name" field.
The "Kernel Information" dialog box opens.
Select the "Route list" tab.

Description

This route ID-oriented view shows the main parameters of a route as represented inside the server (most notably as a number instead of a name).



Column	Range of values	Meaning
Route	1-300	Route ID
AS	1-239	Number of the automation system, see AS_ID

Column	Range of values	Meaning
Up.	0-65535	Route order ID Number of route requests since the server started up This number starts over at 0 once 65535 is reached
Time	0-2 to the power of 32	Total route request time in milliseconds 2 to the power of 32 = 4,294,967,296 Mean route request time = Time/Cnt
Thrd	0 or 1	Internal thread for route request is active (1) or inactive (0).
FPAct	A/B A: 0 or 1 B: 0-65535	A = Faceplate Active bit, that is, at least one Route Control Center is currently monitoring this route (1) or no Route Control Center is connected to this route (0) B = Number of active clients (Route Control Center) currently monitoring this route
Status	0-200	Route Status
FctID	0-65535	Function ID of the route. Different routes use different function IDs unless the routes are concurrent.
Mode	... 0000-...FFFF	Mode level. 32-bit value in hexadecimal format.
Step	0-2 to the power of 32	Step number (from BATCH phase)
BatchID	0-2 to the power of 32	Batch number
Batch name	<Text>	Batch name. 0 to 32 characters.
Source - VIAs - Destination	0 ... 65,535	Locations for source, vias and destination of route, expressed as location numbers
Partial routes	0 ... 65,535	Number of partial routes involved in this route
Description	<Text>	Status of route from the perspective of the Route Control server: • Route started • Route inactive • Route request • Route in error status

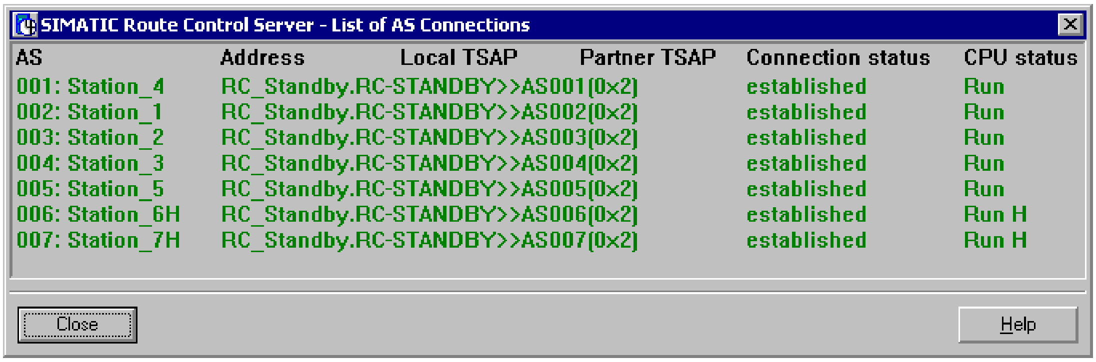
14.7.10 Expanded Diagnostic Information (AS Connections)

General

In the Route Control server dialog box, click "..." to the right of the "AS list" field.
The "List of AS connections" dialog box opens.

Description

This dialog box shows the parameters of the Route Control server connections to the Route Control automation systems.



Column	Value	Meaning
AS	1 ... 239	AS ID
Address	<mac address>	MAC address of the AS in hexadecimal format
Local TSAP	Compare NetPro	TSAP (Transport Service Access Point) on the server
Remote TSAP	Compare NetPro OrDisconnected	TSAP (Transport Service Access Point) on the peer, in this case the automation system Or Automation system is not connected, no communication takes place between the automation system and the Route Control server.
Connection state	Established, …	Status of connection
CPU state	"Run" "Stop"	State of the CPU on the AS A state followed by an H indicates an H-machine.

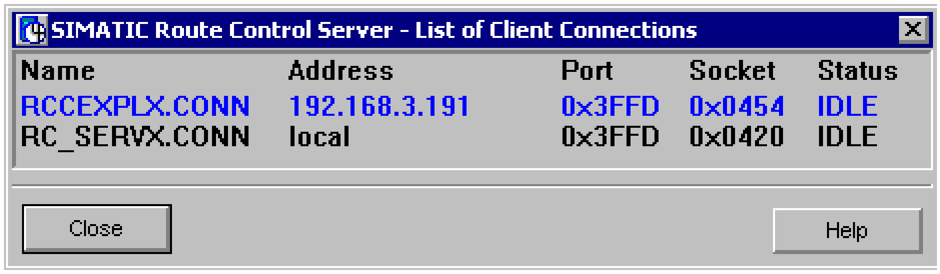
14.7.11 Expanded Diagnostic Information (Client Connections)

General

Click "..." to the right of the "Number of clients" field.
The "List of client connections" dialog box opens.

Description

This dialog box shows the connections of the Route Control clients and the Route Control server, that is, the client applications currently connected to the server.



Column	Value	Meaning
Name	Character string	Name of connection
Address	Local or IP address	IP address of the computer where the Route Control Center that is connected to the server is running
Port		Port on which the server is connected to the client computer and with which data are exchanged
Socket		IP socket used to connect the server to this client
State	IDLE	Status of connection: IDLE: No data transmission ReadBst: Client is reading data from the server WriteBst: Client is writing data to the server

14.8 Messages

14.8.1 Overview of Route Control Messages

Introduction

SIMATIC Route Control produces messages in PCS 7 OS via blocks in the AS and through the Route Control server.

Note

You can recognize the messages originating from the Route Control server by the fact that the message text starts with the abbreviation RCS:.

Messages, AS

	Type of message	Described in Section
	System messages	"AS Messages (System, FB 850)" (Page 543)
	Route	"AS Messages (Route, FB 800)" (Page 545)
	Control elements	"AS Messages (Control Elements, FB 822, 823, 824, 825)" (Page 550)
	Sensor elements	"AS Messages (Sensor Elements, FB 845, 846)" (Page 551)
	REMOTE blocks	"AS Messages (Remote Elements, FB 831, 833)" (Page 551)

You can find additional information about AS messages in "Route Control AS Messages" (Page 542).

OS Messages

	Type of message	Described in Section
	System messages	"OS Messages (System, Server)" (Page 553)
	Route messages	"OS Messages (Route, Server)" (Page 554)

Operator messages

	Type of message	Described in Section
	Operator messages	"Route Control Operator Messages" (Page 557)

14.8.2 AS Messages

14.8.2.1 Overview of AS Messages

Messages

Mes-sage	Described in Section
	"AS Messages (System, FB 850)" (Page 543)
	"AS Messages (Route, FB 800)" (Page 545)
	"AS Messages (Control Elements, FB 822, 823, 824, 825)" (Page 550)
	"AS Messages (Sensor Elements, FB 845, 846)" (Page 551)
	"AS Messages (Remote Elements, FB 831, 833)" (Page 551)

14.8.2.2 AS Messages Relating to the System and FB 850

Overview of error messages

Message class	Message type
Process controlling messages AS	Error

The table below provides information about causes and remedies:

Event ID	Event signal	Message	Cause/remedy
EV_ID1	SIG1	Initialization to Route Control master server failed.	Cannot connect to server. Remedy: • Check the settings in NetPro (connection status). • Check whether the RC Server is in run state.
EV_ID1	SIG2	Error in communication with Route Control master server.	Connection was interrupted. Remedy: • Check the network for errors. • Check whether the RC Server is in run state.
EV_ID1	SIG3	Initialization to Route Control standby server failed.	Cannot connect to server. Remedy: • Check the settings in NetPro (connection status). • Check whether the RC Server is in run state.
EV_ID1	SIG4	Error in communication with RC standby server.	Connection was interrupted. Remedy: • Check the network for errors. • Check whether the RC Server is running.
EV_ID1	SIG5	Connection to the RC master and RC standby is not configured.	Remedy: Start the Route Control Wizard with "AS-Server connection" option.
EV_ID1	SIG6	Route Control AS ID error	The AS ID in RC_IF_CFG is outside the valid range. Remedy: Start the Route Control Wizard with "Data synchronization" option.
EV_ID2	SIG1	Server communication is not being processed.	Invalid value at input RC_IF_CFG.OB_COMM. You can find additional information in section "RC_IF_CFG (FB850)" (Page 172)
EV_ID2	SIG2	Route Control system is not being processed.	Invalid value at input RC_IF_CFG.OB_SYS. You can find additional information in section "RC_IF_CFG (FB850)" (Page 172)
EV_ID2	SIG3	AS-AS communication is not being processed.	Invalid value at input RC_IF_CFG.OB_XC. You can find additional information in section "RC_IF_CFG (FB850)" (Page 172).

Event ID	Event signal	Message	Cause/remedy
EV_ID2	SIG4	AS-AS communication failure.	Communication between two Route Control ASs is down. Remedy: Check the network RC_IF_CFG.ConnASXX (XX = 01 to 32). At least one of these outputs returns an error value. This value can be used to locate the AS that is causing communication problems. You can obtain detailed information by creating the index (XX) of the respective AS at input RC_IF_CFG.DiaConIndx. You can find additional information on the Dia... outputs in section "RC_IF_CFG (FB 850)" (Page 172)
EV_ID2	SIG5	send buffer (FIFO) for the RC server is full	Temporary overload of the communication between the AS and the Route Control server, e.g. with the route requests or status changes of elements

Note

Regarding the message "Send buffer (FIFO) for the RC server is full"

Communication from the automation system to the Route Control server uses a FIFO mechanism (First In, First Out). The data to be transmitted from the automation system to the Route Control server is assembled in the send buffer of the AS. The data is sent at the end of a cycle. The reverse direction, i.e. from the Route Control server to the AS, uses a different communication path and is not affected by this message.

When a high volume of data is being received, for example, when several route requests are made at the same time and/or when routes with a large number of elements are being activated, the send buffer cannot immediately record the full quantity of the data. Moreover, a momentary high system overload can cause the buffer not to empty quickly enough.

If the send buffer is full and the AS attempts to write more data to the send buffer, the message mentioned above is generated and the entry is rejected along with all subsequent entries. The message is generated every time an entry is rejected because the buffer is full.

Important data packets, for example, those associated with route requests, are repeatedly sent. Data packets for updating a route are not sent at first when the send buffer is full, but they are sent automatically every 30 seconds. During this time, the status of the affected routes does not change, therefore no status changes can be lost.

Overview of process messages

Message class	Message type
Operation message	Process message

The table below provides information about causes and remedies:

Event ID	Event signal	Message	Cause/remedy
EV_ID1	SIG7	All control elements of this AS are in simulation mode.	No error, only for information. Value "1" is set at input RC_IF_CFG.CE_SIMU. The feedback of all control elements of this AS is simulated internally according to their activation. Intended for the commissioning phase without hardware.
EV_ID1	SIG8	All sensor elements of this AS are in simulation mode.	No error, only for information. Value "1" is set at input RC_IF_CFG.SE_SIMU. The feedback of all sensor elements of this AS is not ignored when calculating the mode level. Intended for the commissioning phase without hardware.

14.8.2.3 AS Messages Relating to Route FB 800

Overview of error messages

Message class	Message type
Process controlling messages AS	Error

Note

You must explicitly enable the messages indicating the start, stop, and hold state of a route. Additional information is available at "Input parameters EV_ID4, Sig5 to Sig8". Enable the function by toggling the value from 0 to 1 at input EN_DIA_M of RC_IF_ROUTE (FB800) (Page 101).

Additional information is available in the section "RC_IF_ROUTE.QRET_VAL". (Page 119)

The table below provides information about causes and remedies:

Event ID	Event signal	Message	Cause/remedy
EV_ID1	SIG1	Error when transferring route list to AS	Solution: • Check the status of the connections to the AS using the Route Control Server (menu: Coupling/Connections) • Check the network connection to the AS (cable).
EV_ID1	SIG2	Route request timeout	The Route Control server did not acknowledge the route request within the monitoring time. Additional information is available in RC_IF_ROUTE.REQ_TIME. Solution: • Verify that the Route Control Server is in RUN state. • Increase the time up to 240 seconds, maximum. Please observe the note below the table for message time exceeded during route request.
EV_ID1	SIG3	No free / available route found	An available route was not found for the specified locations (general). Solution: Offline route search in Engineering. Additional information is available in the section Guide to the offline route search (Page 293)
EV_ID1	SIG4	Element(s) or partial route(s) already in use	An available route was not found for the specified locations (at the moment). Solution: • Repeat the route request at a later time. • Offline route search in Engineering. Additional information is available in the section Guide to the offline route search (Page 293) • Check the request details in the Route Control Center. Additional information is available in the section Errors During Route Request (Page 494)
EV_ID1	SIG5	Invalid locations	At least one of the source, destination, or via locations is invalid. Solution: • Check whether the source/destination > 0. • Check whether the source is different from the destination. • Check whether the source/destination/via locations are available in the Route Control Engineering project.

Event ID	Event signal	Message	Cause/remedy
EV_ID1	SIG6	Element(s) with incorrect status	A route has been found, but at least one of the elements contained in the partial routes is disabled for Route Control. Solution: • Check the request details. Additional information is available in the section Errors During Route Request (Page 494) • Check whether the element is disabled. • Check whether the element is in maintenance. • Check whether the element is in manual mode. • Check whether the element is in error state.
EV_ID1	SIG7	Material compatibility error	1. A new material in the route request is incompatible with the predecessor material. Solution: • Check/change the successor material. • Repeat the route request. • Check the material configuration Additional information is available in the section Configuring Material Sequences (Page 461) 1. Material cannot be saved to the link elements while the route is active due to incompatibility with the predecessor material. Solution: • Check/change the successor material. • Save valid material • Check the material configuration Additional information is available in the section Configuring Material Sequences (Page 461)
EV_ID1	SIG8	Route ID error	1. Input RC_IF_ROUTE.ROUTE_ID is invalid. or 1. The Route Control server has not yet written valid route IDs to the AS, for example, after the download of all configuration data to the AS. Solution: • Download configuration data to the RC Server. Additional information is available in the section "Download to the Route Control Server". (Page 474) • Activate the configuration (Route Control Center). Additional information is available in the sections: "Server status" (Page 492) and "Updating the Route Control Server". (Page 494) • Start the Route Control Wizard with the "Data synchronization" option. Additional information is available in the sections: "Selecting actions" (Page 348) and "Export guide". (Page 288)

Event ID	Event signal	Message	Cause/remedy
EV_ID2	SIG1	Route data block is missing.	At least one DB from DB101 to DB400 is missing. You can find additional information under RC_IF_ROUTE.QROUTE_DB QID. Missing data block (no.) = QID + 100.
EV_ID2	SIG2	Cross-coupling error	Master or slave AS has been reloaded (route DB has been overwritten). Solution: Repeat the route request, as the route list was invalid.
EV_ID2	SIG3	Cross-coupling timeout error	Timeout of the 120 s monitoring time. Solution: • Verify that the slave AS of this route is in run state. Restart the AS. • Verify that the slave AS has been reloaded. Repeat the route request.
EV_ID2	SIG4	CE/SE device error	At least one control or sensor element of the route is returning a device error. Solution: Eliminate the element error (outside the route control system).
EV_ID2	SIG5	Status monitoring time error	After a function was activated, at least one of the elements of the route could not be activated in this function within the monitoring time. The element did not return the expected feedback to the route on time. Solution: Check the element for errors or malfunction. Increase the monitoring time, if necessary.
EV_ID2	SIG6	Fault tolerance time error	After a function has been activated and all elements have returned the expected feedback, the fault tolerance time is triggered as soon as an element leaves its position setpoint Solution: Check the element for errors or malfunction. Increase the monitoring time, if necessary.
EV_ID2	SIG7	Idle state error	At least one element left its rest position (for longer than the fault tolerance time) while the mode level was deactivated. Solution: Check the element (outside the route control).
EV_ID2	SIG8	Invalid route data in the route list.	A manual request in the Route Control Center caused a change of the static parameters (for example, source, destination, material, or mode table) of an active route. The active route was then reset to auto mode. Solution: • Deactivate the route manually. • Reset the route to auto mode. • Repeat the route request (usually executed automatically in the user program).
EV_ID3	SIG1	General error	You can find information in RC_IF_ROUTE.QRET_VAL (Page 119)

Event ID	Event signal	Message	Cause/remedy
EV_ID3	SIG2	No free route ID found	A free route ID is not available in this AS, or the Route Control Server has not yet written valid route IDs to the AS. Solution: • Download the data and activate the server. • Provide more resources (configure a larger range of available route IDs).
EV_ID3	SIG3	Automation system is not configured for this route ID.	Inconsistent data between the AS, including its routes (ID), and the Route Control configuration. Solution: • Run the Route Control Wizard with the "Data synchronization" option. • Compile and download the CFC charts to the AS, if necessary. • Reload the Route Control Server, if necessary.
EV_ID3	SIG4	Could not save the material.	Material compatibility error. Monitoring timeout during saving of the material to the link elements. Solution: • Additional information is available in the "Material compatibility error" message. • RC_IF_ROUTE.MAT_TIME

Note

Time exceeded during route request message

In certain system configurations, the situation may arise that the request of dynamic routes is terminated when time is exceeded. As a rule, the same route IDs are involved. The reason for this is that during a route request a compression of the load memory would have to occur so that the data of the route can be loaded in the AS. The longer the compression lasts (for example, with a 64 MB load memory module) the higher the risk of the aforementioned exceeding of the time.

This situation can be remedied by restarting the RC server.

Overview of status messages

Message class	Message type
Status Message	Status AS

The table below provides information about causes and remedies:

Event ID	Event signal	Message	Cause/remedy
EV_ID4	SIG3	Route is being controlled in manual mode/RCC.	For information only.
EV_ID4	SIG4	Route is being controlled in automatic mode.	For information only.

Event ID	Event signal	Message	Cause/remedy
EV_ID4	SIG5	Route is ready to start.	For information only.
EV_ID4	SIG6	Route is changing to "active" state.	For information only.
EV_ID4	SIG7	Route is completed	For information only.
EV_ID4	SIG8	Route is changing to "hold" state.	For information only.

14.8.2.4 AS Messages Relating to Control Elements FB 822, 823, 824, 825

Overview of process messages

Message class	Message type
Operation message	Process message

The table below provides information about causes and remedies:

Event ID	Event signal	Message	Cause/remedy
EV_ID1	-	CE is reporting an external error.	Upstream element is faulty. To correct or avoid error: • Eliminate the fault (outside the route control). • The response of the route can be configured. You can find additional information under the "Ignore error" control element property in the RC Engineering project, section "Control element (properties)" (Page 426).
EV_ID2	---	CE is in simulation mode	No error, only for information. Input RC_IF_CFG.CE_SIMU has a value or "1" or input RC_IF_... .MONITOR has a value of "1". Feedback for this AS control element is simulated internally according to its activation. Intended for the commissioning phase without hardware.
EV_ID3	---	CE is locked for Route Control. See also: "LOCK input of element blocks" (Page 72).	No error, only for information. Effects: • Element is disabled for the next route request. • Input LOCK = 1 • Input DISABLED = 1 • Input PEND_OOS = 1 • Input MAN_AUT = 0 • Check the upstream element (outside the route control).

14.8.2.5 AS Messages Relating to Sensor Elements FB 845, 846

Overview of process messages

Message class	Message type
Operation message	Process message

The table below provides information about causes and remedies:

Event ID	Event signal	Message	Cause/remedy
EV_ID1	-	SE is reporting an external error.	Input ERROR = 1 To correct or avoid error: Eliminate the fault (outside the route control).
EV_ID2	-	SE is locked for Route Control.	No error, only for information. Effects: • Element is disabled for the next route request. • Input DISABLED = 1

14.8.2.6 AS Messages Relating to Remote Elements FB 831, 833

Overview of error messages

Message class	Message type
Process controlling messages AS	Error

The table below provides information about causes and remedies:

Event ID	Event signal	Message	Cause/remedy
EV_ID1	SIG1	Remote plant: Communication error at the BSEND block.	Error in AS-AS communication. To correct or avoid error: Check the RC_IF_REMOTE_SEND/RECV.S_HISTORY output; it contains the last error message of the BSEND block called internally. Additional information is available in the sections: "RC_IF_REMOTE_SEND (FB 831)" (Page 193) "RC_IF_REMOTE_RECV (FB 833)" (Page 196)
EV_ID1	SIG2	Remote plant: Communication error at the BRCV block.	Error in AS-AS communication. To correct or avoid error: Check the RC_IF_REMOTE_SEND/RECV.R_HISTORY output; it contains the last error message of the BRCV block called internally. Additional information is available in the sections: "RC_IF_REMOTE_SEND (FB 831)" (Page 193) "RC_IF_REMOTE_RECV (FB 833)" (Page 196)
EV_ID1	SIG3	Remote plant: communication timeout.	Error in AS-AS communication. To correct or avoid error: • Check the following I/O: SND_TIME, ERR_SND , and ERR_RCV. Check the NetPro settings (connection state). • Following partner AS: Check RC_IF_REMOTE_SEND/RECV: SND_TIME ERR_SND ERR_RCV Additional information is available in the sections: "RC_IF_REMOTE_SEND (FB 831)" (Page 193) "RC_IF_REMOTE_RECV (FB 833)" (Page 196)

14.8.3 PCS 7 OS Messages

14.8.3.1 Overview of OS Messages

Messages

Message	Described in Section
	"OS Messages (System, Server)" (Page 553)
	"OS Messages (Route, Server)" (Page 554)

14.8.3.2 OS Messages Relating to the System and Server

Overview of system messages

Message class	Message type
Process controlling messages OS	System

The table below provides information about causes and remedies:

Message	Cause/solution
RCS x: Startup error	The Route Control Server can not start up.
RCS x: Project download error	The configuration database could not be downloa-ded. Solution: Reload and activate the configuration.
RCS x: AS <name> has failed	The connection layer is reporting failure of an AS, or the AS can no longer be accessed. Solution: Check the connections to the named AS in the Route Control Server.
RCS x: AS <name> compression error	A route element list was written to the specified AS and an error was reported by the connection layer or by the AS. The Route Control Server failed to compress the load memory of the AS. This may have been caused by using other tools for simultaneous ac-cess to the AS, for example, STEP 7 in debug mode. Solution: Exit debug mode and, if necessary, repeat the route request.
Operation: Set the AS ... in maintenance state	The operator at the Route Control Center has re-quested the "Maintenance" status for this AS.
Operation: Enable AS ...	The operator at the Route Control Center has re-quested the "Production" state for this AS (in-structs the AS to exit the "Maintenance" state).

Message	Cause/solution
Srv: AS ... in maintenance	The RC Server reports an AS transition to "Maintenance" state. Active routes are completed between the time the operator makes a request and the actual transition to "Maintenance" state. Additional information is available in the section "AS in maintenance". (Page 496)
RCS x: Buffer for route log full RCS x: Error writing the route log RCS x: General route log error	Access to the route log is not possible. Solution: Check if - the specified path exists - there is sufficient space on the disk See also sections 13.3.4.5 "Route log" folder 13.4.2 Directory sharing in the route log

Overview of OS status messages

Message class	Message type
Status Message	Status OS

The table below provides information about causes and remedies:

Message	Cause/solution
RCS x: Start	Route Control Server is restarting. Solution: No error, only for information.
RCS x: Terminate	Route Control Server shuts down operation. Solution: No error, only for information.
RCS x: Project downloaded	The Route Control Server has loaded a new configuration database. Solution: No error, only for information.

x stands for station 1 or 2.
1 = RC application (server)
2 = RC application (standby)

See also

"LOAD" directory on the Route Control Server (Page 79)

14.8.3.3 OS Messages Relating to the Route and Server

Overview of System Messages

Message class	Message type
Process controlling messages OS	System

The table below provides information about causes and remedies:

Message	Cause/remedy
Route request Error: <Source> to <Destination>	An error occurred during the route request; additional messages have been created by the route block of the AS and by the Route Control server. Solution: Depends on the cause of the error; for example, select another source and destination location, or first release occupied elements.
Route request Cancel: <Source> to <Destination>	The route request has been canceled. Solution: • Automatically by the user program in the automation system • Manually in the Route Control Center
<Name> partial route is already in use	The route that was found contains a partial route already occupied by another route. Solution: End the other route first.
<Name> element is already in use	The route that was found contains an element already occupied by another route. Solution: End the other route or enable "parallel routes" by assigning the same function ID to both routes.
<Name> element is in manual mode	The route that was found contains an element that is still in manual mode. Solution: Open the faceplate for this element and switch over to automatic mode; then repeat the route request.
<Name> element is faulty	The route that was found contains an element that is still faulty. Solution: Eliminate the cause of the fault in this element and repeat the route request.
<Name> element is in maintenance	The route that was found contains an element that is still in maintenance mode. Solution: First take the element out of maintenance and then repeat the route request.
<Name> maintenance is affecting the element	The route that was found contains an element that is itself not in maintenance mode, but that is affected by the maintenance mode of another element. Solution: Take the other element that is in maintenance mode out of maintenance and repeat the route request.

Message	Cause/remedy
<Name> element command is invalid	The route that was found contains an element with an illegal element activation. Contradictory commands are being applied to an element in the same function, for example, open valve and close valve. Solution: Change configuration, repeat downloading of the server and repeat the route request.
<Name> element material error	The route that was found has a link element containing a material for which the new material is not a permitted successor. Solution: Change the material in the route request (MATERIAL input at RC_IF_ROUTE) Allow the new material as a successor (material configuration in Route Control Engineering) Apply the new material in the route (MT_CK_EN input at RC_IF_ROUTE block) force without check
<Name> element is locked	The route that was found contains a locked element and thus can not be used for material transports. Solution: Search for an alternative route by changing the source and/or destination locations. Remove the element lock and repeat the route request.
General server error	An internal error has occurred. Solution: If necessary, perform more accurate diagnostics using the Trace server You can find additional information in the section "Diagnostics Trace" (Page 609)
Error downloading route list to AS	The list of elements could not be downloaded to at least one of the automation systems. Solution: Repeat route request and download operation. Check connections (network) between the server and the automation systems Is AS in Stop mode? Can AS be accessed with STEP 7?

Overview of OS Status Messages

Message class	Message type
Status Message	Status OS

Information about causes appears in the following table:

Message	Cause
Route request Start: <Source> to <Destination>	Route request has been received in the Route Control server, along with information about the source and destination locations.
Route request OK: <Source> to <Destination>	Route request was successful; a route has been found.

14.8.4 Route Control Operator Messages

14.8.4.1 Operator messages

Overview of Operator Messages

Message Class	Message Type
Operator message	Operator message.

Information about causes appears in the following table:

Message	Cause
Hold route 2?> Yes	This route is controlled in manual mode, every operation is logged...
Hold route 2? > No	... even if it has been canceled.
Additional operations, such as start, stop, etc.	

Note

As of V7.0, the system writes all Route Control operator messages to the operation list of the PCS 7 OS.

If Route Control operator messages need to be produced on a PCS 7 OS client, you will need to configure a "standard server for alarms" in the server's package settings.

Information on earlier versions 15

15.1 What's new in earlier versions?

15.1.1 What's new in SIMATIC Route Control V8.1?

Software update

You can find information on updating SIMATIC Route Control V8.0 SP1 to V8.1 in the section "Updating from V8.0 SP1 to V8.1 (Page 585)"

SIMATIC Route Control software

Several aspects of the Route Control software were revised.

The following points are affected:

- **List control element**
  In the explanations of the list control element (see @Template_RC.PDL in WinCC "Graphics Designer"), the recommendation is given that you connect the "Enable" attribute with the WinCC tag "*.QAUTO" of a route block RC_IF_Route in the "Properties" tab for the list control element.
  The WinCC tag is now created in the WinCC tag management because the "QAUTO" parameter of the block is set by default with the attribute S7_m_c (OCM-capable) and the value "true" is assigned to the attribute.
- **Maximum value for the priority of partial routes**
  The maximum value for the priority of partial routes is now always limited to the value 9999.
- **Route Control Dynamic Wizard**
  The dialogs for interconnecting Route Control block icons with route blocks and SFCs are now also available in the languages Spanish and Italian.
- **SIMATIC Management Console**
  SIMATIC Route Control supports the functionality of the SIMATIC Management Console.

SIMATIC Route Control help

The content of the SIMATIC Route Control help has been revised.

The help has been updated at various points:

- Maximum value for the priority of partial routes is 9999
- Description of start options of the RC server

15.1.2 What's new in SIMATIC Route Control V8.0 SP1?

Software Update

You can find information on updating SIMATIC Route Control V8.0 to V8.0 SP1 in the section "Updating from V8.0 to V8.0 SP1 (Page 586)"

Overview

The following table provides an overview of the functions that have been modified in or added to SIMATIC Route Control V8.0 SP1.

For more details, please refer to the information in the "Section" column of the table.

No.	Function	Section
1	Route Control software	The Route Control software was revised at several points: • The Trace function has been extended. • The online route search was revised with respect to priority and compatibility with the online search. • For better diagnostics in case of errors in the area of remote elements, the IDs of remote proxy elements can be displayed in the process object view of SIMATIC Manager (see Diagnostics (Page 184)).
2	Route Control help	The Route Control help was revised as far as content is concerned as well as regarding online entries to specific help topics. Some translations have also been adapted and some new explanations have been added, for example • Notes on route configuration • Supplements to idle state monitoring

The first USER_PE is "handled" as a Wait element" (RC V8.0 and higher)

In RC < V8.0, Wait elements were managed as parameter elements (element type 3, subtype 3). This was changed to Engineering page starting at RC V8.0. An independent element type was introduced for "Special elements". For compatibility reasons (to prevent a CPU stop because of new S7 blocks), the old coding was maintained on the Runtime page (RC server, RC block, RC center). This results in the combination of type=3/subtype=3 being interpreted as a Wait element. However, this combination is provided in RC V8.0 on the Engineering page for the **first** USER_PE type found by the RC assistants.

This means that all instances of this first USER_PE are handled as Wait elements in the AS as well as in the RC Center.

Solution for RC V8.0

USER_PE created in:

- RC V7.1 SP2:
  The database converter adapts the data automatically.
- RC V8.0:
  They contain the affected USER_PE type (instances of which are displayed as a Wait element in the RC Center) as an unconnected dummy in CFC, but do not use other instances of it. Instead of this, you create a functionally identical USER_PE type with a different name. Place and interconnect instances of this type in place of the instances of the original USER_PE type. After the RC wizard is run, place the instances of the new USER_PE type in the corresponding partial routes. Through these measures, the dummy type has the combination type=3/subtype=3 (see above). However, because no more instances of this can be used, there are also no fault indications.

Solutions for RC V8.0 Update 1 and RC V8.0 SP1

USER_PE created in:

- RC V7.1 SP2:
  The database converter adapts the data automatically.
- RC V8.0
  - The aforementioned change was already carried out.
    The problem is already resolved.
  - The aforementioned change was **not** implemented.
    The "solution for RC V8.0" also helps in this case.
- RC V8.0 Update 1
  USER_PEs are detected correctly. No adaptation is necessary.
- RC V8.0 SP1
  USER_PEs are detected correctly. No adaptation is necessary.

See also

What's new in SIMATIC Route Control V8.1? (Page 559)

15.1.3 What's new in SIMATIC Route Control V8.0?

Software Update

You can find information on updating SIMATIC Route Control V7.1 to V8.0 in the section "Update from V7.1 SP2 to V8.0 (Page 587)"

Overview

The following table provides an overview of the functions that have been modified in or added to SIMATIC Route Control V8.0.

For more details, please refer to the information in the "Section" column of the table.

No.	Function	Section
1	Operating systems	Route Control V8.0 also runs on the operating systems Windows 7 SP1 32-bit and 64-bit, Windows Server 2008 SP2 32-bit and Windows Server 2008 R2 SP1 64-bit.
2	CSV import/export	The CSV import/export has been revised with the following objectives: • Uniqueness of the addressing • Full import • Streamlining of the CSV data See CSV Export/Import (Page 357)
3	Material configuration	The material configuration has been completely revised The saved route can be started at a later time. See Materials (Page 458)
4	User key	User keys are now also assigned types. See How to Create User Keys (Page 423)
5	Control texts	Control texts are included in the product package and can be expanded or modified. See Control commands (Page 60)
6	Static routes	When downloading the Route Control Server, the routes stored online are deleted and routes stored offline are copied online. See Static routes (Page 415)
7	Route Control Engineering	The user interface has been revised. See Configuring with Route Control Engineering (Page 379)
8	Route Control Engineering	From Route Control Engineering you can open the selected element block in CFC.
9	Offline route search (check route)	The offline route search now also features a graphical representation. The search can be narrowed further. See Guide to the offline route search (Page 293)
10	FB 815	The RC_ResPosV5 compatibility block provides the response of the V5 at the QRESTPOS output at RC_IF_ROUTE (FB 800). See RC_ResPosV5 (FB 815) (Page 128)
11	New template in the Graphics Designer	The @Template_RC.pdl file was created in addition to the @PCS7TypicalsRC.pdl file. See Compiling the script file for the Route Control Dynamic Wizard (Page 82)

No.	Function	Section
12	Calling the Route Control Server dialog	The call of the Route Control Server dialog, rc_serverdialog.exe, can be made with the following parameters: • /Activate Starts the server function in the rc_serverhostx.exe service • /Deactivate Terminates the server function in the rc_serverhostx.exe service • /NoDiaolg The server dialog terminates again after the call - no dialog The way in which parameters are stored depends on the particular implementation of the launch and needs to be specifically configured for each user.
13	Licensing	You can combine licenses as desired for 10 or 50 material transports up to a maximum of 300 material transports. See Licensing (Page 44)

15.1.4 What's New in SIMATIC Route Control V7.1 SP2?

Software Update

You can find information on updating SIMATIC Route Control V7.0 SP1 to V7.1 in the section "Update from V7.1 SP1 to V7.1 SP2 (Page 589)"

Overview

The following table provides an overview of the functions that have been modified in or added to SIMATIC Route Control V7.1 SP2.

For more details, please refer to the information in the "Section" column of the table.

No.	Function	Section
1	Activation/deactivation sequence	In automation systems, actuators (for example valves, motors) must in many cases be activated or deactivated with a time delay (cascaded). Actuators can be activated with a time delay with the help of Wait elements. See Wait elements (Page 440)
2	Single pulsing	Elements could be activated in pulse mode up to now, which means a configurable pulse sequence was output at the element in active mode. This pulsing now includes single pulsing. See Pulse mode (Page 453)
3	Static routes	In addition to the dynamic route search, SIMATIC Route Control now offers the option of reusing an "existing" route. The partial routes of an existing route can be saved. The saved route can be started at a later time. See Static routes (Page 415)

No.	Function	Section
4	Shadow process cells	In SIMATIC Manager, objects of the plant hierarchy (i.e. process cell, unit and locations) of an adjacent multiproject can be declared via a new dialog. This enables, for example, partial routes for process cells to be configured in other multiprojects in Route Control. See Locations (Page 320)
5	Remote elements	The use of elements of a different process cell by means of remote elements is coordinated to an extent that double assignment is not possible. See REMOTE Elements (Page 270)

Memory requirements of the blocks

Due to the enhanced functionality in Route Control V7.1 SP2, the memory requirement and the amount of local data required by some blocks has increased. The following tables show the space in work memory, the space in load memory and the amount of local data required by these blocks compared to V7.1 SP 1.

Block	Name	PCS7 V7.1 SP1 space in the work memory	PCS7 V7.1 SP2 space in the work memory	Increase
FB803	RC_ROUTE_RCE_ON	5784 bytes	7098 bytes	18.51%
FB805	RC_ROUTE_TIME	1490 bytes	1926 bytes	22.64%
FB809	RC_ROUTE_STATES	3776 bytes	7720 bytes	51.09%
FB821	RC_IF_REMOTE_CE	814 bytes	1202 bytes	32.28%
FB834	RC_XC_REMOTE_RECV	2668 bytes	3462 bytes	22.93%
FB842	RC_IF_REMOTE_SE	720 bytes	1136 bytes	36.62%
FB843	RC_IF_REMOTE_PE	1014 bytes	1406 bytes	27.88%
FB857	RC_MASTER_MSG	2768 bytes	2952 bytes	6.23%
FB858	RC_MASTER_XC_SND	746 bytes	872 bytes	14.45%

Block	Name	PCS7 V7.1 SP1 space in the load memory	PCS7 V7.1 SP2 space in the load memory	Increase
FB803	RC_ROUTE_RCE_ON	7666 bytes	9296 bytes	17.53%
FB805	RC_ROUTE_TIME	3158 bytes	3834 bytes	17.63%
FB809	RC_ROUTE_STATES	5568 bytes	10060 bytes	44.65%
FB821	RC_IF_REMOTE_CE	1018 bytes	1588 bytes	35.89%
FB834	RC_XC_REMOTE_RECV	3150 bytes	4082 bytes	22.83%
FB842	RC_IF_REMOTE_SE	912 bytes	1486 bytes	38.63%
FB843	RC_IF_REMOTE_PE	1262 bytes	1804 bytes	30.04%
FB857	RC_MASTER_MSG	4852 bytes	5052 bytes	3.96%
FB858	RC_MASTER_XC_SND	2776 bytes	2924 bytes	5.06%

Block	Name	PCS7 V7.1 SP1 required local data	PCS7 V7.1 SP2 required local data	Increase
FB803	RC_ROUTE_RCE_ON	166	228	27.19%
FB805	RC_ROUTE_TIME	78	94	17.02%
FB809	RC_ROUTE_STATES	28	438	93.61%
FB821	RC_IF_REMOTE_CE	46	60	23.33%
FB834	RC_XC_REMOTE_RECV	68	78	12.82%
FB842	RC_IF_REMOTE_SE	46	60	23.33%
FB843	RC_IF_REMOTE_PE	66	80	17.50%
FB857	RC_MASTER_MSG	174	194	10.31%
FB858	RC_MASTER_XC_SND	38	58	34.48%

15.1.5 What's new in SIMATIC Route Control V7.1 SP1?

Software Update

You can find information on updating SIMATIC Route Control V7.1 to V7.1 SP1 in the section "Updating from V7.1 to V7.1 SP1 (Page 590)"

Error corrections

RC wizard

The RC wizard log has been supplemented to include information that is required by Route Control data blocks in the automation systems used, as shown in the following example:

"Please check that the following route data blocks: DB102, DB103, DB104, DB105, DB106 are found in all block folders of the multiproject/S7 project."

In rare cases, after the insertion and removal of projects in the Simatic Manager, the Route Control wizard could be terminated with an error message. This error behavior has been rectified.

RC Engineering

Up to now , with "Download Client" only part of the computer name is used for network addressing. This approach has resulted in errors if only the last places of the computer name were different. For this reason only the full name is now used for network addressing.

An error in the display of the element view which occurred on toggling between the views: "Large Symbols", "Small Symbols", "List" and "Details" has been rectified.

See also

Updating from V7.0 to V7.0 SP1 (Page 591)

RC_ROUTE_RCE_ON (FB 803) (Page 215)

Route Control and the Advanced Process Library (APL) (Page 266)

Drop-down list box for selecting locations in plant pictures (Page 80)

Result of the Actions (Page 355)

Downloading the Route Control Server (Page 472)

Control elements (Page 131)

CSV Interface Overview (Page 357)

15.1.6 What's New in SIMATIC Route Control V7.1?

Software update

The following table provides an overview of the functions that have been modified in or added to SIMATIC Route Control V7.1.

For more details, refer to the information in the "Section" column of the table.

No.	Function	Section
1	Route Control Library: Block versions and symbol comments	The version designations for the blocks have been changed from 7.0 to 7.1, and the symbol comments changed on some of the blocks.
2	Route Control Library: Update in RCC	The FB803/RC_ROUTE_RCE_ON (Page 215) block has been changed in order to rectify a problem with picture updates in the RCC.
3	Using the Advanced Process Library (APL)	Route Control and the Advanced Process Library (APL) (Page 266)
4	Control for interconnection with an automatic program	A drop-down list has been provided in the "@pcs7typicalsrc.pdl" picture as early as version 7.0 SP1. The purpose of integrating a drop-down list into your plant pictures is to enable selection of locations during process mode. The recommendations concerning use of this drop-down list are different for Version 7.1 and higher. Drop-down list for selecting locations in plant pictures (Page 80)
5	Import log removed	The import log has been omitted. It has been combined with the export log. Route Control Wizard > Result of actions (Page 355)
6	Downloading clients in Route Control Engineering	In the dialog for downloading the RC server, you now have the option of selecting whether RC clients should also be downloaded. You can obtain additional information from the online help, under Configuring with Route Control Engineering > Transfer to the Server, in the section "Downloading the Route Control Server" (Page 472).

No.	Function	Section
7	Route Control connection elements QROUTE/QFUNC_ID	The QROUTE and QFUNC_ID outputs are updated when the route enters the material ID in the element. You can obtain additional information in the online help, under Block library > Interface Blocks > Control Element. (Page 131)
8	CSV Export/Import	Only [//] is now permitted as a comment designation. You can obtain additional information from the online help, under CSV Export/Import in the section "CSV Interface Overview" (Page 357).

15.1.7 What's new in SIMATIC Route Control V7.0 SP1?

Software update

You can find additional information on updating SIMATIC Route Control V7.0 to V7.0 SP1 in the

section "Updating from V7.0 to V7.0 SP1 (Page 591)"

Overview

The following table provides an overview of the functions that have been modified in or added to V7.0 SP1:

Detailed information is available in the sections listed in the table.

A brief introduction is available below the table.

No.	Function	Section
1	Additional operating languages	"What is SIMATIC Route Control?" (Page 25)
2	Getting Started	*Process Control System PCS 7; Route Control Getting Started* Manual
3	Support of SlotPLCs	Manual *Process Control System PCS 7; SIMATIC PCS 7 BOX*
4	Export/Import of locations in SIMATIC Manager	Mass configuration of locations via exporting and importing (Page 332)
5	Disabling of monitoring times	Block RC_IF_ROUTE (FB 800) (Page 101) Inputs MON_TM and FLT_TM.
6	Location names at outputs	Block RC_IF_ROUTE (FB 800) (Page 101) Outputs NA_SOURCE, NA_DEST, NA_VIAn
7	Maintenance request by program	Block "RC_IF_CFG (FB 850)" (Page 172) Input OOSREQUP "Maintenance view of the Route Control Center" (Page 506)
8	ActiveX Control for the selection of locations	"Drop-down list for the selection of locations" (Page 80)
9	Layout in Route Control Engineering	"Route Control Engineering Main View" (Page 381)
10	Default names for partial routes	How to Configure Partial Routes (Page 411)
11	CSV files with comments	CSV Interface Overview (Page 357)
12	New offline route search	Guide to the offline route search (Page 293)
13	Improving security	What is SIMATIC Route Control? (Page 25)

No.	Function	Section
14	Start response of redundant servers	Guide to Starting up the Route Control System (Page 300)
15	Server monitoring	Monitoring the server and AS (Page 399)
16	Filtering location types in the Route Control Center	How to Configure Route Properties (Page 511)
17	"Partial Routes" tab in the Route Control Center	"Partial Routes" tab in the Route Control Center (Page 509)
18	Fully qualified location names in the faceplate	Faceplate, Classic style (Page 483)
19	Messages relating to BATCH	Updating from V7.0 to V7.0 SP1 (Page 591)

More operating languages

In addition to German, English, French, Italian and Spanish, SIMATIC Route Control now also supports Chinese as an operating language.
The documentation is available in German, English, French and Chinese.

Route Control Getting Started

A "Getting Started" is now available in German and English to help familiarize you with the configuration of Route Control using an example project.

Support of SlotPLCs

The Route Control Wizard in STEP 7 V5.4 SP2 can now be used to create S7 connections between two applications of a PC station. This functionality enables the use of SlotPLCs, that is, automation systems operated in a PC station, for Route Control.

Export/Import of locations in SIMATIC Manager

The "Options" menu in SIMATIC Manager can be used to export all locations of a PCS 7 project, including the hierarchy folders and units, to a CSV file and to re-import these data to SIMATIC Manager after they have been edited and/or expanded using external tools.

The monitoring times can be disabled

A status monitoring time MON_TMx and a fault tolerance time FLT_TMx are defined for each mode level at the RC_IF_ROUTE block. These inputs are set to the default value -1. This setting activates the substitute values MON_TM and FLT_TM. If the maximum value 32767 is set at one of these inputs, the corresponding monitoring time never expires.

Location names at outputs

Previous versions output the location names at the NA_SOURCE, NA_DEST and NA_VIAn outputs of RC_IF_ROUTE as long as the route controlled by this block was active. The output now contains the ID of the location in the first five digits followed by a space character and then the location name.

Maintenance request by program

A user program can now set input OOSREQUP at the RC_IF_CFG block to request the "AS in maintenance" (Out of Service) state. This "Maintenance request by program" can be disabled/enabled in the column header of an AS by selecting the corresponding shortcut menu in the Route Control Center maintenance view.

ActiveX Control for the selection of locations

Graphics Designer now provides a new control element that you can install in plant pictures for selecting a location from a drop-down list in process mode. The location types offered in this drop-down list, that is, "Source", "Via", "Destination" or "All Types", are defined when you install the element. The control element returns the ID of the selected location to be set at the input of a route block, for example.

Layout in Route Control Engineering

The automation systems are now visualized so that users can recognize their association with a multiproject and a project. The runtime parameters have been distributed to subfolders.

Default name of partial routes derived from the source and destination

The system now suggests a name for new partial routes that consists of the source and destination name. The source and destination names are derived from the unit and location names.

CSV files with comments

You can add comments to the CSV files that were generated during the export of configuration data from Route Control Engineering. A comment can be entered at the end of a line, or as the only text in a line. The comment text starts with the [//] or [;] character. The Wizard ignores the comments during import.

New offline route search

The user interface has been redesigned. You now have the following options:

- Visualization of all route combinations between a source and a destination
- Visualization of the shortest route between a source and a destination
- Visualization of alternative parallel routes
- Visualization of all destinations which can be reached from a specific source

The new route search is based on a faster search algorithm.

Improving security

Route Control now uses a custom communication and copy service to move or copy files to other computers. These data are transferred using the SIMATIC Communication Service (SCS), which does not require any open ports.

Improving the start response of redundant servers

The server now requests information about the availability and operating state of the partner station during its startup in order to determine whether to start in master or standby mode. The server compares the configuration data if the partner station is available. The server does not start up if the versions of the Route Control databases and the downloaded projects are different in the two servers.

Improving redundancy monitoring

The master server cyclically broadcasts monitoring message frames to all automation systems used by the Route Control system. Each AS responds to both servers. If the standby server does not receive any further monitoring message frames, it no longer immediately interprets this as a master server failure and initially responds by requesting the operating state of the partner station. If the master server returns a message frame indicating that is has no faults, the standby server does not assume the master function.

Filtering location types in the Route Control Center

The RCC drop-down lists that are used to select the source, destination or Via of a route now offer only the locations of the type to be selected.

New "Partial Routes" tab in the Route Control Center

The new "Partial Routes" tab returns information about the partial routes of a route you selected in the Route Control Center.

Fully qualified location names in the faceplate

The Route Control faceplate now visualizes the source, destination and Via names in the "processcell\unit\location" format. These names are unique throughout the PCS 7 project.

Messages relating to BATCH on the PCS 7 OS

The auxiliary values of messages of the route block FB 800, which affect the interplay with SIMATIC BATCH, now contain batch name, step number and batch number. If this information is to be correctly transferred to the PCS 7 OS, a restart of the AS involved is required.

15.1.8 What's new in SIMATIC Route Control V7.0?

Software update

You will find information about updating from SIMATIC Route Control V6.x to V7.0 in "Updating from V6.1 SP1 to V7.0" (Page 592).

Overview

The following table provides an overview of the functions that have been modified or added to V7.0:

You can find detailed information in the sections specified in the table.

You can find brief, explanatory information below the table.

Mode	Sections
Licenses	"Overview of Licensing" (Page 44)
Configuring the locations	"Configuring the locations" (Page 328)
Location Import Wizard	"How to import locations into the PH" (Page 593)
Location as a variant	"Location as a variant" (Page 79)
Generic user-defined elements	"Generic User-Defined Elements" (Page 169)
Adding projects to a multiproject	"Adding Projects to a Multiproject" (Page 304)
Access protection	Help on SIMATIC Manager ("Options" Menu)
Change log	Help on SIMATIC Manager ("Options" Menu)
Route Control Wizard	"Transferring Data From an S7 Project" (Page 343)
Transferring Data From a Multiproject	"Transferring Data from an S7 Project" (Page 343)
Interaction with SIMATIC BATCH	"SIMATIC BATCH and SIMATIC Route Control" (Page 83)
Engineering user interface	"Route Control Engineering Main View" (Page 381)
Activation key icons	"Meanings of Activation Key Icons" (Page 422) "How to Change the Activation Key Icons" (Page 423) "How to Configure Activation of Elements" (Page 420)
User-defined Activation Keys	"How to Create User Keys" (Page 423) "How to Delete User Keys" (Page 425)
CSV interface	"Overview of the CSV Interface" (Page 357) "Structure of CSV Files" (Page 369)
Route Control Center	"Keys for the Type of Activation" (Page 502)
Configuring route properties	"How to Configure Route Properties" (Page 511)
Route templates	"Working with Route Templates" (Page 513)
Operator languages	"What is SIMATIC Route Control?" (Page 25)
Operator messages in the PCS 7 OS	"Operator messages" (Page 557)
PCS 7 OS Web option	"Operator Control and Monitoring with PCS 7 Web Option" (Page 32)

Licenses

The Route Control Applications Server, Engineering and Center require licenses for V7.0.

The following features are new to Version V7.0:

- The rental license for Route Control Engineering lasts 30 days (previously 150 hours).
- The PCS 7 Software Update Service SIMATIC Route Control
- The PCS 7 Upgrade Package SIMATIC Route Control

Configuring locations in SIMATIC Manager

As of V7.0, you configure or change process cells, units and locations along with their properties, solely in the plant hierarchy in SIMATIC Manager.

You create location types as equipment properties in the shared declarations.
You create locations (instances of location types) as equipment properties in units. The locations are thereby given unique location IDs across projects.

You must manually assign the first ID in an appropriate way. Additional IDs are then consecutively assigned by the system. Make sure you reserve a large enough number range for the IDs of each project of a multiproject when assigning the first ID.

SIMATIC BATCH takes the locations from the S7 project and uses them to control material transports with Route Control.

Location Import Wizard

Once the Route Control configuration data have been converted to V7.0 format, you can read the locations that were configured in V6.1 SP1 from Route Control Engineering using the Location Import Wizard and copy them to the plant hierarchy of the S7 project.

Location as a variant

The "Variant" property of a location cannot be configured in SIMATIC Manager.

To ensure compatibility with projects from earlier versions, you can continue to activate this property in Route Control Engineering.

Generic user-defined elements

You can assemble technologically compatible elements which are always added together in a partial route in a generic user-defined element (GE block). You can include both standard elements such as RC_IF_VALVE and user-defined elements such as RC_IF_USER_CE in a GE block. The Route Control Wizard recognizes these GE blocks and imports the elements they contain to Route Control Engineering as individual elements.

Adding projects to a multiproject

If you want to add projects to a multiproject, the system checks whether the new data match the existing data. If the Route Control specifications are violated, a dialog box displaying notes on how to correct the errors appears automatically.

Access protection

If you are using the components of *SIMATC Logon*, you can activate access protection in SIMATIC Manager from the "Options" menu. This provides protection with a project password when opening projects and starting the Route Control Wizard.

Change log

If you activated access protection, you can activate and display the change log from the "Options" menu in SIMATIC Manager. This records specific online functions, such as delta download to the AS or the download to the Route Control Server, along with comments you may have entered.

Route Control Wizard

There is only one Route Control Wizard, which performs all the tasks from exporting data from the S7 multiproject to importing it into Route Control Engineering in consecutive order.
The Route Control Wizard can only be started in SIMATIC Manager.

Before performing the import, you can specify if the route ID should be dynamic or fixed.

Transferring Data From a Multiproject

If you have removed single projects from a multiproject for external processing, the Route Control Wizard will detect this during export/import. The data of these projects remains in Route Control Engineering and can be further processed there.

Interaction with SIMATIC BATCH

Supporting BATCH recipes, V7.0 makes managing material transport processes easier.
The interface is provided by an SFC type, which activates a Route Control route block.
The BATCH operator specifies, e.g., the source and target of a material transport process in the transfer parameters associated with a transfer phase.
The Route Control library contains an executable example of such an SFC type.

Route Control Engineering User Interface

As before, there are four Route Control Engineering panes.
When a partial route is selected, the lower right-hand panel now only contains two tabs:

- "Elements" tab:
  Information from the previous columns "Value" and "Passive/Idle state" has been collated in a column entitled "Activation". The display is therefore similar to the one in the "Elements" tab in the Route Control Center.
- The "Functions" tab is new to Route Control Engineering:
  The elements are displayed as on the Route Control Center "Functions" tab.
  When adding an element to a partial route, you set the element activation parameters as previously in a mode level. You can now configure activation in additional mode levels on the "Functions" tab. You no longer have to configure the activation properties each and every time; you can now use default activation keys.

Changing the Icons for the Activation Keys

You change the icons associated with the activation keys in Route Control Engineering (previously these changes were made in the Route Control Center).

User-defined Activation Keys

You can assign a user-defined key of your choice to each activation mode. You configure these keys once and use them in the configuration in the same way as the supplied keys.

CSV interface

As of V7.0, you can also export user-defined elements and activation masks for user-defined elements from Route Control Engineering via the CSV interface.

You configure user-defined elements in SIMATIC Manager.
This means that you can only import user-defined elements into Route Control Engineering via the Route Control Wizard, and not via the CSV interface.

You configure activation masks in Route Control Engineering.
This means that you can import activation masks for user-defined elements into Route Control Engineering via the CSV interface.

Route Control Center

The display of keys for the activation type has been corrected.

Route Properties

If you wish to run a material transport process in manual mode, you must configure the route properties in the Route Control Center.
As of V7.0 you can enter all required parameters in a single dialog box.

Route templates

Once you have configured a set of route properties you can save them as a route template. Whenever you need to run a material transport process of this type again, simply select the corresponding route template.

Operator languages

Route Control V7.0 supports the following operator languages: English, French, German, Italian, and Spanish.

Operator Messages in the PCS 7 OS

As of V7.0, the system writes all Route Control operator messages to the operation list of the PCS 7 OS.

PCS 7 OS Web option

The PCS 7 OS Web option enables you operate and monitor routes with the Route Control faceplate via Intranet/Internet.

15.1.9 What's new in SIMATIC Route Control V6.1 SP1 ?

Migration

Note

The process for migrating a V6.1 project to V6.1 SP1 is described in "Migration From V6.1 to V6.1 SP1". (Page 599)

Route Control applications in HW Config

Prior to V6.1, you had to configure a standard application for the Route Control server in HW Config. The Route Control Wizard then asked for this application when exporting objects to the Route Control Engineering project. As of V6.1 SP1, you now configure special SIMATIC Route Control applications in HW Config. In this respect, the following applications are offered for SIMATIC Route Control:

- Route Control application
  A Route Control application is the preferred station (server master) for SIMATIC Route Control. A PCS 7 OS application and/or BATCH application can also run on this station. Following a switchover, this station becomes the standby station for all applications running on it. You can find additional information in "Route Control Redundancy".
- Route Control application (stby)
  A Route Control application (stby) is the substitute station (standby server) for SIMATIC Route Control. A PCS 7 OS application (stby) and/or BATCH application (stby) can also run on this station. Following a switchover, this station becomes the master station for all applications running on it (you can find additional information in "Route Control Redundancy").
- Route Control application client
  A Route Control application client represents a station on which a Route Control Center (client) is installed. The configuration related to Route Control (one or two computer names for the Route Control servers) is downloaded to the client station via the Route Control application.

Additional information

- Section "Route Control Applications" (Page 244)

Downloading the Configuration to a Route Control Client

Once the Route Control server applications have been configured, this information can be downloaded to a Route Control client. This configuration with the names of the Route Control servers replaces the previous selection dialog box in the Route Control Center.

Select the Route Control application client to which the configuration is to be downloaded in the SIMATIC Manager S7 project. Open the shortcut menu and select the menu command **CPU > Download**.

You can find additional information in "Selecting a Route Control Server". (Page 490)

Maintenance

The Route Control server process and the Route Control Center application are linked to the maintenance component of PCS 7 (Station Observer). In this version, therefore, you can monitor the computer-based properties such as hard disk space and available RAM. Parameters specific to SIMATIC Route Control are not monitored.

PCS 7 Standard Redundancy for Route Control Server

The Route Control server process is now linked to the PCS 7 standard redundancy monitoring at all times (redundancy control). SIMATIC Route Control thus runs in a network with the PCS 7 OS and/or SIMATIC BATCH server applications and can be switched together with these as a group. A connection is required for the two servers to monitor each other. The monitoring of the redundant processes and the switchover of the redundancy status between the computers must be guaranteed. We therefore recommend you set up a serial connection between the two computers (as for SIMATIC Batch).

You can find additional information in "Redundant Route Control Configurations". (Page 36)

Additional Operator Languages

In addition to the existing languages of English, French and German, SIMATIC Route Control V6.1 SP1 now also supports Italian and Spanish as user interface and operator languages for the Route Control tools. Chinese (Simplified) is also supported for Asia. The required modules for Chinese (Simplified) are installed on the target system by a separate PCS 7 setup routine (DVD).

Additional Changes from V6.1 to V6.1 SP1

Blocks

- FB 800 (RC_IF_ROUTE)
  The MAN_AUT input now has a different logic for the values 0 and 1. It is, therefore, now like all other blocks of STEP 7 or SIMATIC Route Control.
  The input is now called MAN_AUT instead of AUT_MAN. The @PG_RC_IF_ROUTE_STANDARD.PDL picture has been correspondingly adapted.
- FB 825 (RC_IF_VAL_MOT)
  The QAUTO_OC signal has moved from Q_C_00 to Q_C_01.
- FB 808 (RC_IF_VOLUME)
  The texts for the "QSUMMED" output have been corrected.

- FB 800 and as such also FB 852, FB 853, FB 854, FB 855, FB 856, FB 857, FB 858, FB 859, FB 860
  The blocks have taken on the data structure of FB 800 and must, therefore, be recompiled!
- FB 800, FB 852 und FB 857
  These blocks now use the input and have been adapted to the reversed logic using an internal Temp variable.
- FB 800 and as such also FB 852, FB 853, FB 854, FB 855, FB 856, FB 857, FB 858, FB 859, FB 860
  The maintenance inputs at blocks FB 850 and FB 800 have a new data structure. The blocks named above adopt this changed structure and, therefore, have to be recompiled.
- FB 850
  The block has a new input.

PCS 7 OS Pictures

- The tooltip for the Route Control block icon now no longer cuts off the full text (@PCS7TypicalsRC.PDL). You need to reinsert the @PCS7TypicalsRC.PDL file in your PCS 7 OS project for existing PCS 7 OS pictures.
- No additional windows open when enlarging the Route Control faceplate in PCS 7 OS.

15.1.10 What's New in SIMATIC Route Control V6.1?

Integration in the PCS 7 System Setup

For the first time, SIMATIC Route Control V6.1 is available to you from within the PCS 7 system setup. As with other option packages, you select which product you wish to install at the beginning of the PCS 7 system setup. The PCS 7 system setup will then install the product automatically.
You can find additional information in "Installing Route Control Components". (Page 39)

Automation License Manager

As of V6.1, SIMATIC Route Control supports the Automation License Manager. This means that it is now also able to support the SIMATIC Route Control license model.
You can find additional information in "Overview of Authorization". (Page 44)

Route Control Maintenance Safety

SIMATIC Route Control V6.1 provides support to maintenance personnel by enabling them to set the automation system to "Maintenance" status. New material transport processes are no longer permitted via this automation system.
You can find additional information in
"Route Control Support for Maintenance Work". (Page 496)

Operating Systems

SIMATIC Route Control can run under Windows XP Professional (Route Control Center, Route Control Engineering) or Windows 2003 Server (Route Control server), as well as Windows 2000.
You can find additional information in "Hardware and Software". (Page 40)

SIMATIC S7 417-H

SIMATIC Route Control V6.1 supports SIMATIC S7 H-CPUs. In addition to the server level, you can now also design and implement the automation systems to be more fault-tolerant. The Route Control library now supports non-H and H-machines. A route can also be controlled by both non-H and H-machines in combined operation.
You can find additional information in "Communication with H-Machines". (Page 306)

Hardware Configuration

You can now use the HW Config application to configure the Route Control server and get support from the Route Control Wizard when generating the named communication links. These links are also downloaded to the PC station on the target computer, similar to other PCS 7 OS or BATCH servers. The Route Control Server then uses these configured link to establish the link.
You can find additional information in "Hardware Configuration (HW Config)". (Page 313)

CPU Firmware

SIMATIC Route Control now also supports CPUs with firmware versions earlier than V3.1.0. The Route Control Wizard no longer stops with an error message; it shows a warning instead. We still recommend that you use firmware V3.1.0 or later.

SIMATIC Logon

SIMATIC Route Control V6.1 is based on the same version of *SIMATIC Logon* as all other PCS 7 V6.1 products. The authorization management system functions in the same way as in RC V6.0 and V6.0 SP1.
You can find additional information in "User Roles for Route Control". (Page 46)

Multiprocessor Computers

Recommended hardware configurations for PC stations appear in the
Process Control System PCS 7; PC Configuration and Authorization Manual.

Security

With SIMATIC Route Control, directories are no longer shared for "everyone", but only for Route Control groups (RC_ENGINEER, RC_MAINTENANCE, RC_OPERATOR_L1 to RC_OPERATOR_L3). This means that only members of one of these groups can access the shared directories from another computer.

Material in the Route Control Center

In manual mode, material can now even be changed during an active route in the Route Control Center. Before RC V6.0 SP1, it was only possible to change the material when the route was not active.
You can find additional information in "Route Properties" (Page 511).

Route Control messages

In the PCS 7 OS alarm server for Route Control messages, the Route Control Wizard generates messages with a tag.

Example:

Previous message	New message	Functionality
"Fault on route 23"	"Fault on route %d"	The wildcard (%d) is assigned the number of the corresponding route during runtime and a message is generated.

This means message definitions in a PCS 7 OS project can be created up to 300 times faster using the Route Control Wizard.

15.1.11 What's new in SIMATIC Route Control V6.0 SP1 ?

New Functions

SIMATIC Route Control V6.0 Service Pack 1 has the following new functions:

- **External Material Interface**
  You can now transfer material master data to the Route Control server from an external source. In addition to the actual materials, you can also define the successor relationships.
  You can find additional information in "Material Interface" (Page 465).
- **Route Log**
  The following information is recorded in the route log:
  – Operator input by means of the Route Control Center
  – Status of a route (e.g., Start, Stop, Pause, mode level activation/deactivation)
  – Startup, operation and shutdown of the Route Control server

  These route logs can be displayed and saved using an application that is provided with SIMOTION Route Control. This route log user interface offers you a wide range of functions for filtering, searching and evaluating logs.
  You can find additional information about this in "Route Log" (Page 515).
- **User-Defined Element Blocks**
  In addition to the preset element types (control, parameter, linking, and sensor elements), you can also create your own element types (CFC), transfer them to the Route Control configuration and interconnect them in partial routes.
  You can find additional information about this in "Example of a User-Defined Type" (Page 168).

Note

You can find all changes relating to SIMATIC Route Control V6.0 SP1 in this online Help system by searching for "SP1".

15.1.12 What's new in SIMATIC Route Control V6.0?

Overview

In this section, you will find information about the new and expanded functions of SIMATIC Route Control V6.0 as compared to the following previous versions:

- Route Control V5 based on BRAUMAT V5
- Route Control V5 based on PCS 7 V5

General

Windows 2000 capability

Like PCS 7, SIMATIC Route Control V6.0 can run on the Windows 2000 operating system.

Integration in PCS 7

SIMATIC Route Control V6.0 is integrated in PCS 7.

- **User interfaces**
  An essential component of SIMATIC Route Control V6.0 is integration into the PCS 7 environment. In many areas, the user interfaces (for example, dialog boxes, icons) have been revised, simpler procedures for working with the tools have been introduced and a wizard and PCS 7 OS faceplate have been added.
  The Route Control Wizard also includes a plausibility check of the configured element and route blocks. This enables errors to be detected early and data consistency between the S7 project and the Route Control project to be ensured.
- **AS-Server Connection (Route Control AS and Server)**
  The automation systems are connected to the Route Control server by means of BSEND services (in V5, this was accomplished using alarm services).
- **Messages**
  In version 6.0, blocks in the Route Control library use standard alarm services (ALARM blocks) and communication routes to signal to a PCS 7 OS message server.
  To avoid dependence on BRAUMAT/SISTAR library blocks (V5), the required blocks are now integrated in the Route Control library.
- **Elimination of major sources of error**
  In SIMATIC Route Control V6.0, the problem of extended data blocks familiar from V5 is eliminated. The data areas in the automation system are now separate and have been revised. As a result, route data in the instance data block of RC_IF_ROUTE are separated from the element list DB 101 to DB 400.
  To reduce the burden on the OB 1 cycle, you can now also call route blocks in other organization blocks.
- **Basic Package - Expanding the Number of Material Transports Incrementally**
  The SIMATIC Route Control V6.0 basic package supports material transports, from project engineering to the runtime system, to operator control and monitoring of routes and route elements, including process messages.
  The basic package is limited to 30 routes (no more than 30 material transports can take place simultaneously). An upgrade package provides an incremental expansion to 100 or 300 material transports.
  At level 1 (V6.0) the functionality of SIMATIC Route Control V6.0 cannot currently be expanded by adding options: SIMATIC Route Control V6.1 does support these packages (H-Option, S7-317).
  You can find additional information in file *readme* supplied with SIMATIC Route Control V6.0.
- **Redundancy**
  With SIMATIC Route Control, you can configure the Route Control server that processes route requests redundantly. This ensures permanent availability.
- **Integration in PCS 7 OS**
  SIMATIC Route Control V6.0 provides improved integration in the PCS 7 OS (client) via the following options:
  - Block icon
  - PCS 7 OS faceplate
  - Cross-selection between PCS 7 OS pictures and the Route Control Center

Project Engineering in the Engineering System

Several important additions have been made for project engineering route control, which make it easier to enter and import existing data from an S7 project to a Route Control project.

A portion of project engineering takes place in SIMATIC Manager and associated applications:

- CFC: Project engineering of routes
- CFC: Project engineering of elements
- CFC: Configuration of a Route Control automation system
- NetPro: Project engineering of AS-AS connections
- NetPro: Project engineering of AS-server connections

The Route Control Wizard assists you in carrying out all this project engineering work.

- **Route Control Servers and Route Control Clients**
  Phase one does not yet have its own Route Control object manager (OM) in SIMATIC Manager. Because of this, the Route Control server settings are made in the Route Control Wizard, transferred to Route Control Project Engineering and downloaded from there to the server computers.
- **S7 individual projects and multiprojects**
  SIMATIC Route Control V6.0 supports both individual S7 projects and S7 multiprojects of SIMATIC Manager. Each individual project or multiproject can have no more than one Route Control project. If you are implementing various process cells using multiple multiprojects, then you must also use several Route Control projects. The maximum scope of a Route Control project is the multiproject.
- **Type-based engineering (sample SFC for route control)**
  SIMATIC Route Control contains a sample SFC (SFC Typical) for controlling the route, which includes S88 status tabs with sample programming. Copy this SFC and adapt it to your requirements.
  The following steps are suitable for adaptation:
  - Transferring relevant parameters (e.g. source and destination locations, function ID, material)
  - Requesting a route
  - Controlling a route (mode levels)
  - Deactivating a route

- **Interface to processing programs**
  The interface between SIMATIC Route Control V6.0 and the actual processing in the automation system is formed by the following blocks:
  – SFC types created using SFC standard tools in PCS 7 V6.0 and higher
  – Route Control interface blocks

  The interfaces are required for the following tasks:
  – Activation of elements and routes
  – AS-AS cross-coupling within a Route Control project
  – AS-AS cross-coupling spanning several Route Control projects
  – Diagnostics
  – Use of the preconfigured sample SFC
- **Plant hierarchy in the plant view**
  The plant hierarchy in SIMATIC Manager allows you to display your project in a structured manner. The plant view of the Route Control Engineering system can include up to two levels of the plant hierarchy (process cell and unit) in accordance with S88.01. These two levels are recognized by the BATCH attributes in the hierarchy folder.
  To improve the structure, you can also add (bi-level) neutral folders to the plant hierarchy in SIMATIC Route Control.
- **Fault-tolerant route control**
  You can configure the Route Control servers redundantly to increase availability (fault tolerance) and enable software updates during operation. The two Route Control servers (standby/master) are switched over if redundant operation is required.
  Redundancy is achieved with two Route Control servers. These servers do not require local data management. Nevertheless, to enable the Route Control client applications (Route Control Center) to access the current Route Control server database, the two local project-engineering databases are synchronized. If one Route Control server fails, the other server reads in the project-engineering database again and initiates a general request. This general request provides the new master server with the current status of the elements and routes from the automation systems.
  This strategy renders the continuous synchronization of server data and persistent data management on a hard disk superfluous. Data only has to be synchronized when a Route Control server is reloaded from the Route Control Project Engineering application.
  You can find additional information in the section "Downloading to the Server".

- **Route Control interface blocks**
  SIMATIC Route Control V6.0 takes advantage of the new functionality of SFC types in the engineering system. Alternatively, SIMATIC Route Control V6.0 still contains special interface blocks with a new technical design as communication interfaces to the processing programs in the automation system:
  - Faceplates
    A Route Control block icon and faceplate for the RC_IF_ROUTE route block are available for operation on the PCS 7 OS.
  - RC_IF_ROUTE
    This block is the central block for controlling a route (was: ROUTE_CM block).
  - RC_IF_CFG
    This block is used centrally once for each automation system. The automation-system number and communication IDs for the cross-coupling configuration are programmed in this block. You can assign these IDs using the Route Control Wizard. This makes it easier for you to configure the cross-coupling entries.
- **Route Control Wizard**
  A wizard in the context of SIMATIC Manager helps you to configure cross-coupling communication (communication ID). You can also use the wizard to export the configured data relevant to Route Control and to import them to Route Control Project Engineering:
  - Plant hierarchy
  - Automation systems
  - AS-AS and AS-server connection information
  - Elements
  - Route properties (route ID and fixed/dynamic specification)

  The Route Control Wizard is also used to define the relevant message server (PCS 7 message OS) for Route Control and to check the element and route IDs for consistency and plausibility.

Route Control Runtime System

- **Working in the PCS 7 OS Faceplate**
  Click the block icon that displays the most important route status to open the faceplate. It is used to perform the following tasks:
  - Displaying the route status in various views
  - Operating the route
  - Displaying pending messages for the route

  The Route Control operator prompts are displayed in the group display of PCS 7 OS.
- **Working in the Route Control Center (RCC)**
  The RCC provides the following highly-detailed displays going beyond the scope of the Route Control PCS 7 OS faceplate:
  - Route
  - Route status
  - Elements and their status

It also enables you to operate the route more comprehensively.

- **Authorization management**
  SIMATIC Route Control V6.0 supports PCS 7 *SIMATIC Logon* central user management. At level 1 (V6.0), you need to create five user groups with specific names in Windows. Due to a redesign of the *SIMATIC Logon Component* itself, SIMATIC Route Control will be integrated in and administered from the *SIMATIC Logon Admintool* as of SIMATIC Route Control V6.1. From a current perspective, it will then be possible to configure the names of the user groups freely.

Other changes

- **Switch-on and switch-off delays for elements**
  In SIMATIC Route Control V6 and higher, the switch-on and switch-off delays for elements relate to the mode level and will be valid across automation systems. These delays are absolute and are no longer relative to the preceding element, as was the case in version 5. When project-engineering data are migrated from V5 to V6, the conversion tool automatically converts the element times. The maximum time has been limited to 255 seconds.
- **Element sorting**
  The sorting number for elements in a partial route has been eliminated from the engineering tool, as it was irrelevant with respect to the order in which elements are switched on or off. Because SIMATIC Route Control V6.0 is currently designed for the transport of liquids only (and materials that can be transported according to this concept), the sorting number has been removed. This sorting number will become relevant when solid-material variants are introduced because the interlocking of elements is dependent on the element sequence for these materials.

15.2 Software update of earlier versions

15.2.1 Updating from V8.0 SP1 to V8.1

Overview

Select "Update" in the setup to update the SIMATIC Route Control software from V8.0 SP1 to V8.1.

You can find information about the new functions in the section: What's new in SIMATIC Route Control V8.1? (Page 559)

Note the following when updating a Route Control project from V8.0 SP1 to V8.1:

Note

The update of the AS blocks in your projects **does not require a CPU stop**.

- Conversion of the SIMATIC Route Control database is not required.
- Update the AS blocks in your projects that use RC functions.
  Copy the new AS blocks from the installed RC library into the S7 projects in which RC functionality is used.
  Update the CFCs with a block type import and compile/download the charts to the affected automation systems.

Block update

We recommend that you update the blocks because all changes to the versions listed below have been incorporated:

- V8.0
- V8.0 Update 1 and 2
- V8.0 SP1
- V8.0 SP1 Update 1

Note

If you still want to continue working with AS blocks prior to V8.1, this is possible with restrictions.

You can learn about the restrictions in the readme file of the respective version.

15.2.2 Updating from V8.0 to V8.0 SP1

Overview

Select "Update" in Setup to update the SIMATIC Route Control software from V8.0 / V8.0 Update 1 to V8.0 SP1.

You can find information about the new functions in the section: What's new in SIMATIC Route Control V8.0 SP1? (Page 560)

Note the following when updating a Route Control project from V8.0 / V8.0 Up1 to V8.0 SP1:

- Conversion of the Route Control database is not required.
- Copy the new RC blocks from the installed RC library to the S7 projects in which you use RC functionality, update the CFC charts with block type import and compile / load the charts to the respective automation systems.

Continue working with the blocks of V8.0 or V8.0 Update 1

No stop of the CPU is required after installation of the blocks of the V8.0 SP1.

If you nevertheless want to further process version V8.0 / V8.0 Update 1, note the following limitations:

The blocks provided for the use of elements of other PCells (RC_IF_Remote_CE/SE/PE) do **not** have the corresponding parameter attributes for indicating the parameters in a process object view.

Information on the blocks is located in the section REMOTE blocks (Page 183).

15.2.3 Update from V7.1 SP2 to V8.0

Overview

Perform the following steps to update a Route Control project from V7.1 SP2 to V8.0:

- Convert the Route Control database to Version V8.0 format. The conversion is started by opening Route Control Engineering or when the Route Control wizard is initially run.
- Update the Route Control blocks in your projects that use RC functions. (see also: Installation)
  You can find information about the new functions in the section: What's new in SIMATIC Route Control V8.0? (Page 561)

New RC library

A new RC library is installed during setup. Make sure, therefore, that you save the original RC Library 7.1 beforehand.

If possible, close any running RC applications on the computer where the installation will be performed and run the provided update setup. It will install the required or selected components onto the system.

Continuing to work with V7.1 SP2 or V7.1 SP2 UP1 blocks

- After installing the V8.0 blocks, you need to set the CPU to STOP.
- If this is not possible, you can also continue to work with V7.1 SP2 or V7.1 SP2 UP1 blocks. (For details on the differences between V7.1 SP2 and V7.1 SP2 UP1, refer to the corresponding Readme!)
- Note the following limitations when you continue using V7.1 SP2/UP1 blocks:

Change of route IDs

When processing the RC Wizard you have the option of changing the type (static/dynamic) or IDs of routes. Depending on the type of changes made (e.g. ring replacement), it may no longer be possible to resolve the assignment between the FB800/RC_IF_ROUTE and the route data block assigned using the route ID after download to the AS. This is indicated with the value 8FF5h at the QRET_VAL output of RC_IF_ROUTE. These routes can no longer be used.

A complete download of the AS (with CPU restart) is required to remedy this situation with blocks from V7.1 SP2 UP1.

Messages of FB850/RC_IF_CFG

Two error states are recognized by the FB850/RC_IF_CFG and indicated as QRET_VAL (8504h/8505h). The two related OS error messages

- "Route Control system is not being processed" and
- "AS-AS communication is not being processed"

are not output, however.

Messages of FB800/RC_IF_ROUTE

With the MSG_LOCK input, the output of the alarm messages of the RC_IF_ROUTE can be blocked.

The message "Could not save the material" is NOT suppressed however.

AS blocks

The following AS blocks have been changed in this version of RC Lib to provide the new functionality:

- FB 803 / RC_ROUTE_CE_ON
- DB100 / RC_CFG

The following block has been newly created:

- FB 815 / RC_ResPosV5

Due to the dependencies of DB100, the following blocks needed to be recompiled, although they have not changed. They therefore obtained a new time stamp:

- FB852 / RC_MASTER_FUNC
- FB850 / RC_IF_CFG
- FB818 / RC_ROUTE_GET_EXT_PE
- FB817 / RC_ROUTE_XC_PE_ACTV
- FB812 / RC_TG34_TG36
- FB806 / RC_ROUTE_XC_SEND
- FB801 / RC_ROUTE
- FB858 / RC_MASTER_XC_SEND

To bring your S7 user projects up to date, proceed as follows:

1. Close all routes before downloading the automation systems.
2. Copy the above-indicated RC blocks from the installed library into the block folders of the user projects.
3. If you want to set the behavior of V5, enter the value W#16#ABAB for the ID "wLikeV5" (offset 80.0) in all automation systems in DB100/RC_CFG.
4. Open a CFC in every user project.
5. Import the new (see above) block types.
6. Compile and download the automation systems (with user data blocks).
7. Run the RC Wizard and follow the instructions it provides.

15.2.4 Update from V7.1 SP1 to V7.1 SP2

Overview

Select "Update" in Setup to upgrade the SIMATIC Route Control software from V7.1 to V7.1 SP2.

You can find information about the new functions in the section: What's New in SIMATIC Route Control V7.1 SP2? (Page 563)

AS blocks: new structure of instance DBs (e.g. route DBs (DB101 to DB400))

The newly implemented functions (Wait elements, remote elements) call for structural changes to various function blocks and their instance data. In addition, the interface of the FB800/ RC_IF_Route has been extended and the structure of the instance DB has also been changed.

These changes call for the replacement of all RC blocks.

Note

CPU in STOP

The RC blocks can only be replaced if the CPU is in STOP mode.

Carry out the following steps:

1. Copy all RC blocks (FB 8xx, FC 8xx, DB, UDT) from the installed library to the block folders of your projects.
2. Open a CFC chart in every user project.
3. Import the new block types
4. Compile and download your automation systems and restart them

---

Note

Larger local data ranges

The local data ranges have been made larger for various blocks of the RC Lib. This can result in warnings or errors when you load the CFC. Make the local data ranges of the displayed priority levels larger as well (properties of CPU) and repeat the download.

Continuing to work with V7.1 SP1 blocks

After installation of V7.1 SP2 blocks, you must set the CPU to STOP. If this is not possible, you can also continue to work with V7.1 SP1 blocks.

The following new functions can then not be used:

- Save route/Start saved route
  During startup, the Route Control server checks whether one of the automation systems involved does not contain any current blocks. If this is the case, the buttons for the two functions are disabled in the Route Control Center.
- Wait elements
  Routes with Wait elements can be configured, but are terminated with an error message pointing out the incompatibility with the old blocks. Additional error messages are entered in WinCC and in the diagnostic buffer of the CPU. You can avoid this by not using Wait elements when working with V7.1 SP1 blocks.

Updating the blocks

You cannot operate V7.1 SP1 blocks together with V7.1 SP2 blocks in the same project.

For a project with several automation systems, you either have to update all the automation systems to version 7.1 SP2 or leave version 7.1 SP1 blocks on all automation systems.

Combined operation, for example, 2 automation systems with new blocks and 3 automation systems with old blocks, is not possible.

See also

What's new in SIMATIC Route Control V8.0? (Page 561)

15.2.5 Updating from V7.1 to V7.1 SP1

Procedure

Perform the following steps to update a Route Control project from V7.1 to V7.1 SP1:

- Conversion of the Route Control database to V7.1 SP1 format by opening Route Control Engineering or when the Route Control wizard is initially run.
  Then download and update your RC server.
- Optional: Update the Route Control block FB803 in your S7 user projects if you would like to use the correction named in point 2.

You can find information about the new functions in the section: What's new in SIMATIC Route Control V7.1 SP1? (Page 565)

Blocks

The version V7.1 blocks also function with Route Control V7.1 SP1.

To correct the reaction of the QRPOSERR output at the FB800/RC_IF_ROUTE , the FB803/ RC_ROUTE_RCE_ON has been changed. Idle-state errors of a function are now correctly displayed with a 1. If you want to use this correction in your user projects, you have to copy the FB803 from the installed RC Lib ("RC Library V71SP1") to your user projects. Please note that you may have to adapt the evaluation of this output in your CFC interconnection. Update the block types in CFC, then compile and download the CFCs (changes only). A CPU stop is not required for this.

15.2.6 Updating from V7.0 to V7.0 SP1

Overview

It is not necessary to re-install the SIMATIC Route Control software when updating from V7.0 to V7.0 SP1. Select "Update" in the Setup.

You can find information about the new functions in the section: What's New in SIMATIC Route Control V7.0 SP1? (Page 567)

Updating the blocks

The version V7.0 blocks also function with Route Control V7.0 SP1. Update all Route Control block types if you want to use one of the following new functions:

- Disabling of monitoring times
- Maintenance request by program
- Display of the complete name of the locations in the Route Control faceplate
- Messages relating to BATCH on the PCS 7 OS

> **Note**
>
> Central updating of block types does not include DBs and UDTs. Therefore, you must first manually copy the required DBs and all the UDTs into the block folder of the respective CPU.

To update the block types, proceed as follows:

1. In the SIMATIC Manager, open the RC Library V7.0 SP1.
2. Select all the Route Control blocks in the "RC Library V70 SP1\Blocks+Templates\Blocks" folder.
3. Select the menu command **Options > Charts > Update block types...**.
4. Follow the instructions in the following dialogs.

Then compile the entire program and download just the changes to the affected automation systems. A CPU stop is not required for these changes.

Messages relating to BATCH on the PCS 7 OS

The auxiliary values of alarms of the route block FB 800, which affect the interplay with SIMATIC BATCH, are now changed. They now include the batch name, step number and batch number. If this information is to be correctly transferred to the PCS 7 OS, you need to restart the automation systems involved after the block update and compilation of OS with memory reset.

Other necessary actions

Ensure you run the Route Control Wizard so that the Route Control database is updated. Then load and update the Route Control server(s).

Adding the new controls in Graphics Designer

If you want to use the new drop-down list for selecting locations in your plant pictures, then you must update the PCS 7 OS software.

Then, add the "rcCBox Class" control to the object palette in Graphics Designer.

Procedure:

1. Open the Graphics Designer.
2. Open the shortcut menu on the "Controls" tab of the object palette and select the **Add/ Remove** command.
   The "Select OCXs" dialog box opens.
3. Select the check box for the "rcCBox Class" control.
4. Click "OK".
   The control is added to the object palette.

15.2.7 How to update projects from V6.1 SP1 to V7.0

Introduction

As of V7.0, you configure process cells, units and locations, along with their properties, solely in SIMATIC Manager. You can no longer add, change or delete process cells, units or locations in Route Control Engineering.

Locations that were previously configured in Route Control Engineering must be imported into the plant hierarchy in SIMATIC Manager.

Overview of Procedure

Step	Action
1	Update the S7 project in SIMATIC Manager from V6.1 SP1 to V7.0
2	Implementation of licenses for V7.0 You require the Server, Engineering and Center licenses for Route Control.
3	Converting CFC charts into the V7.0 format (can be done by moving a block in a CFC chart)
4	Implementing equipment properties in the global declarations (can be done when you create the "Equipment Properties" folder)
5	Conversion of the Route Control database to V7.0 format (executed when Route Control Engineering is initially opened)

Step	Action
6	Import the locations from Route Control engineering in the PH in SIMATIC Manager. You can find additional information in: "How to import locations into the PH" (Page 593).
7	Import the locations from SIMATIC Manager into Route Control engineering using the Route Control wizard
8	Compile the CFC charts (entire program)
9	Download the automation systems (with changes)
10	Download the Route Control server and update it in the Route Control Center.

Note

Steps 1, 3, and 4 may be performed automatically during steps 6 and 7 if required.

Blocks

The blocks from version V6.1 SP1 also work with Route Control V7.0.

If you want to use blocks from V7.0, update the Route Control block types.

Centralized updating of the block types does not affect DBs and UDTs. For this reason, you must copy the required DBs and all UDTs to the block folders associated with the CPUs concerned manually **before** performing the update.

Proceed as follows to update the block types:

1. Open the RC Library V70 in SIMATIC Manager.
2. Select the required Route Control blocks in folder "RC Library V70\Blocks+Templates\Blocks".
3. Select the menu command **Options > Charts > Update block types...**.

   Note

   Once you have updated the Route Control blocks, you will need to perform a complete CPU download. To do this, you will need to stop all CPUs.

15.2.8 How to import locations into the PH

Introduction

If you converted the Route Control configuration data to V7.0 format during the software update from V6.1 SP1 to V7.0, you need to import the locations from Route Control Engineering into the plant hierarchy of the S7 project. The Route Control Location Import Wizard will assist you.

Requirements

The procedure described below applies to all situations in which the structure of the process cells and units in Route Control Engineering matches the structure of the PH in SIMATIC Manager.

The following rules apply in situations in which this requirement is not fulfilled:

- A project in the SIMATIC Manager may contain only one plant.
  The import wizard cannot generate any additional plants in the S7 project.
  Locations which are in additional plants in Route Control-Engineering are therefore not imported into the plant hierarchy.
- If the process cell in Route Control Engineering contains more units than the process cell in the PH, then the import wizard generates all additional units in the PH and imports the locations of these units.

Procedure for importing locations

1. Start the program rclocimpax.exe from the directory C:\Program Files\Siemens\RCS\bin.
   The step "Introduction" for the wizard opens.
2. Click "Project".
   The dialog box for selecting a project appears.
3. Select the project whose locations you wish to import into the PH.
4. Click "Next" and check the displayed data.
5. Click "Next".
   The import is executed and a summary is displayed.
6. Click "Finish".

Result

The "Equipment Properties" folder in the "Shared Declarations" of the S7 project contains all location types. The units contain "Equipment Properties" folders with locations. These folders have the same names as the units. Locations from the previous "General Locations" folder in Route Control Engineering are saved in the PH in the "General Locations" units in the "General Locations" folder.

15.2.9 Updating in overview

Overview

This description applies to Route Control projects that were implemented with one of the following variants of SIMATIC Route Control V5:

- Updating from "RCS-based-on-PCS 7" Projects (Page 597) (V5.0, V5.2)
- Updating from "RCS-based-on-BRAUMAT" Projects (Page 597) (V5.2, V5.3)

Earlier versions of Route Control, such as the routing system of SISTAR/BRAUMAT V4.x, are not considered here.

You can find additional information in section

- "Updating tasks" (Page 595)

Note

You can find a brief overview of the blocks that have changed in V6.0 in "Block Changes". (Page 596)

Additional information

- Section: "Updating From V6.0 to V6.1" (Page 598)
- Section: "Updating From V6.1 to V6.1 SP1" (Page 599)

15.2.10 Updating tasks

Overview of the update tasks

You have to carry out different steps, depending on the variant (PCS 7 or BRAUMAT) used. The following table provides an overview of these steps:

Step	Based on PCS 7	Based on BRAUMAT
Conversion of the Route Control database	X	X
CFC chart: Route block	X	x (new)
CFC chart: Elements	X	x (new)
CFC chart: XC Config	x (new)	x (new)
Export/import of elements	x (optional)	x (new)
Configuration of RC server	x (new)	x (new)
PCS 7 OS pictures + faceplate	X	x (new)
User program (CFC)	X	x (new)
User program (STEP 7)	-	x (conversion to CFC)
Interface to BATCH (route block)	X	x (conversion to CFC)

Note

Because BRAUMAT did not make use of CFC, additional steps are required to create CFC charts for migration of BRAUMAT projects.

15.2.11 Block changes

Block Changes

The following table shows the interface blocks found in versions V5 and V6.

	Block name V5	Block name V6	Note
	Configuration		
	Not available	RC_IF_CFG (FB 850) (Page 172)	
	Route		
	RC_ROUTE_CM	RC_IF_ROUTE (FB 800) (Page 101)	RC_IF_ROUTE: Simulated idle state (Page 127)
	RC_ENCODER	RC_IF_ENCODER (FC 800) (Page 128)	
	RC_DECODER	RC_IF_DECODER (FC 801) (Page 129)	
	SFC		
	Not available	RC_IF_ROUTE_SFC (FB 849)	SFC: Overview (Page 279)
	Control elements		
	RC_MOT_REV	RC_IF_MOT_REV (FB 823) (Page 142)	
	RC_MOT_SPED	RC_IF_MOT_SPED (FB 824) (Page 146)	
	RC_VAL_MOT	RC_IF_VAL_MOT (FB 825) (Page 134)	
	RC_MOTOR	RC_IF_MOTOR (FB 822) (Page 138)	
	RC_VALVE	RC_IF_VALVE (FB 826) (Page 131)	
	RC_CE_COMMON	RC_CE_COMMON (FB 827) (Page 216)	
	Sensor elements		
	RC_SENSOR	RC_IF_SENSOR (FB 845) (Page 154)	
	RC_CONDUCT	RC_IF_CONDUCT (FB 846) (Page 156)	
	RC_SE_COMMON	RC_SE_COMMON (FB 847) (Page 220)	
	Parameter elements		
	Not available	RC_IF_VOLUME (FC 808) (Page 163)	
	Not available	RC_IF_TIMER (FC 809) (Page 164)	
	Not available	RC_PE_COMMON (FC 810) (Page 206)	
	Link elements		
	RC_LE	RC_IF_LE (FB 828) (Page 166)	
	Cross-coupling		
	Not available	RC_IF_XC_DIAG (FB 884) (Page 178)	

	Block name V5	Block name V6	Note
	Not available	RC_IF_XC_LIFE (FC 884) (Page 182)	
	Remote elements		
	RC_REMOTE_CE	RC_IF_REMOTE_CE (FB 821) (Page 185)	
	RC_REMOTE_PE	RC_IF_REMOTE_PE (FB 843) (Page 190)	
	RC_REMOTE_SE	RC_IF_REMOTE_SE (FB 842) (Page 187)	
	RC_REMOTE_RECV	RC_IF_REMOTE_RECV (FB 833) (Page 196)	
	RC_REMOTE_SEND	RC_IF_REMOTE_SEND (FB 831) (Page 193)	

15.2.12 Updating from RCS-based-on-PCS 7 projects

Procedure

Proceed as described in
"Converting a Route Control Project". (Page 388)

15.2.13 Updating from RCS-based-on-BRAUMAT projects

Introduction

BRAUMAT systems based on PCS 7, which interconnect blocks in CFC charts, are better suited for updating to SIMATIC Route Control than systems in which CFC charts are not used.

Note

SIMATIC Route Control does not support SIMATIC S5 modules.

Updating the Route Control Library (CFC Charts)

1. RC_CALL is replaced by RC_IF_CFG.
2. Element blocks are replaced by blocks from the SIMATIC Route Control V6 library.
   Note the following:
   - The correct element types must be used.
   - Element blocks are placed in CFC for all elements that were previously interconnected in partial routes. This prevents any elements that have already been interconnected having to be deleted during import into Route Control Configuration.

The AS-AS connections are generated by the Route Control Wizard.

Updating the Route Control Configuration

1. Route Control Configuration version 5 is opened using the Route Control configuration tool.
2. Convert the database into the V6 format
   The conversion tool is automatically called.
   The elements are transferred from the CFC charts to the Route Control configuration using the wizard. Elements that are not in the S7 project can be deleted.
   The activation masks and return values for the standard types can be retained.
   The partial routes and their interconnected elements are retained
3. The global settings are adapted according to the earlier parameter files (INI files).

Updating the Route Control Server

1. The PCU server with Route Control miniport is completely replaced by a Route Control server V6. In principle, BRAUMAT can be uninstalled on the server and the Route Control server installed, as there are no persistent data that must be transferred from V5 to V6.
2. A new configuration is then downloaded to the Route Control server V6 by the Route Control Engineering tool. This configuration contains the settings for server-server communication and server-AS communication, as well as the settings contained in the previous parameter files (INI files).

Updating the Route Control Block Icons and Faceplate

Because version 5 does not include a block icon or faceplate, you must now configure them in your PCS 7 OS pictures.

Updating the Route Control Center

1. BRAUMAT is uninstalled from the client computers.
2. SIMATIC Route Control V6 is installed.

The Route Control Center does not need to be configured. The Route Control server will be determined or requested during the initial call.

15.2.14 Updating from V6.0 to V6.1

Basic Procedure

Carry out the steps below to migrate a SIMATIC Route Control V6.0 project to V6.1:

Step	Action
1	Set up a PC station in HW Config for the Route Control Server(s).
2	Switch the PG/PC interface (SIMATIC NET setting) on the PC to internal (local).

Step	Action
3	Load the server PC station in HW Config Additional information is available in the section entitled "Component Configurator". (Page 316)
4	Delete the old Route Control interconnections in NetPro (AS-AS and AS-Route Control Server) The Route Control Wizard generates new interconnections at a later time.
5	Copy the blocks from the Route Control library V6.1 into your project, without FB 849.
6	Perform a type import in PCS 7.
7	Start the Route Control Wizard to select the appropriate Route Control Server Additional information is available in the section"Route Control Wizard:Adapting IDs" (Page 351).
8	Compile and download the AS.
9	Compile the PCS 7 OS (due to named connections).
10	Start the Route Control Wizard by selecting the message server.
11	Perform a PCS 7 OS delta compilation.
12	Perform the PCS 7 OS delta download.

15.2.15 Updating from V6.1 to V6.1 SP1

Restrictions

Note

Due to changes made to the blocks in the Route Control library, the AS **can not** be upgraded in RUN.

Neither is it possible to only upgrade the software on a Route Control client/server without using the new blocks from the Route Control library V6.1 SP1!

Adapting PC Stations

Step	Action
1	**New** In HW Config, add the required Route Control applications to the PC stations operating as Route Control Servers and Route Control client stations. You can find the following Route Control applications in the "PCS7_V61" profile in the "SIMATIC Route Control" folder: Route Control application Route Control application (stby) Route Control application client
2	Replace the user-defined application for already existing projects that were configured for a Route Control server with a "Route Control Application".
3	Replace the user-defined application on the standby server with a "Route Control Application (stby)".

Step	Action
4	Configure a "Route Control application client" for each PC station on which a Route Control Center will run. You do not necessarily have to configure a Route Control application client. If a configuration was not carried out, you must later set up a Route Control Server in the Route Control Center during runtime. A "Route Control application client" is only designed for stations running a Route Control Center. Stations running a PCS 7 OS application with Route Control faceplates do not have to be configured for operation as a "Route Control application client". Additional information is available in the section "Route Control applications" (Page 244).
5	Enter the correct station name for the S7 project in the properties of a PC station. The Route Control Wizard will subsequently read this station name and transfer it to the Route Control configuration. These server computer names are also read when the configuration is downloaded to a Route Control client. The Route Control Center application uses these two computer names to find its Route Control Servers.

The following table provides an overview of the old and new configuration schemes:

V6.1	V6.1 SP1	Meaning
User-defined application	Route Control application	Route Control Server (master)
User-defined application	Route Control application (stby)	Route Control Server (standby)
Not available	Route Control application client	Route Control Center

Adapting the Station Configuration Editor

In the Station Configuration Editor on the PC stations running a Route Control Server process, replace the previously configured "User-defined applications" with a "Route Control application" or a "Route Control application (stby)".

Replacing Changed Blocks in the Route Control Library

Step	Action
1	Replace the changed blocks in the offline block folder of each Route Control AS and perform a type import in the CFC. • FC 808 • FB 800, FB 852, FB 853, FB 854, FB 855, FB 856, FB 857, FB 858, FB 859, FB 860 • FB 850 • FB 825, FB 827
2	Start the CFC complete compilation and download the blocks to the AS. (AS is in STOP!)

Transferring the PCS 7 OS Pictures

Transfer the changed picture file for the V6.1 SP1 Route Control faceplate from installation directory

<drive>\Programs\SIEMENS\WINCC\options\pdl\faceplatedesigner_v6

to your PCS 7 OS project directory

<Project name>\WINCPROJ\<OSNAME>\GRACS.

The new faceplate is based on the changed interface of the RC_IF_ROUTE route block.

Compiling PCS 7 OS

Step	Action
1	Compile the PCS 7 OS (only the changes). The new texts of the input parameters are declared in the PCS 7 OS project (for the faceplate).
2	Download to the PCS 7 OS (only the changes). The name change at FB800 (AUT_MAN -> MAN_AUT) must be compiled and downloaded to the PCS 7 OS as the faceplate is "interconnected" directly with the input.
3	Compile PCS 7 OS with the menu command **Block icons > Create/Update** or manually replace the Route Control faceplates in the PCS 7 OS pictures with the new faceplate (depending on your previous configuration).

Route Control Wizard

Step	Action
1	Start the Route Control Wizard with the menu command **Export**. You will **not** be prompted again to indicate which of the "standard applications" is represented by the Route Control Server and/or standby application.
2	Import the data into Route Control Engineering and download the changes to the Route Control Server. The Wizard will now always create communication links between the "Route Control applications" and the Route Control AS and not between the "User-defined applications" and the Route Control AS.

NetPro

Compile the NetPro configuration and download it to the AS.

Route Control Engineering

Step	Action
1	Open the project in Route Control Engineering.
2	Import changes (Route Control applications and their server computer names).
3	Download the configuration to the Route Control Server(s).

Route Control Server

Activate the changed and newly downloaded configuration using the Route Control Center.

Runtime

Activate the PCS 7 OS project and the Route Control Server.

Appendix

16

16.1 Range of values

16.1.1 Overview of Valid Ranges of Values

Introduction

Here is an overview of all ranges of values. These ranges of values are valid for inputs and outputs (parameters) of blocks in the Route Control library as well as in the Route Control configuration or your Route Control project.

Available Ranges

- "Valid Route IDs" (Page 603)
- "Valid Function ID" (Page 604)
- "Valid Maximum Route Request Time" (Page 604)
- "Valid Maximum Material Acceptance Time" (Page 605)
- "Valid Material IDs" (Page 605)
- "Valid ID Ranges for CEs, SEs, LEs, and PEs" (Page 605)
- "Valid SNDRCVDB Block Numbers for Remote Elements" (Page 606)
- "Valid AS Numbers" (Page 606)
- "Valid Index of External Parameter Elements" (Page 607)
- "Chart-in-Chart Technology" (Page 79)

Additional information

Not all objects in the quantity framework are input and output parameters in the sense described above.
You can find an overview of the Route Control quantity framework in "Quantity Framework for Route Control" (Page 607).

16.1.2 Valid route IDs

Blocks

RC_IF_ROUTE (FB800) (Page 101)

Parameters and Ranges of Values

Parameter	Min.	Max.	Notes
ROUTE_ID	1	300	Up to 300 material transports can be performed simultaneously. If more than 300 blocks of the RC_IF_ROUTE type are inserted in CFC charts, you must use dynamic ID assignment. You can find information about this in "Guide to Dynamic ID Assignment" (Page 284).

Note

The FIXED_ID parameter must be set to 1 for fixed route IDs.

Assign the route IDs once and do not change them afterward.

For every route ID used in an automation system, the corresponding data block must be downloaded to and available in this AS and all (slave) automation systems involved in the route.

Data-block number = 100 + route ID, i.e., DB number = 101 ... 400

16.1.3 Valid function ID

Blocks

RC_IF_ROUTE (FB800) (Page 101)

Parameters and Ranges of Values

Parameter	Min.	Max.	Note
FUNC_ID	0	32,000	0: System uses the route ID as the function ID 1...300: Used by the system 301 to 32,000 User-defined

16.1.4 Valid Maximum Route Request Time

Blocks

RC_IF_ROUTE (FB800) (Page 101)

Parameters and Ranges of Values

Parameter	Min.	Max.	Note
REQ_TIME	1	240	In seconds

16.1.5 Valid maximum material acceptance time

Blocks

RC_IF_ROUTE (FB800) (Page 101)

Parameters and Ranges of Values

Parameter	Min.	Max.	Note
MAT_TIME	1	255	In seconds

16.1.6 Valid material IDs

Blocks

RC_IF_ROUTE (FB800) (Page 101)

Parameters and Ranges of Values

Parameter	Min.	Max.	Note
Material	0	1024	0 = No material in the link element, transport medium is "empty" 1 ... 1,024 = Material in transport medium

16.1.7 Valid ID Ranges for CEs, SEs, LEs, and PEs

Blocks

RC_CE_COMMON (FB 827) (Page 216)

RC_IF_CONDUCT (FB846) (Page 156)

RC_IF_LE (FB828) (Page 166)

RC_IF_MOT_REV (FB823) (Page 142)

Parameters and Ranges of Values

Parameter	Min.	Max.	Note
CE ID	1	1.024	This element ID is unique within one AS. In the next AS, the IDs start over at 1.
SE ID	1	1.024	This element ID is unique within one AS. In the next AS, the IDs start over at 1.

Parameter	Min.	Max.	Note
PE ID	1	1.024	This element ID is unique within one AS. In the next AS, the IDs start over at 1.
LE D	1	1.024	This element ID is unique within one AS. In the next AS, the IDs start over at 1.

Note

With multiple blocks, especially with interface blocks for elements, the Route Control Wizard helps you with automatic and unique ID assignment.

16.1.8 Valid SNDRCVDB block numbers for remote elements

Blocks

RC_IF_REMOTE_SEND (FB 831) (Page 193)

Parameters and Ranges of Values

Parameter	Min.	Max.	Note
SNDRCVDB	51	95	All block numbers in this range can be used. The corresponding block must be available in the local AS and the remote peer AS and the same number must be used in both automation systems. DB 51 to DB 90 are data blocks from the user area. You must synchronize the numbers used for Route Control with your own numbers.

16.1.9 Valid AS numbers

Blocks

RC_IF_CFG (FB850) (Page 172)

Parameter Name and Range of Values

Parameter	Min.	Max.	Note
RC_AS_ID	1	239	Up to 32 automation systems can be used in a Route Control project. Each automation system must be assigned a unique ID, which is used to reference the AS within the context of Route Control.

16.1.10 Valid index, external parameter elements

Blocks

RC_IF_ROUTE (FB800) (Page 101)

Parameters and Ranges of Values

Parameter	Min.	Max.	Note
QINDEX	1	24	Up to 24 external parameter elements can be referenced in a route.

16.2 Quantity framework

16.2.1 Quantity framework for Route Control

Introduction

The quantity framework is valid for the scope of **one** Route Control project, that is, an individual S7 project or an S7 multiproject, depending on the configuration.

Note

The specifications provided below are theoretical limits. Because many different program parts (in addition to Route Control) are implemented in an automation system, the elements of Route Control themselves are also distributed across multiple automation systems.

The number of message-block calls (AlarmS, SFC18) is restricted in PCS 7. This is related to the new message concept. The cause and the effects on Route Control are described in the section
"Restriction of the quantity framework" (Page 65)
.

Quantity Framework Overview

Object	Min.	Max.	Note
Routes	1	N	You can insert as many instances of block type RC_IF_ROUTE as you wish in your S7 project/CFC charts. This applies equally if you are using the concept of dynamic ID assignment. Only the number of material transports that can be performed simultaneously during runtime (that is, the number of instances actively controlling a route and its elements).
Material transports	1	300	This is the number of simultaneously active (operating) routes during runtime, that is, instances of block type RC_IF_ROUTE.
Control elements (CE)	1	1,024	Per AS
Sensor elements (SE)	1	1,024	Per AS
Parameter elements (PE)	1	1,024	Per AS
Link elements (LE)	1	1,024	Per AS
Automation system	1	32	Number of automation systems that can be controlled by Route Control. An automation-system number ranges between 1 and 239.
Partial routes	1	64,000	Per Route Control project
Route control element (RCE)	1	64,000	Over all partial routes of the entire Route Control project
Interconnected elements per route per AS	0	450	One route can accommodate up to 450 interconnections per AS and control these elements. If a route runs via more than one AS, these values are added. Thus, one route can activate more than 1,000 interconnected elements via 3 automation systems. The route search can be influenced by specification of intermediate (via) locations. If one element is interconnected multiple times in different mode levels (for example, 3 times in the same partial route), this counts as three elements.
Elements per partial route	0	64,000	Theoretical limit, limited in practice by the number of elements per AS
Server	1	2	1 = Route Control application (server) 2 = Route Control application (server + standby)
Element subtypes	1	255	Number of permitted subtypes for the following elements: • Control elements (CE) • Sensor elements (SEs) • Parameter elements (PEs)

Object	Min.	Max.	Note
Modes/ Mode levels	1	32	Per mode table
Mode table/ Mode table	1	64,000	Limited by the Route Control database, even though the MODETABLE parameter in RC_IF_ROUTE is a DINT-type parameter.
Configuration chart (CFC)	1	1	Exactly one chart per AS; thus, up to 32 charts for 32 automation systems
Locations	0	64,000	SOURCE/DEST parameter in RC_IF_ROUTE
Plants (PCell)	0	64,000	Limited by plant hierarchy in SIMATIC Manager
Unit (Unit)	0	64,000	Limited by plant hierarchy in SIMATIC Manager
Material	0	1,024	Limited by RC_IF_ROUTE
Material group	0	1,024	Limited by Route Control database
Successor Relationships	0	64,000	Limited by Route Control database

16.3 Diagnostics and Logs

16.3.1 Trace Server

Description

The Trace Server installed with Route Control is not intended for operating personal. It is a special tool to be used by experts, such as commissioning personnel, for detailed diagnostics.

While the information displayed is complex, it can also be used by the hotline to diagnose and quickly locate the causes of faults. with some practice, valuable information can be obtained even during the commissioning phase.

For more information, refer to the section: "Diagnostics Overview" (Page 609)

16.3.2 Diagnostics Overview

Diagnostics Overview

Route Control offers experienced users a series of expanded diagnostic options for the following levels:

- "Diagnostics for Engineering" (Page 610)
- "Diagnostics for Operator Control and Monitoring" (Page 610) (operating personnel)

- "Diagnostics for Cross-Coupling" (Page 613) (automation system)
- "Diagnostics for the Route Control Server" (Page 613)

These diagnostic options are not intended for operating personnel, but rather for configuring engineers and commissioning personnel.

16.3.3 Diagnostics for engineering

Diagnostics for Engineering

Route Control creates log files at various times. Once an operation is complete, you can open these log files using an editor.

- "CSV Interface (Export Log)" (Page 367) (exporting from the Route Control project)
- "CSV Interface (Import Log)" (Page 368) (importing to the Route Control project)
- "Route Control Wizard (Export Log)" (Page 356) (exporting from the S7 project)
- "Route Control Engineering: Checking Data Consistency" (Page 471) (Route Control project)

Note

For all log files, time stamps are indicated in the individual sections so that the duration of an operation can be calculated.

16.3.4 Diagnostics for Operator Control and Monitoring

General

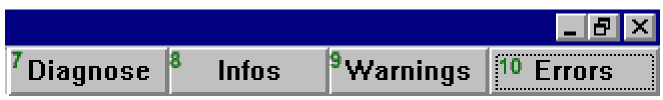
The Trace Server application always operates locally instead of over the network. Always start Trace Server on the computer where the application to be diagnosed, such as the Route Control Center or the Route Control server, is running.

Setting Diagnostics

1. Start Trace Server via ..\SIEMENS\RCS\bin\rctrcsrv.exe.
2. In the dialog box, select one of the applications to be diagnosed.
   The Trace Server displays only those applications that are currently running, are in the main memory and are logged on in the Trace Server.
3. Set the scope of messages to be displayed (diagnostic, information, warning, error).

Meanings of Display Elements

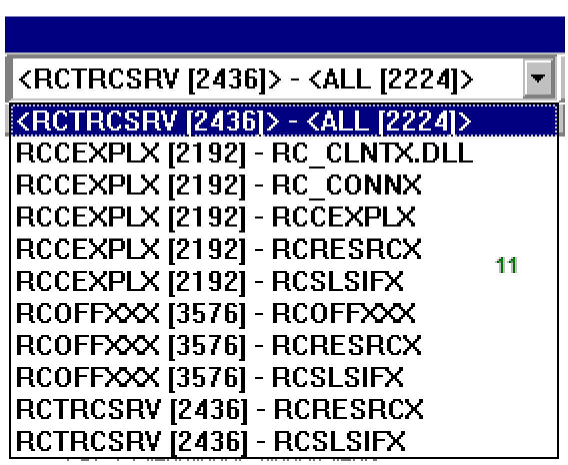
No.	Meaning
1	When element is depressed, the Trace Server is always the topmost application.
2	Enable and disable generation of messages in the window.
3	Enable and disable automatic scrolling.
4	Enable and disable output in a trace file
5	Delete messages in the window
6	Suppress output of all messages for all applications in the window.



No.	Meaning
7	Diagnostic level 1: Show diagnostic messages
8	Diagnostic level 2: Show information messages
9	Diagnostic level 3: Show warnings
10	Diagnostic level 4: Show error messages

Note

During normal operation, diagnostic level 3 and 4 messages (warning and error messages) do not appear.



No.	Meaning
11	Left: Name of application (EXE), as shown in the Task Manager, including its process ID Right: Name of module within the application

Applications

The primary applications are listed in the following table. As a general rule, it is sufficient to set the switches for the diagnostic levels below globally for the application:

- Diagnosis
- Information
- Warnings
- Errors

Name	Meaning
RC_SERVX	Route Control server (runtime)
RCCEXPLX	Route Control Center (runtime)
RCCONVTX	Route Control conversion tool (engineering)
RCEXPAXX	Route Control Export Wizard (engineering, SIMATIC Manager context)
RCOFFXXX	Route Control Engineering tool (engineering)

Saving and Loading Diagnostic Profile Files

The settings can also be saved and reloaded later.

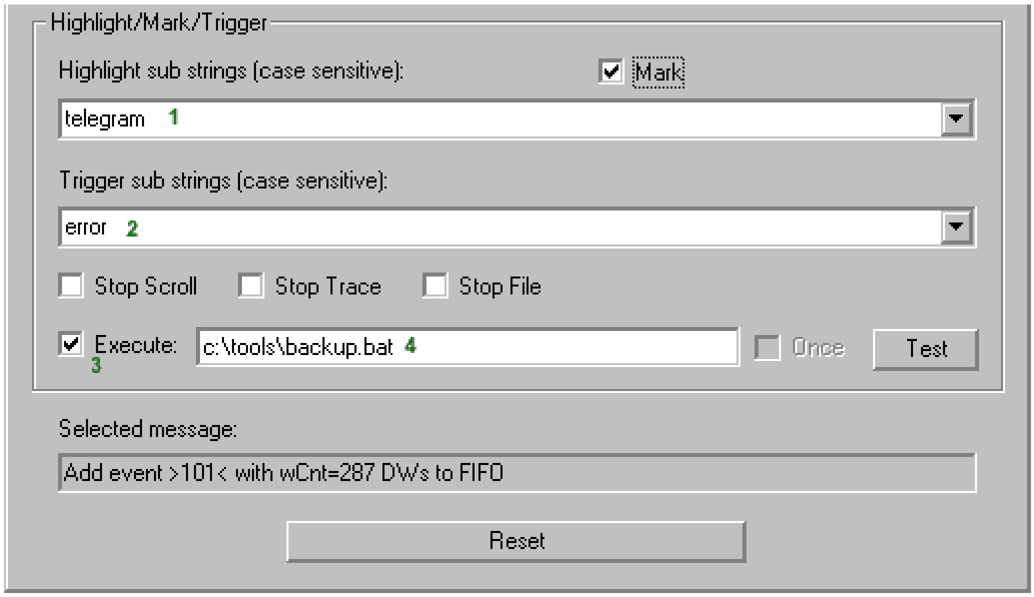
1. Open the shortcut menu in the message window.
2. Click "Save profile" to save
   Or
   Click "Load profile" to load.

Setting Filter Criteria

Another interesting option allows filter criteria to be set for the messages themselves. In this way, you can provide a color background for messages containing a particular character string so that they stand out from the other messages and can be more easily distinguished.

1. Open the shortcut menu in the message window.
2. Select the menu command **Settings and Filters**.
   The Configuration dialog box opens.

Running an Application When Certain Events Occur



#	Meaning
1	If the character string "telegram" occurs in a message, color shading is applied to this line.
2	If the character string "error" occurs in a message, the file indicated in item 3 is executed.
3	Activate and deactivate startup of an application
4	File to be executed, including its path

16.3.5 Diagnostics for Cross-Coupling

Diagnostics for Cross-Coupling

Route Control offers two blocks from the library for diagnosing the cross-coupling between the Route Control automation systems. These blocks provide information about the status of the connection:

- RC_IF_XC_DIAG (FB 884) (Page 178)
- RC_IF_XC_LIFE (FC884) (Page 182)

16.3.6 Diagnostics for the Route Control Server

Diagnostics for the Route Control Server

You can use the application Trace Server to create a log file.
You can find additional information in"Trace Server" (Page 609).

16.4 FAQs

16.4.1 Subsequent Modification of AS ID

Question

How can I make subsequent changes to an automation system ID without losing its elements or element interconnections in the Route Control Engineering project?

Answer

Step	Procedure
1	Create a copy of the Route Control project file (S7 project or S7 multiproject path ../Global/RCS/RCS.mdb).
2	Open Route Control Engineering via the S7 project.
3	Run a complete CSV export (all elements, locations, partial routes, and interconnections).
4	Change the RC_AS_ID parameter on the RC_IF_CFG block in accordance with the required AS ID in the CFC charts.
5	Call the Route Control Wizard and select the Export option: Data synchronization for all elements AS-AS connection AS server connection If necessary, the wizard will modify the NetPro settings and the CFC configuration. You will need to run a partial download of the charts and a full download of the connections. Notice: During import, all interconnections between elements and partial routes will be deleted, but the partial routes will not be deleted.
6	Run a complete CSV import CSV reimports the interconnections using the names of the automation systems rather than the RC AS IDs. The previous interconnections are available again following the CSV import.
7	Download the Route Control server database and update the Route Control Center.

16.4.2 AS Load Due to Route Execution

Question

How much load is generated in an automation system when route blocks are executed?

Answer

The load depends on the factors below, for example:

- The type of CPU
- The number of configured routes (parameter L(Wp))

- The number of those routes that are active (parameter L(Wa))
- The base load of Route Control system blocks (parameter L(Cfg))
- The load due to AS-AS connection and AS-server connection (parameter L(K))

The load in the automation system is specified with L(AS-RC). This gives the following formula:

L(AS-RC) ≈ L(Wp) + L(Wa) + L(Cfg) + L(K), where

L(Wp)	≈	2.6 ms * number of configured routes
L(Wa)	≈	1.5 ms * number of active routes
L(Cfg)	≈	4.0 ms (occurs only once per automation system and is therefore fixed)
L(K)	≈	2.5 ms * number of configured routes + 26 ms

Note

There are also the following loads:

- Load due to the processing of elements. The overall load also depends on the number of elements involved in the route.
- Load due to other blocks (non-Route Control), if you wish to calculate the automation system's overall load.
  Example: SFCs, BATCH interface blocks

Example

75 routes are configured in an automation system, 40 of which are active. This produces the following load due to Route Control:

L(AS-RC) ≈ 2.6 ms * 75 + 1.5 ms * 40 + 4 ms + 2.5 ms * 75 + 26 ms

L(AS-RC) ≈ 195 ms + 60 ms + 4 ms + 187.5 ms + 26 ms

L(AS-RC) ≈ 470 ms

16.4.3 Network Security

Question

What must be taken into consideration as regards data security in the network?

Answer

The points to be observed for data security within a network are specified during the PCS 7 or Route Control installation.

To ensure smooth operation of Route Control, the settings must be accepted.

16.4.4 Download of changes or CPU Stop

Question

In which situation must I download the entire program while the CPU is in STOP instead of downloading only the changes?

Answer

CPU stop is always required if the following actions were carried out:

1. Update of blocks whose structure was changed.
   For information on a new software version with enhanced blocks, refer to the chapter "Software update".
2. Deletion of the RC_IF_CFG (FB850) block in an AS, or deletion of an AS that contained an RC_IF_CFG block.
3. Insertion of an RC_IF_CFG block in an AS, or insertion of an AS that contains an RC_IF_CFG block.

Note

Run a Route Control Wizard session in situations 2 and 3 in order to re-generate the S7 connections. The Wizard assigns all RC_IF_CFG blocks new connection IDs. That is, you have to download the data once again to all ASs that contain an RC_IF_CFG block. CPU STOP is mandatory in these situations, as the connection ID is not activated in the AS unless system function SFB PUT is initialized.

Additional information

Additional information about delta downloads (= download of changes) and on avoiding the causes of CPU STOP is available in the "Download" chapter of the *CFC for SIMATIC S7* Manual.

16.4.5 "online" route search

Parameter

When searching for a route via the route network the following parameters are taken into consideration:

1. Location for the source
2. Location for the destination
3. Via locations
4. Priorities of the partial routes
5. Elements that are in "Manual" operating mode

6. Elements that are in "Maintenance" operating mode
7. Elements that are in an error state
8. Elements for which the "DISABLED" input is set
9. Elements that are affected by the maintenance of other elements

Note

In the "Project settings" folder in Route Control Engineering, select the "Runtime parameters" subfolder and here you can set the influence the parameters 5 - 9 can have on the route search.

Glossary

Activation delay time

When installing a control element in a mode level, program the activation delay time for the control element to be triggered after this mode level has been activated
(0 to 255 seconds).

Activation key

Icons show the activation type of an element at different mode levels. They are used on the "Modes" tab in Route Control Engineering and in the Route Control Center.

AS-AS connection

AS-AS communication link,
also known as cross-coupling.

A (logical) AS-AS connection is always a point-to-point connection and is created for Route Control by the Route Control Wizard.

As the system supports operation with up to 32 AS, the Wizard generates up to 32 * 31 connections are generated, that is, up to 31 connections per Route Control AS.

AS-Server connection

Communication link between an AS and a computer,
in this case, the Route Control Server.

A (logical) AS-server connection is always a point-to-point connection and is created for Route Control by the Route Control Wizard.

A standalone server for Route Control provides one connection for each Route Control AS, that is, up to 32 connections.

A redundant server system for Route Control provides one connection for each Route Control AS to each redundant server, that is, up to 2 * 32 connections.

Control element

The CE (control element) is an active object that can also return a value.
Examples: motors, valves, pumps, controlled flaps

Cross-coupling

This term always denotes a communication link between two Route Control automation systems.

Deactivation delay time

When installing a control element in a mode level, program the deactivation delay time for the control element to be triggered after this mode level has been deactivated
(0 to 255 seconds).

Element

Interface block of the Route Control library for integrating process blocks.
The name of these interface blocks starts with RC_IF_.
Elements are installed in partial routes in Route Control Engineering. This configuration includes the definition of the element activation mode at the different mode levels.

Element subtype

Subtypes of a main type include items such as a motor or a valve in the group of control elements. Element subtypes also differ in terms of their activation commands and feedback.

Element type

Route Control distinguishes between four main types of the elements:

- Control elements (CE)
- Sensor elements (SE)
- Parameter elements (PE)
- Verbindungselemente / link elements (LE)

Control, sensor, and parameter elements are further split into "element subtypes".

Fault tolerance time

A mode level is successfully activated after all elements have returned the expected feedback. The route enters the error state if an element changes its position setpoint for a duration longer than the fault tolerance time after this mode level was activated.

Function ID

Material transports operate with different values for the function ID parameter.

Partial routes and elements are assigned a function ID by the route network when a search is made for a suitable path. This ID specifies whether a partial route or an element is locked for a further search. Material transports or routes cannot share an element or a partial route. This safely prevents any mixing of products.

Mixed products are, however, desirable in certain situations. In other situations the material is transported from two sources to the same destination. The same function ID is then entered for both routes (FUNC_ID parameter at RC_IF_ROUTE). This expressly allows joint operation of the routes.

General request

Request of all automation systems by the server to update the process image.

If the general request is interrupted when the server starts up, then end the server, load NetPro and restart the server.

Generic user-defined element

Also known as GE block.

User-specific block that is compatible with RC_IF_ and characterized by special User Defined Attributes (UDA).
The block contains several standard and/or user-defined elements. The elements are imported separately to Route Control Engineering.

An example is available in the Route Control library.

H-CPU

CPU of an H-machine

H-machine

An H-machine consists of two CPUs, two PSs (power supplies) and 2 CPs (communication processors). The CPUs are interconnected and represent a pair of redundant ASs. One CPU assumes control (master), while the other CPU remains in standby mode in order to assume control if necessary (fault-tolerant system).

Link element

The LE (link element) object represents a material in a transport medium such as a pipe or a conveyor belt. The LE is also used to check material compatibility for route requests.

Location

Locations refer to the start, paths (vias) and final points of partial routes or routes. Each location is an instance of a location type. Locations are configured as equipment properties of units in SIMATIC Manager and are then imported to Route Control Engineering for creating partial routes.

Location

Location

Locations refer to the start, paths (vias) and final points of partial routes or routes. Each location is an instance of a location type. Locations are configured as equipment properties of units in SIMATIC Manager and are then imported to Route Control Engineering for creating partial routes.

Location

Location ID

Location identifier that is unique throughout the project.

Location type

Equipment property of data type "LOCATION" in the "Shared Declarations" folder of an S7 project A location type can have none, one, or several properties of the "Source", "Via" or "Destination" type.

Master AS

A master AS is an automation system that controls the route and its elements. It is the automation system in which the user program activates an RC_IF_ROUTE block and from which a route request is transferred to the Route Control Server. Each route requires precisely one master AS.

See also "Slave AS".

Mode level

It is not necessary to simultaneously activate/deactivate all of the elements of a route or partial route. Instead, these can be implemented in up to 32 groups, namely the mode levels, with different activation type or times.
Additional information is available under the keyword "Mode table".

The user program is responsible for generating suitable logical links of the mode levels. Examples:

If "initial position reached",
then "open transport valves"

If "Transport valves open",
then "Switch on pump"

"Basic position reached" means that the parameter value QMODE at RC_IF_ROUTE must return the value 1 when logically linked to the mode level bit by an *OR* operation.

"Open transport valves" means that the mode level bit must be set to 1 at the MODE input parameter of RC_IF_ROUTE.

Mode table

A mode table comprises up to 32 modes or mode levels, and groups them into process-related levels.
Example:

Brewery/fermenting cellar (mode table)

- Initial state (mode level)
- Open transport valves (mode level)
- Switch on pump (mode level)
- Open source valve (mode level)

Parameter element

A PE (parameter element) is an object that defines a setpoint and displays an actual value (from the process).

An external PE is an expansion of the general PE. The setpoint of an external parameter element is unknown at the time of configuration and is not transferred until runtime. A "wildcard" is configured by referencing a specific PE based on its index for this reason. The actual setpoint is transferred as a parameter to the RC_IF_ROUTE block in runtime. The block transfers this value to an output, from which it can be read by the user program.

Partial route

Partial routes form the sections of a route. They are defined by their source and destination locations. Elements are inserted into partial routes during configuration. The combination of all partial routes forms the route network from which the search algorithm selects specific partial routes in order to assemble the routes.

Route

A route always comprises 1 to n partial routes. The partial routes are selected in runtime. A route comprises all transport media and elements of its partial routes, and covers the distance between the source and the destination of material transport.

The Route Control configuration only covers partial routes. A route from the source to the destination of material transport is only generated on request in runtime.

Route element

Element that has been installed in a partial route.

S7 connection

Logical communication link either between a Route Control AS and a Route Control Server, or between two Route Control ASs.

Sensor element

The SE (sensor element) is an object that returns a value from the process and specifies whether an expected actual value is equivalent to the real actual value. Sensor elements are not activated.
Examples: conductivity measurements, flow volume measuring sensors, limit switches

Server

Refers to the Route Control Server in this context.

Standalone or redundant computers that process route requests from the Route Control automation systems, and act as a link between the RC AS and clients (Route Control Centers).

Slave AS

A route can include slave automation systems (0 to 31). These partner ASs are controlled by way of cross-coupling by the master AS and return their feedback to the master AS.

Each AS can be the master of one route, and a slave for one or several other routes. A slave AS also receives its element list from the Route Control Server (as does the master AS), however, without requesting any routes.

Additional information is available at the "Master AS" entry.

Status monitoring time

The route enters an error state (mode level error or mode error) if at least one element fails to return the expected feedback within this monitoring time after a mode level was activated. Additional information: Inputs MON_TM at RC_IF_ROUTE and MONITOR at the control elements.

Symbol

One or several characters used to display the type of activation of an element in activation keys.

User element

See "User-Defined Type".

User key

User-defined activation key
The key is configured once and an icon is used for each additional configuration.

User-defined type

Also known as user element.

RC_IF-compatible block that you can edit and install as an element.

The SW package includes the block templates
RC_IF_USER_CE, RC_IF_USER_SE, and RC_IF_USER_PE

Variant

A variant is a fictitious location within a partial route, which is specified in addition to the start and final point. With one variant, you can define alternative partial routes with an identical start and final point.

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