SIEMENS

SIMATIC

SFC Visualization for S7

Manual

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Safety Guidelines

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

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

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

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

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

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

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

Qualified Personnel

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

Prescribed Usage

Note the following:

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

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

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1.1 SFC Visualization (SFV)

Introduction

You can use the "SFC Visualization" software package to configure SFC visualization in WinCC and to perform operator control and monitoring of SFC charts and SFC instances in the WinCC runtime system.

What is SFC?

SFC (Sequential Function Chart) is a sequential control system that is used for control flow-oriented process control.

A sequential control system is a controller with automatic, step-wise execution. It switches from one state to the next depending on conditions.

Note

In this manual, we generally refer to the SFC charts and SFC instances as SFCs, unless these objects need to be distinguished in the respective context.

What does the SFC Engineering System offer?

The engineering system allows you to create SFC charts, SFC types and SFC instances, compile and download them to the CPU, and test and commission them.

In order to be able to use the SFCs in the runtime system, you must transfer them to the runtime system from the engineering system using the "AS-OS-Engineering" software package. You can also transfer charts individually. You transfer the SFCs with their OS comments and configured messages. Mechanisms are stored with the messages that enable you to directly access the SFC that the message pertains to.

You can also perform the following actions:

- Configure the display of SFCs
- Configure global operator authorizations for the SFCs and specific operator authorizations for each SFC
- Place objects in the WinCC display for calling the SFCs

You can find additional information about this in the *SFC Sequential Function Chart* manual of the SIMATIC STEP 7 user manuals and in the corresponding online help.

What does the SFC Runtime System offer?

The runtime system enables simultaneous operator control and monitoring of any number of SFCs.

Note:

- Configuration is not possible during runtime operation.
- You can transfer SFCs to the runtime system even while the OS is running. This may cause a temporary inconsistency in the displays, since the SFCs must first be downloaded to the automation system before being loaded on the OS. The potential for inconsistencies during this period is unavoidable.

1.2 SFC Basic Settings

Settings in WinCC Explorer

In WinCC Explorer, you can configure general settings for the display of the SFC charts and SFC instances in the runtime system. You can make these changes globally for all displayed SFCs or for specific objects.

Global Settings

Global settings for displaying SFCs affect the following areas:

- Topology
- Colors
- Authorization level
- Group display

To open the "SFC" dialog, select "SFC" in the WinCC Explorer and open the context menu. Then, select the menu command **Open**.

You can specify the size of the objects and the distance between them for the **sequencer topology** in the detail window and overview window.

You choose **colors** to distinguish the states of steps, transitions and selected objects in the display.

You change the **authorization levels** for operator inputs if you require levels other than the default levels ("Monitoring", "Process Operation" and "Advanced Process Operation"). These apply to all the SFCs of the respective WinCC project unless specific authorization levels have been assigned for the SFC.
When compiling the OS, the SFC-specific authorizations are retained if you set "Changes" as the scope.

In order to grant a user the authorization to perform operator inputs in SFC Visualization, the corresponding authorization levels must be enabled for this user (globally or area-specific) in the User Administrator.

If no users are configured, all operator inputs are permitted without restriction. In this case, the "Authorization Levels" tab is not available.

There are a number of other tabs available for configuring the **Group Display**:

Tabs	Setting
Geometry	Size of the display fields
Colors	Background color of the display fields
Style	3D frame width (in pixels)
Font	Font attributes (font, alignment etc.)
Flashing	Flashing frequency
Other	Other attributes such as enabled for operator, group relevant, display, group value and acknowledgment pattern
Message Types	Display text and attributes (font color, background color, flashing) for the individual message statuses
Lock	Whether the messages are output or locked. An "x" (default setting) will appear in the display field to indicate that messages have been locked. You can change the default setting.
Assignment	Message type for each display field

Object-Based Settings (on server only)

You can make the following settings individually for each SFC:

- Configuring the update cycle
- Configuring the default view
  This is the overview window or detail window that is to be opened with the SFC.
- Configuring the operator authorization levels

The available SFCs are displayed in the detail window of WinCC Explorer when "SFC" is selected. To edit object-based settings, open the context menu of the selected SFC and select the menu command **Properties**.

2 Configuration

2.1 Configurations for SFC Visualization

Introduction

You can place objects in a WinCC display that enable you to open an SFC during runtime operation.

The following objects can be used for this:

- Block icons
- "PCS 7 SFC Control"
- "PCS 7 SFC MultiChart Control"
- Any graphic object (such as a rectangle)
- A Windows object (such as a button)

Preparation

- To transfer the SFC charts and SFC instances to the OS, select the menu command "**Options > 'Compile Multiple OSs' Wizard > Start...**" in SIMATIC Manager.
- Then, carry out the preparations for the controls

Note

The "@PCS 7 SFC Panel Control" and "@PCS 7 SFC SP Control" controls, which are supplied with SFC Visualization, are the internal controls required in SFC Visualization. They have not yet been approved for use in WinCC pictures.

You can configure the following objects for opening the SFC:

- SFC Block Icon
- SFC Faceplate
- PCS 7 SFC Control
- PCS 7 SFC Multichart Control
- SFC Button
- SFC Browser Selection

You can use SFC Visualization functions in order to create your own scripts.

You will find more information on this subject in
- Using Functions for Custom Scripts.

2.2 Configuring SFC Block Icons

SFC Block Icon Templates

The block icon templates for the "@SFC_RTS" SFC chart and the instance of an "@SFC_TYPE" SFC type are provided in the "@@PCS7Typicals.pdl" picture. Use the following procedure to perform all changes, for example, to create several variants of a type:

1. Copy this picture and save it with the name "@PCS7Typicals.pdl".
2. Create additional blocks icon in this picture for each SFC type using the copy/paste commands.
3. Then open the properties for each block icon.
4. Under "General", replace the value (@SFC_TYPE, for example) for the attributes "StructureType" and "type" with the name of the corresponding SFC type.

Creating Block Icons

You can create block icons for your OS picture in two different ways:

- Automatic creation in the plant hierarchy
  With this method, the required block icons are automatically inserted into the picture and parameters are assigned, as appropriate, for all existing SFC charts.
- You place the OS picture in WinCC in the Graphics Designer and configure it with the Dynamic Wizard.

  You can find additional information on this in the online help of the PH, *Automatically Creating/Updating Block Icons for OS Pictures*.

Procedure in WinCC

1. Copy the required block icon from the template to your current picture.
2. Adapt the "StructureType" and "type" property to the type name (not necessary for the block icon for SFC chart)
3. Select the block icon and double-click "Connect faceplate to process tag" in the "Default Dynamics" tab of the "Dynamic Wizard" window.
   The Dynamic Wizard opens.
4. Click "..." on the "Set Options" page.
   The "Tags - Project:" dialog box opens.

5. In the WinCC tags, open the "List of all tags" and double-click the corresponding tag for the chart or instance in the right window to select it.
   The dialog box closes; the variable name is entered in the Dynamic Wizard.
6. Click "Continue".
   The next page shows what the wizard is now generating.
7. Click "Finish".

The block icon is now configured. You can use it to call the associated faceplate in runtime operation.

2.3 Configuring SFC Faceplates

SFC Faceplates

There are two types of faceplate templates for visualizing the various SFC instances of the SFC types and for visualizing SFC charts during runtime operation:

- The "@pg_@sfc_rts.pdl" variant is used to visualize SFCs.
- The "@pg_@sfc_type.pdl" variant is used to visualize SFC instances of an SFC type. The interface elements (setpoints, control strategies, for example) that are configured in the "Characteristics" dialog box are included in this faceplate.

In addition to the display objects (type name/instance name, comment, group display, etc.) that are created with the standard WinCC resources, the faceplates contain an OCX for displaying and manipulating the operating state logic and an OCX (for SFC instance) for displaying and manipulating the setpoints. You also use these OCX in SFC Visualization.

The meanings of the elements contained in all views in the faceplate are described in:
Operator Control and Monitoring of SFC By Means of Faceplate

Configuration

The faceplates are supplied preconfigured and you can customize them individually.

You can also create your own faceplates from the templates. However, you use the available OCX for displaying and manipulating the operating state logic and the setpoints (for SFC instance).

You can find a detailed description of the configuration of faceplates in the *PCS 7 Programming Instructions for Blocks* manual.

Additional Information

You will find more information in the section Adapting Faceplates

2.4 Adapting Faceplates

Introduction

You adapt the "Actual Values" (@pg_@sfc_type_actualsp.pdl) and "Prepared Values" (@pg_@sfc_type_prepare.pdl) views in the Graphics Designer.

Procedure

1. Open the "@pg_@sfc_type_actualsp.pdl" or "@pg_@sfc_type_prepare.pdl " picture in the Graphics Designer.
2. Double-click on the OCX area in the picture.

   The "Properties of "@PCS 7 SFC SP Control" dialog box opens.
3. In the "General" tab, use the '"Actual Values" view enabled' option to specify if the operator can edit the information in the setpoint column or if it is write-protected.

   Note: This option can be set both in the properties of the "Actual Values" and "Prepared Values" views. It only affects the "Actual Values" view.
4. In the "Colors" tab, you can change the font and background colors of the respective OCX elements.

2.5 Preparation for the Controls

Introduction

You can prepare for the configuration of the controls to enable you to insert controls in a graphic display more easily.

Procedure

1. Open the desired picture in the Graphics Designer.
2. Switch to the "Controls" tab in the object palette.
3. Select the "Add/Remove" command in the context menu of the object palette. The "Select OCXs" dialog box opens.
4. In the list, select:
   - PCS 7 SFC Control
   - PCS 7 SFC Multicast Control
5. Click "OK" to close the dialog box.

Both controls are now in the object palette and can be inserted directly from there into the graphic display using a drag-and-drop operation.

2.6 Configuring the "PCS7 SFC Control" Status Display

Introduction

The states of an SFC can be displayed in a graphic display via an SFC control that is assigned to this chart. This control is also referred to as the status display (same as the SFC MultiChart Control). You place and configure the status display in a graphic display in the WinCC Graphics Designer.

Placing the PCS 7 SFC Control in the Graphic Display

Open the desired graphic display in the **Graphics Designer**.

- If you have performed the preparation for the controls, use a drag-and-drop operation to move the "PCS 7 SFC Control" from the "Controls" object palette to the picture.
- If the controls are not yet in the object palette, proceed as follows:
  - Select the  entry in the "Smart Objects" tool palette.
  - Draw a frame in the graphic display for the object to be displayed.
    The selection list of all installed "Controls" is displayed.
  - Select "PCS 7 SFC Control".

Assigning Parameters

1. Double-click on the SFC control.
   The "Properties" dialog box opens.
2. Open the "General" tab.
3. Specify whether the SFC should be opened as an "Overview" or "Section" (detailed) display.
   The button provided for this purpose in the SFC control is labeled accordingly.
4. Click "Assign SFC".
   Another dialog box opens listing all the SFCs on this OS.
5. Select the desired SFC.
6. Close the dialog box with "OK".
   Under "Connected SFC:" you can see the current SFC name. When you close the "Properties" dialog box with "OK", the current SFC name is also in the control.

Options in the other tabs:

- You can individually configure the display of the SFC control.
- In the "Colors" tab, you can use the color palette to change the current colors for certain elements (for example, title bar, window background, etc.)

Note

You can also use the Dynamic Wizard to assign parameters for the status display – as in previous versions.

2.7 Configuring the "PCS7 SFC MultiChart Control" Status Display

Introduction

The "PCS 7 SFC MultiChart Control" enables operator control and monitoring of multiple SFCs.

This control is also referred to as the status display (just like the SFC control). As with the "SFC Control", you insert the "SFC MultiChart Control" into a picture and then assign parameters for it.

Placing the PCS7 SFC MultiChart Control in the Graphic Display

Open the desired graphic display in the **Graphics Designer**.

- If you have performed the preparation for the controls, use a drag-and-drop operation to move the "PCS 7 SFC Control" from the "Controls" object palette to the picture.
- If the controls are not yet in the object palette, proceed as follows:
  - Select the 

 entry in the "Smart Objects" tool palette.
  - Draw a frame in the graphic display for the object to be displayed.
    The selection list of all installed "Controls" is displayed.
  - Select "PCS7 SFC MultiChart Control".
    The control is displayed according to the size of the drawn frame.
  - If you do not stretch the frame to its complete size, not all the columns are visible. In this case, a horizontal scroll bar is inserted to enable you to scroll through the contents in the visible area during runtime operation.

Assigning Parameters

1. Double-click on the SFC MultiChart control.
   The "Properties" dialog box opens.
2. Open the "General" tab and assign the desired SFCs to the control or delete them from it.

Assigning:

1. Click  .
   The dialog box for selecting SFCs opens.
2. Select the desired SFC and then close the dialog box with "OK".
3. Repeat this procedure for every SFC that you want to include in the SFC multichart control. A line is inserted for each SFC. This line contains columns that supply the information about the SFC during runtime operation.
   You will find more information in the section PCS 7 SFC MultiChart Control

Deleting:

1. Select an SFC that is no longer needed in the "Properties" dialog box.
2. Click  .
   The SFC is deleted.

You can change the order of the selected SFCs at a later time.

Sorting:

A selected SFC can be moved up or down using the  buttons.

Title:

You can specify a title for the SFC multichart control that identifies it uniquely during runtime operation.

Options in the other tabs:

- You can individually configure the display of the SFC control.
- In the "Colors" tab, you can use the color palette to change the current colors for certain elements (for example, title bar, window background, etc.)
- In the "Fonts" tab, you can specify the font, the type style and the font size.

2.8 Configuring an SFC Button

Introduction

For selecting an SFC, you can also configure any graphic object of your choice. Such an object serves to represent the SFC chart. Unlike an SFC status display, however, it does not receive any information on the current status of the SFC. Such an object can be a button, for example.

Procedure

The procedure is basically the same as that for configuring the SFC control:

1. Select the "Button" object in the "Windows Objects" window and draw a frame in the graphic display.
2. Make the required settings (text input for label, font, operator authorization, etc.). Click "OK" to close the dialog box.
3. Double-click "Configure SFC button" in the Dynamic Wizard.
4. If an instructional page appears, ignore it by clicking "Next".
5. On the next page, select the mouse action for opening the SFC, which you will assign in the next step.
   The "SFC Browser" opens.
6. Select the SFC that is to be associated with the button.
7. In the "Set Option" dialog box, choose the display in which the SFC is to be opened ("Overview" or "Section").
8. Click "Finish" to complete the configuration.

2.9 Configuring the SFC Browser Selection

Introduction

You place an object in the graphic display in order to call the SFC browser during runtime operation. You then select the SFCs from it.

Procedure

1. In the Graphics Designer object palette, select the desired object and draw a frame in the graphic display.
2. Double-click "Configure SFC Browser" in the Dynamic Wizard.
3. If an instructional page appears, ignore it by clicking "Next".
4. In the next dialog box, select the mouse action for opening the SFC.
5. Click "Finish" to complete the configuration.

2.10 Using Functions for Custom Scripts (SFC API Calls)

SFC API Functions

The Graphics Designer contains ready-made scripts for assigning certain actions to objects.

SFC Visualization offers many functions. The most important functions are included in these ready-made scripts.

You can also use functions in SFC Visualization in your own scripts. For this purpose, you read in the "sfccli.h" header file. Insert the line ' # include "sfccli.h" ' in the script.

The most important functions are described in the section SFC API Functions.

General Information about the Functions

- If a Boolean value is returned, then TRUE = success and FALSE = error.
- Functions that have "LPOHIO_ERRORSTRUCT lpdmError" as a parameter can be called with "(void*)0". The error is not evaluated in this case.
- If a window handle is needed, specify the window of the "parent" for this new window. "NULL" is also allowed as the assignment. In this case, the desktop is used as the "parent" of the new window.

2.11 OS Server and OS Client

2.12 What You Should Know About the OS Server and the OS Client

What is an OS Server?

An OS server is connected to the automation system. It receives process data, but usually has no operator control and monitoring function in a multiple station system. The OS server contains all of the configuration data, and you can modify these data here.

What is an OS Client?

An OS client is an operator station (OS) where you can perform operator control and monitoring of the process during runtime operation. A client does not have its own SFCs or any process inputs/outputs. Operator control and monitoring of SFCs that are available on the OS servers can be performed from the client, but no changes can be made to these SFCs from the client.

How are OS Server Data Accessed?

Server project data are made known to the client via reference lists (packages). The client can access the server data only after the packages have been created and loaded.

The same applies to SFC Visualization; the references to the SFCs are exported instead of the actual data. You therefore do not have to generate and download the packages after changing an SFC. You only have to generate and download a new package to the client only if SFCs have been deleted, added or renamed.

You can find additional information in the *Process Control System PCS 7 Operator Station* configuration manual.

Configuring the SFC Visualization

You can configure the display and operator controls in WinCC Explorer on the client, as described in the "SFC Basic Settings" section of this documentation.

The SFC basic settings available for the individual server projects are not relevant for the client. If no configuration is performed, the default settings apply for the client.

In a multi-client project, you can place objects for opening SFC charts in graphic displays and connect SFC charts as is done in the server project. You will find more information about this in the section "Objects for Opening SFC Charts". You must download the corresponding packages to the client for this.

Note on Configurations in Server Projects

- Configurations for SFC visualization in graphic displays (for example, SFC selection buttons, SFC status display) will also work on the client.
- Server projects can be configured from the client. You can read about the procedure for this in the *Process Control System PCS 7 Operator Station* configuration manual.

Permanent Operability for Clients

SFC Visualization supports "permanent operability" for clients. If a preferred server is configured on the client, it will be used as the server. This applies regardless of whether the server is the current MASTER or STANDBY. When there is a redundancy failover, SFC Visualization reacts in accordance with the behavior defined in WinCC.

3 Operator Control and Monitoring of the SFC

3.1 Operator Authorizations

Operator Authorizations

If no users are configured, all operator inputs are permitted without restriction.

The following settings or functions are performed depending on the logged on user and the authorization levels configured for SFC Visualization:

- Operator control buttons are activated or deactivated.
- Operator input is checked prior to execution.
  Depending on the outcome of the check, the operator input is either accepted or rejected.

Note

If button or a setpoint is not enabled although the user has the necessary operator authorization, then operation may be disabled on the block
(for instance ENSTART = 0).

3.2 Operator Control and Monitoring of the SFC by Means of a Faceplate

Overview

You operate the SFC chart and the SFC instance by means of a faceplate.

- The faceplate for the **SFC chart** has two views:
  - "Standard" View
  - "Messages" View
- The **SFC Instance** faceplate has five views:
  - "Actual Values" View
  - "Prepared Values" View
  - "Parameters" View
  - "Messages" View
  - "Batch" View

Note

You can only ever start an SFC instance in the faceplate in the "Prepared Values" view.

This is most important if control strategies or setpoints are being used, because a control strategy and setpoints have to be set prior to starting.

Fixing Faceplates

In the top left-hand corner above the overview line there is a button that can be used to "pin" the faceplate in order to prevent a change in area. The button looks like this:

 Not pinned (once the faceplate has been called)

 Pinned (once the button has been pressed)

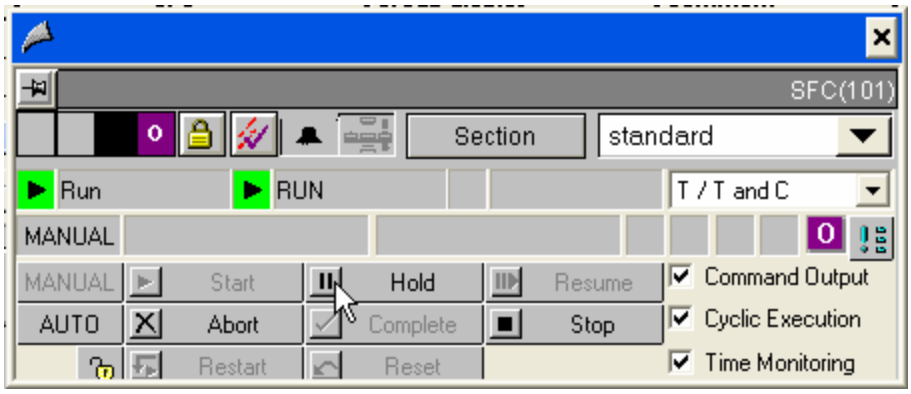
Once pinned, a faceplate will remain pinned until it is closed, i.e., pressing the button again will have no effect.

Note:

- When you open the faceplate, the "Prepared Values" view (Idle or MANUAL mode) or the "Actual Values" view (in all other operating states) is displayed depending on the current operating state of the SFC.
- When a faceplate is open, a change in the operating state does not automatically change the view.

3.3 SFC chart faceplate, "Standard" view

"Standard" View



SFC chart faceplate, "Standard" view

The faceplate contains the following:

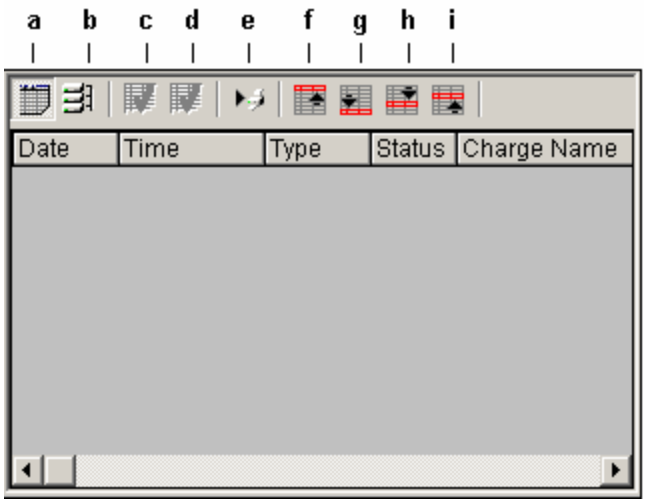
- The overview line with the elements for the group display, message acknowledgment, message suppression, batch assignment and selection of the views.
- Control and display section of the SFC

You can find the meaning of the boxes and buttons in the description of the "SFC Instance" Faceplate, "Actual Values" View under **1** and **2**.

3.4 "SFC Chart" Faceplate, "Messages" View

"Messages" View

This view contains the elements of the "Standard" view plus the message window.



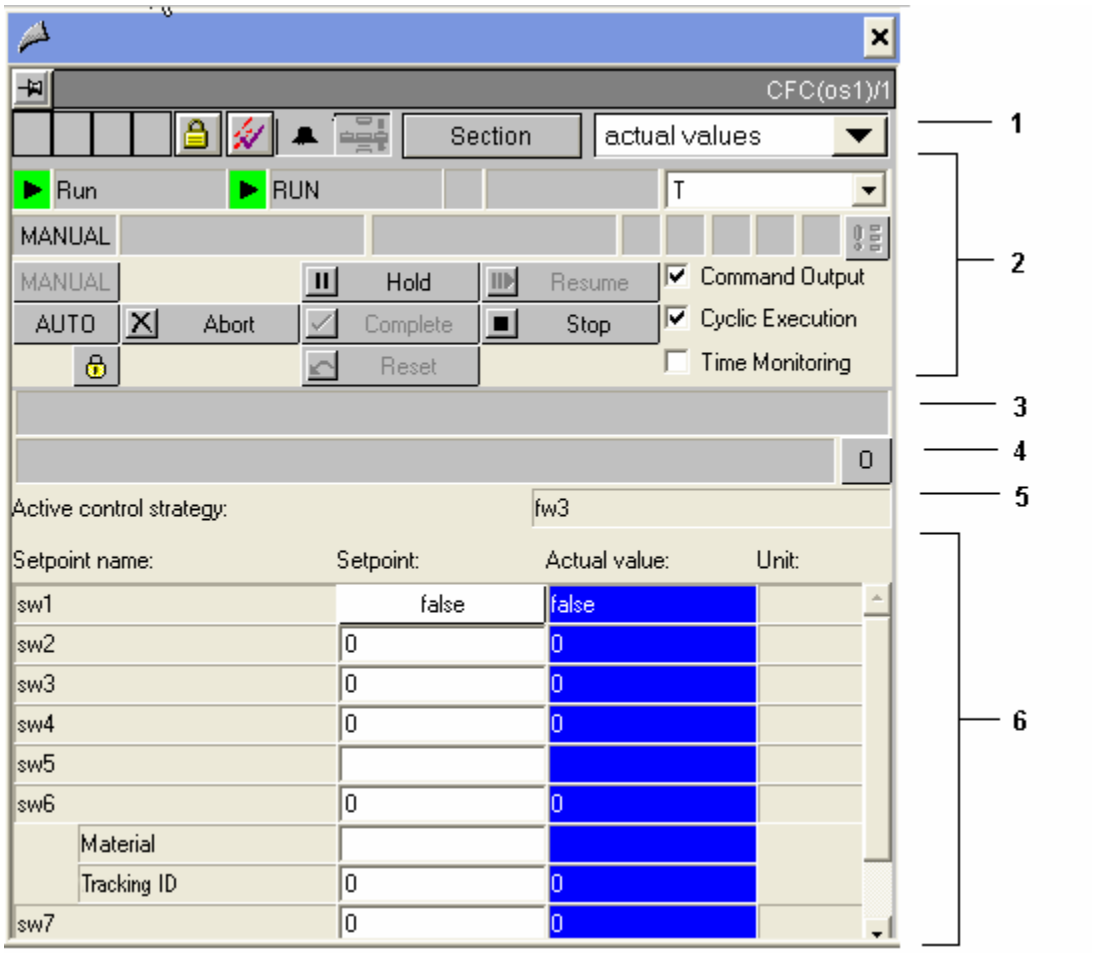
Message window in the SFC chart faceplate

Meaning of the buttons:

a	Display message list
b	Display long-term archive
c	Acknowledge single message
d	Acknowledge all visible messages
e	Print page log
f	Display first message
g	Display last message
h	Display next message
i	Display previous message

3.5 "SFC Instance" Faceplate, "Actual Values" View

"Actual Values" View



SFC instance faceplate, "Actual Values" view

The following are displayed (from left to right):

- **1:** Overview line:
  - PCS 7 group displays: Alarm, warning, sequence step error, operator prompt
    The symbol operator prompt  is also displayed here when the displays  or  are available.
  - Lock/enable messages
  - Message acknowledgement
  - Message suppression
  - Batch assignment (shows if a faceplate is assigned to BATCH)
  - SFC display (section / overview)
  - View selection
- **2:** Control and display section of the SFC:

  First row:
  - Status display and SFC operating status label
  - Status display and name of the active sequencer
  - Status display and name of the held sequencer
  - Field with drop-down list for displaying and changing the switching modes

  Second row:
  - The current operating mode (MANUAL / AUTO)
  - "CONT" (continuous operation) status flag for bumpless changeover, for example, when restarting an SFC to avoid having to switch it off first. Display if output QCONT = 1.
  - Status display "READY T.C." (ready to complete), if the SFC is not self-terminating (SELFCOMP = 0) and it is waiting for the "Complete" command while in Active state (display if READY_TC=1).
  - Sequencer status display following CPU startup,

    startup with consistent data  or startup with inconsistent  data
  - The  display for an interconnection error (or empty box)
  - The  display for an operator error (or empty box)
  - The  display for a step error (or empty box)
  - The  display for an operator prompt (or empty box)
  - The  button for group acknowledgement

Buttons:

- For selecting "MANUAL" or "AUTO" mode
- For enabling changeover to "AUTO"  .
-  Start (only active in the "Prepared Values" view)
-  Hold
-  Resume
-  Abort
-  Complete
-  Stop
-  Restart
-  Reset

The **check boxes** for enabling and disabling the execution options, "Instruction output", "Cyclic execution", "Time monitoring".

- **3:**

  The **position text** is for displaying the current position within the sequencer. It consists of a number and an assigned text. The text is displayed in the SFC faceplate.

- **4:**

  The **note text** contains information for the operator. The operator can acknowledge this text with the "O" button.

- **5:**

  The line shows the **active control strategy**. The control strategy cannot be changed here. The control strategy can only be selected in the "Prepared Values" view.

- **6:**

  The **setpoints** and **actual values** assigned to the selected control strategy are displayed in this table.

  - **Setpoint name**
    A setpoint can consist of more than one value. In the example picture, the "sw6" setpoint has the additional values "Material" and "Batch ID".
  - **Setpoint**
    The current setpoints are displayed here. The setpoints can be edited if the "Actual values view enabled" option is selected when configuring the properties of the control. The configured upper and lower limit values are also shown during editing.
  - **Actual value**
    The values of the actual value output are displayed here.
  - **Unit**
    The unit labels are displayed here.

3.6 "SFC Instance" Faceplate, "Prepared Values" View

"Prepared Values" View

The view is identical to the "Actual Values" view. You can change the **control strategy** and the **setpoints** here.

The changes made in this view are applied the next time you start the sequencer.

Note

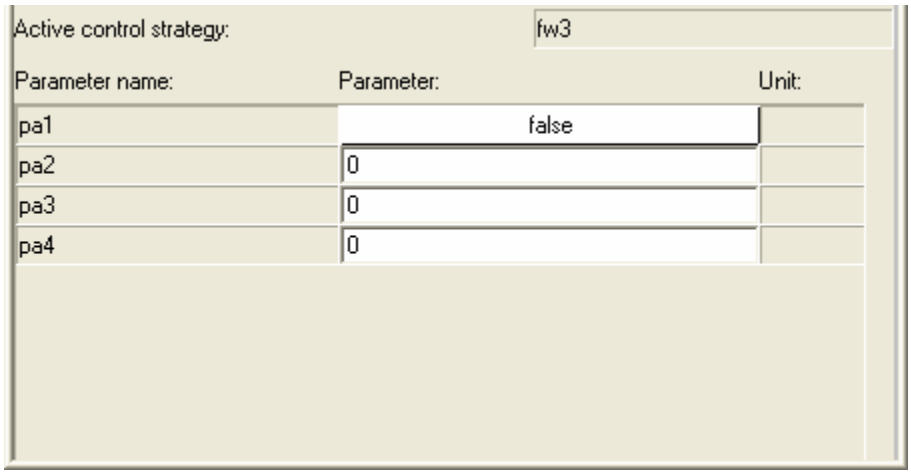
You can only ever start an SFC instance in the faceplate in the "Prepared Values" view.

This is most important if control strategies or setpoints are being used, because a control strategy and setpoints have to be set prior to starting.

3.7 "SFC Instance" Faceplate, "Parameters" View

"Parameters" View

This view contains the elements of the "Actual Values" view as described under **1** and **2** (see there). Instead of the elements listed under **6**, the window shows the active control strategy and the OS-relevant parameters.



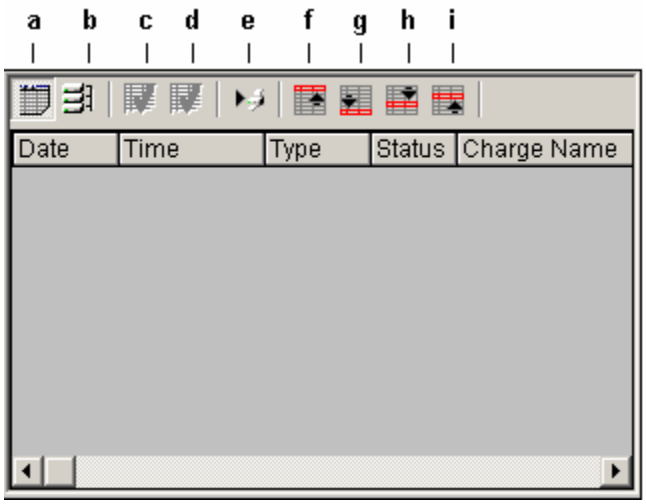
Changing Parameters

You can change the value of a parameter in MANUAL or AUTO operating mode if you have been assigned the relevant permissions. The changed parameter is written to the AS immediately, i.e., at first, it is only effective in the CPU. To make changed values available in offline data in the ES also, you need to run a read-back at the specified time. Otherwise, the next time a complete download is performed, the original parameter values configured will be written to the CPU.

3.8 "SFC Instance" Faceplate, "Messages" View

"Messages" View

This view contains the elements of the "Actual Values" view as described under **1** and **2** (see there). Here, the message window is displayed instead of the elements listed under **3** to **6**.



Message window in the SFC instance faceplate

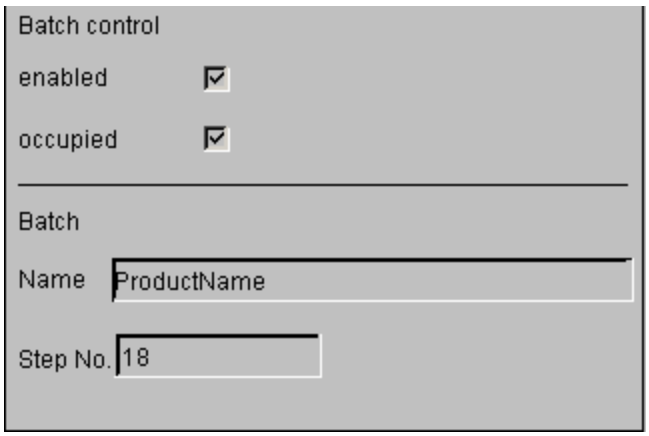
Meaning of the buttons:

a	Display message list
b	Display long-term archive
c	Acknowledge single message
d	Acknowledge all visible messages
e	Print page log
f	Display first message
g	Display last message
h	Display next message
i	Display previous message

3.9 "SFC Instance" Faceplate, "Batch" View

"Batch" View

This view contains the elements of the "Actual Values" view as described under **1** and **2** (see there). Here, the batch window is displayed instead of the elements listed under **3** to **6**.



Batch window in the SFC instance faceplate

Meaning

- "Batch control" box:
  - The "Enable" option shows if the SFC is enabled for BATCH.
  - The "Assigned" option shows if the SFC is assigned to BATCH ("Assigned" can only be set if "Enable" is also set).
- "Batch" box:
  - "Name" shows the current product name from BATCH
  - "Step" shows the current step number from BATCH

3.10 Operator Control and Monitoring of the SFC by Means of the SFC Status Display

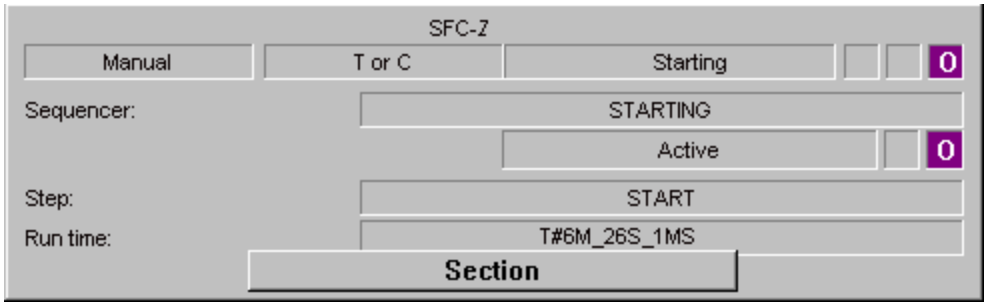
SFC Status Displays

You obtain an overview of the SFC status (PCS 7 SFC Control) when you select a graphic display that contains a status display configured for the SFC. In the case of "PCS 7 SFC MultiChart Control", you can monitor multiple SFCs and also change certain parameters.

- PCS 7 SFC Control
- PCS 7 SFC Multichart Control

3.11 PCS 7 SFC Control

PCS 7 SFC Control



The following current information is displayed:

Heading	• Name of the assigned SFC (chart or instance name) ***)**	
1. Line	• Mode (MANUAL / AUTO)	
	• Abbreviation for the step control mode ("T", "C", "T and C", "T or C", "T/T and C").	
	• SFC status (chart or instance); Additional information about this is available in the Table of the Operating States.	
	• Status in the CPU	
	CPU stop	
	CPU start with consistent data	
	CPU start with inconsistent data	
	• Group display for step error (if it exists, otherwise empty).	S
	• Group display for operator prompt (if it exists, otherwise empty).	0
2. Line	• Name of the active sequencer	

3. Line	• Operating state of the active sequencer; Additional information about this is available in the Table of the Operating States.	
	• Display for step error "S" (if it exists, otherwise empty).	
	• Display for operator prompt "O" (if it exists, otherwise empty).	
4. Line	• Step: Name of the first ****)** active step.	
5. Line	• Runtime: Current runtime of the first ****)** active step.	
	• Button for the SFC display: "Overview" or "Section".	

***)** If the text ## Initialization error ## is displayed instead of the name, this SFC control is assigned to an SFC that has been deleted in WinCC.
If the SFC still exists in the AS project, you can recompile the OS to transfer the SFC back to the WinCC data management. Otherwise, you assign another SFC chart to the SFC control.

****)** Several steps can be active at the same time in a simultaneous sequence.

You change to the detailed view of the SFC by clicking the "Section" button (as configured in this example), or you change to the overview display, if the "Overview" button is configured.

If "S" is displayed, the "Properties" dialog box for the step opens.
If you click on "S", the detailed view of the SFC opens and centers the active step with the error acknowledge button.
If "O" is displayed, the "Properties" dialog box of the transition opens.
If you click on "O", the overview display of the SFC opens and centers the active transition with the acknowledge button of the operator prompt.

3.12 PCS 7 SFC MultiChart Control

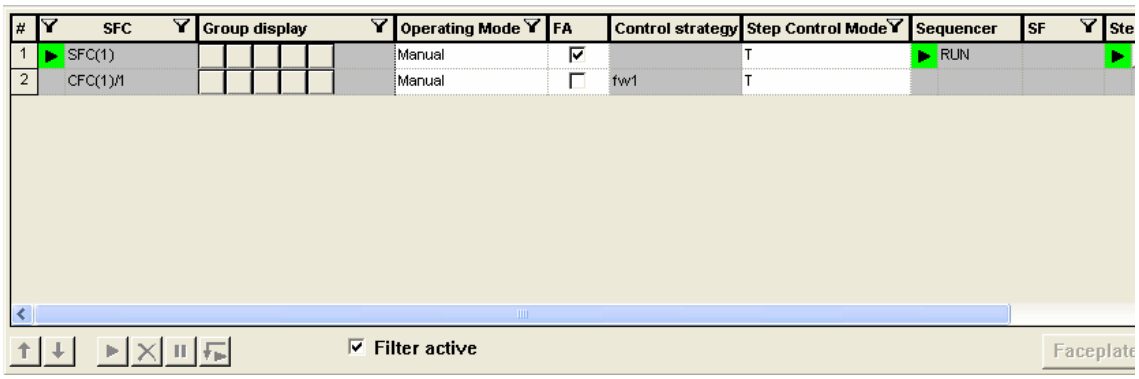
PCS 7 SFC MultiChart Control

The SFC multichart control enables operator control and monitoring of multiple SFCs.
The control is provided with a scroll bar because it cannot be displayed in its configured length. The #, SFC, and group display columns are always visible, regardless of the scroll bar position.

The first view shows the section with the scroll bar on the left, the second with the scroll bar on the right.

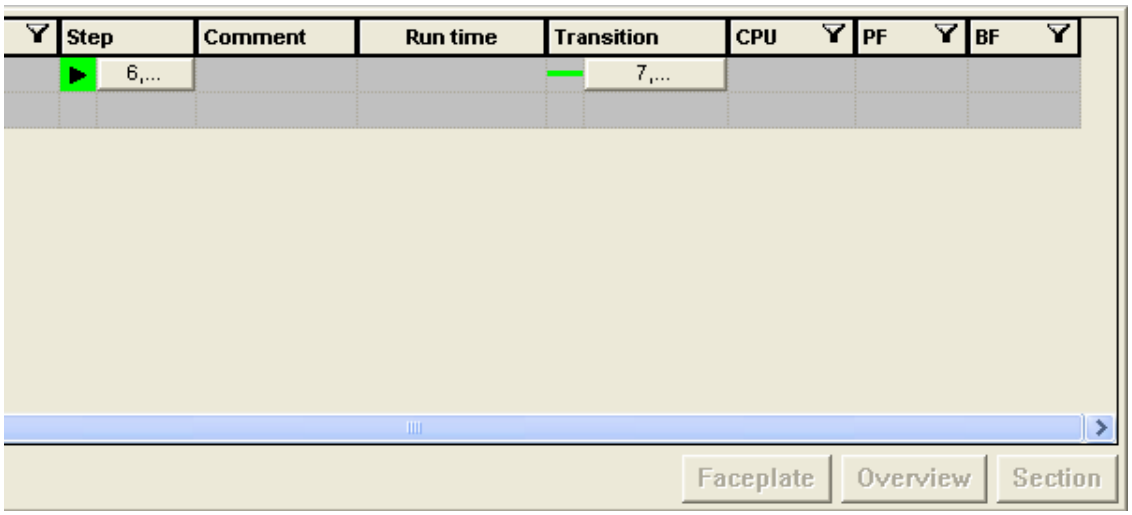
Note

You can only start an SFC instance with control strategies or setpoints in the faceplate in the "Prepared Values" view, because a control strategy and setpoints have to be set prior to starting.



Section on the left

Columns	Contents		Function
#	Line Number		Display for sorting
SFC	Name of the SFC (including naming element of the PH)		Double-clicking this name opens the overview display for the SFC.
	Icon for the operating state; you can find additional information about this in the Table of Operating States.		Display
Group display	Group display for messages, in accordance with the configuration in SFC (e.g., alarm, warning, step error, operator prompt, locked). Displays 3 and 4 are set by default.		Display
	Step error	S	
	Operator prompt	O	The symbol is also displayed when the displays  or  are available.
Operating Mode	"AUTO" or "MANUAL" mode		Allows changeover of the operating mode by means of a selection in a drop-down list box.
EA - Enable Auto	Check box for enabling changeover to "AUTO" mode		Allows setting or resetting of the enable.
Control Strategy	SFC instances: Name of current control strategy		
Step Control Mode	Abbreviation for the step control mode ("T", "C", "T and C", "T or C", "T/T and C")		Allows changeover of the step control mode by means of a selection in a drop-down list box.
Sequencer	Name of the current sequencer.		Display
	The icon of the operating state (of the sequence) is indicated in front of the name of the active sequence. See Table of Operating States.		Display
SF	"Step error" display	S	Display



Right section

Columns	Contents		Function
Step	Name of the first active step.		Clicking this name opens the detailed view of the SFC with the active step centered.
	Icon for the step status		Display
	INACTIVE not executed		
	INACTIVE, running		
	ACTIVE		
	HELD		
	ERROR		
Comment	Comment of the first *) active step		Display
Run Time	Runtime of the first *) active step		Display
Transition	Name of the first **) active transition		Clicking this name opens the detailed view of the SFC with the active transition centered.
	Symbolic display of the result (colored line)		
CPU	Status in the CPU		
	CPU stop		Display
	CPU start with consistent data		
	CPU start with inconsistent data		
PE	Display for parameter assignment errors (if any exist, otherwise empty box)		Display
OE	Display for operator errors (if any exist, otherwise empty box)		Display

*)	Several steps can be active at the same time in a simultaneous sequence.
**)	Several transitions can be active at the same time in an alternative sequence.

Buttons

- Buttons for filter settings appear in the column headings. Click the filter symbol  to open and close a dialog. The following filter settings are available for selection:
  - SFC: Operating status and SFC display
  - Group display: Message class displays
  - Operating Mode
  - Step control mode: Step control modes
  - Step error: Step error on/off
  - CPU: Stop and restart
  - PE: Parameter error on/off
  - OE: Operator error on/off
- A selected line can be moved up or down one line at a time by clicking the  or  button.
- You use commands to control a selected SFC chart.
  The  buttons (inactive here) have the following function (from left to right):

   Start or Resume,  Abort,  Hold,  Restart.
- You open a selected SFC with the "Section" or "Overview" buttons in the selected display.

Note on the Display

- If a line containing only the SFC name is shown in light gray in the SFC multichart control, then this SFC is no longer in the WinCC data management. It is deleted here and was not transferred during the most recent OS compilation.
  Remedy: If the SFC still exists in the AS project, recompile the OS to transfer the SFC back to the WinCC data management. Otherwise you have to assign another SFC to the line in the SFC multichart control or delete the line.
- Line selections are discarded after approximately 30 seconds.
- If you click on a column heading, you can sort the table rows in ascending or descending order. The sorting order is based on the alphabetical order of the symbol names (such as aborted, completed, idle, held, run).
- If you change the sorting during runtime operation, the change is not permanent. The next time you select the picture, the configured display mode is restored.

3.12.1 Icons of Operating States

SFC Operating States

Icon	State	Meaning
	Aborting	Processing after "Aborting" command.
	**Aborted**	Processing in "Aborting" state completed, waiting for "Reset" or "Start" command.
	**Run**	Processing after completion of the processing in the "Starting" state.
	**Held**	Processing in "Held" state completed, waiting for "Resume" "Abort" or "Stop" command.
	Held (Error)	Processing in "Error" state completed, no error pending; waiting for "Resume" "Abort" or "Stop" command.
	Holding	Processing after "Hold" command.
	Completing	Processing after "Complete" command or after implicit complete.
	**Completed**	Processing in "Completing" state completed, waiting for "Resume" Start or "Abort" or "Stop" command.
 (empty)	**Idle**	Processing in initial state; waiting for "Start" command.
	Error	Processing after "Error" command.
	Error (Completing)	Processing after "Error" command in the "Completing" state.
	Resuming	Processing after "Resume" or "Starting" command.
	Resuming (error)	Processing after "Resume" or "Starting" command.
	Stopped	Processing in the "Stopping" state completed; waiting for "Start" or "Reset" or "Abort" command.
	Starting	Processing after "Start" or "Restart" command.
	Stopping	Processing after "Stop" command.
Only operating states displayed in **bold** letters apply to sequencers.		

3.13 Visualization of the SFC Status by Means of an SFC Selection Button in the Button Set or an SFC Browser Selection in the Display

Introduction

You can also visualize and control the status of an SFC in the runtime system as described below.

Procedure

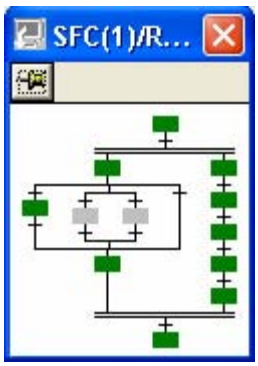
1.  Click this button in the button set, or click an object configured in the picture to selects the SFC browser.

   The SFC browser opens with a list of all SFCs (also the SFCs of servers in the case of an OS client).

   Select an SFC from the list and click "OK" to visualize the SFC.

2. Click the desired SFC name.

   Depending on the setting in WinCC Explorer, the selected SFC is displayed in an overview or a detailed window. In the following example, the SFC is displayed in the **overview window**. The SFC is always displayed in full in the overview window. Exception: Very large charts are maximally displayed on half the screen and have a scroll bar.
   If an active sequence is present, it is displayed. Otherwise, the first sequence is displayed.

   When the overview window is open, the current status of the SFC is displayed in color. The assignment of the colors to the respective states can be user-configured and is applied globally to all SFC in WinCC Explorer.

   The button for the user-specific session log appears to the left of the title bar. The saved position is retained until it is overwritten by a new save operation.

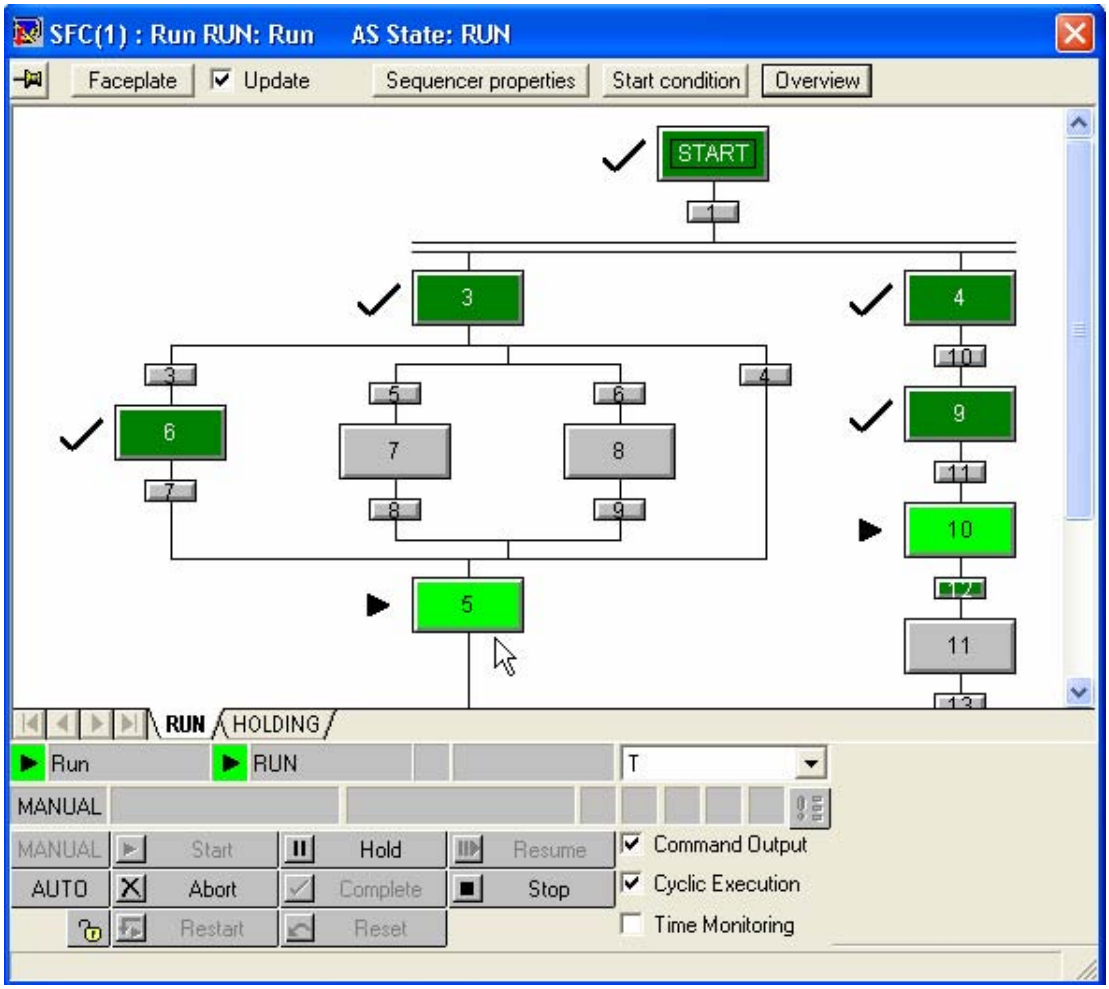
   An information bar below the title bar shows the name of the currently active step. This bar is empty if no step is active, for example, following execution of the SFC.

3. You open a section of the SFC by clicking the desired position in the overview window. The area around the click position is displayed in the detailed window. You can control this area by scrolling or scaling the detailed window.

   The SFC windows are displayed in the working area and are always on top.

3.14 Information and Operator Inputs in the Detailed Window

The Detailed Window



Information in the Title Bar

The title bar of the detailed window has the following form:

- **Session log**

  The button for the user-specific session log appears to the left of the title bar:

Icon	Meaning
	Current position and size not saved, e.g., following the shifting of the window to a new position.
	Current position and size saved. The next time the SFC is opened, the window will show the last position saved.

  The saved position and size are retained until they are overwritten by a new save operation.

- **Status information:**

  <Plant hierarchy\\SFC name> : <SFC status> <S> <O>
  <Sequence name> : < Sequencer status> <S> <O>
  AS status : <AS status>

  The individual components of the title bar reflect the respective circumstances.

You can find the possible states of the SFCs and sequencers in the table:
Icons of Operating States

The states of the AS have the following significance:

State	Meaning
STOP / Abort	• The connection to the AS is disrupted. • The AS is switched off. • The AS is in Stop mode, the connection to the AS is okay, the SFCs are being updated.
RUN	The AS is running, the connection to the AS is okay, the SFCs are being updated.

Information in the Window

If a step has been configured with acknowledgement information, this information will be displayed by the associated acknowledgement button in "Step-specific confirmation by operator (T/T and B)" step control mode. You can position the text anywhere you like in the window using the mouse (although it will remain linked to the button by a connecting line).

Operator Inputs

The following operator input options are available when the detailed window is displayed:

In the Edit Line Underneath the Title Bar:

- **Fix SFC Window**

  You can click the button in the left-hand corner to "pin" the SFC window and prevent a change in area. The button looks like this:

Icon	Meaning	
	Not pinned	(once the SFC window has been called)
	Pinned	(once the button has been pressed)

  Once pinned, an SFC window will remain pinned until it is closed, i.e., pressing the button again will have no effect.

- **"Faceplate" Button**

  Use this button to call up the corresponding SFC faceplate.
  For additional information, see: Operator Control and Monitoring of SFC Faceplate

- **"Update" Option**

  If the box is checked, when a sequence changes, the window will automatically switch to the latest sequence.

- **"Sequence Properties" Button**

  Use this button to open the dialog containing the object properties for the current sequence.
  For additional information, see: "Properties" Dialog Box for the Sequence

- **"Start Condition" Button**

  Use this button to open the dialog containing the start conditions for the current sequence.
  For additional information, see: "Properties" Dialog Box for the Start Condition

- **"Overview" Button**

  Use this button to switch to the overview display.

In the Window:

A step error is represented by a button  to the left of the step symbol. An operator prompt (not with "T") appears when you click  to the left of the transition symbol. After clicking on the button (or ) and the process is continued, the buttons hidden again.

Along the Bottom Edge of the Window:

If the SFC contains several sequencers, you can switch between them using the tabs at the lower edge of the detailed window.

In the Control and Display Section:

- Setting the Operating Mode
- Setting the Operating State and Acknowledging
- Setting the Step Control Mode
- Setting the Execution Options
- Acknowledging Operator Prompts and Step Errors

A description of the views is available in the section SFC Instance Faceplate, "Actual Values" Views

3.15 Setting the Operating Mode

Setting the Operating Mode

By setting the operating mode, you specify how the execution of the SFC is be controlled.

The SFC recognizes the following operating modes:

- AUTO (process mode) - the execution is controlled automatically.
- MANUAL (operator mode) - the execution is controlled by the operator.

You switch from "MANUAL" to "AUTO" as follows:

- With an enable, using the enable button  .
- Without an enable, if the operator has the required authorization (authorization level AUTO / MANUAL: "Process control".

You switch from "AUTO" to "MANUAL" as follows:

- With an enable for the SFC on the AS and the corresponding authorization (AUTO / MANUAL, operator process control)
- Without an enable with the corresponding operator authorization (authorization level "MANUAL without enable": "Higher-order operator process control".

Note: To ensure that an operator cannot switch an SFC from AUTO to MANUAL mode, for example, both operator inputs (changeover with or without enable) can be assigned an authorization that the operator does not possess.

Alternatively, you can also block just the changeover without enable by assigning an appropriate authorization. The changeover with enable is provided with an authorization that is assigned to the operator. However, the enable is issued and revoked with a corresponding control setting in the ENMAN input for the SFC in the AS.

The changeover is either permitted or refused, and different messages will be displayed depending on the operator authorization and whether or not the enable has been issued.

3.16 Setting the Operating State

Setting the Operating State

The commands in the control and display section (or in the PCS7 SFC multichart control) enable you to set or modify the operating status of an SFC.

Button	Command	Meaning
	Start / Resume	With this command, you start the processing by changing to "Starting" state or you resume the execution by changing to "Resuming" or "Resuming (error)" state. Note: The "Resume" function associated with the "Start / Resume" button is only available in the multichart control. You use the "Resume" button in all other displays. In the detailed window or on the "Actual Values" page of the faceplate for SFC instances, the "Start" button is only enabled if neither the control strategy nor the setpoint s are configured. If they are configured, you start on the "Prepared Values" page of the faceplate because you have to assign a control strategy and the setpoints beforehand. If a step is marked as target step  , the target step of the active sequence is activated directly.
	Cancel	With this command, you cancel the processing by changing to "Aborting" state.
	Hold	With this command, you stop the processing by changing to "Holding" state.
	Restart	With this command, you restart the processing by changing to "Starting" state.
	The following commands are additional in the operation and display section of the cutout window and the faceplates:	
	Resume	With this command, you resume processing by changing to "Resuming" or "Resuming (error)" state.
	Exit	With this command, you complete the processing by changing to "Completing" state.
	Stop	With this command, you stop the processing by changing to "Stopping" state.
	Reset	With this command, you change to "Idle" state.

Additional Information

For more information, refer to the following sections:

- SFC Operating State Logic
- Operating State Logic for Sequencers

3.17 Setting the Step Control Mode

Setting the Step Control Mode

You use the step control mode to specify the step enabling behavior of the sequential control system. The step control mode changes the behavior of prepared or fulfilled transitions.

A button is displayed for a pending operator prompt in all step control modes, except for "T", if the user is authorized to make operator inputs.

You can switch the step control mode in all operating states.

You set the following step control modes in this combo box 

:

Step control mode	Meaning
T	Transition: The sequential control system is process-driven (running automatically). When a transition is fulfilled, control is passed by disabling the predecessor steps and enabling the successor steps.
C	Confirmation by operator: The sequential control system is controlled exclusively by the operator. The transitions do not need to be fulfilled. An operator prompt is set for all successor transitions of each active step, and the next step is enabled after the operator input.
T and C	Transition **and** confirmation by operator: The sequential control system is process-driven and operator-controlled. When the successor transition of an active step is fulfilled, an operator prompt is set and the next step is enabled only after operator input has been made.
T or C	Transition **or** confirmation by operator: The sequential control system is process-driven or operator-controlled. An operator prompt is set for each successor transition of an active step, and the next step is enabled after operator input is made. If the transition is fulfilled before the operator prompt is acknowledged, the next step is enabled without operator input (automatically).
T / T and C	Step-specific confirmation by operator: The "Confirmation" label is set or reset on a step-specific basis in the "Properties" dialog box for the step. The sequential control system runs in the following modes: • **Process-driven** for steps **without** the "Confirmation" label. Each fulfilled successor transition of an active step without "confirmation" enables the next step without operator intervention (corresponds to step control mode "T"). • **Operator-controlled** for steps **with** the "Confirmation" label. If the successor transition of an active step with "confirmation" is fulfilled, an operator prompt is set and the next step is enabled after operator input (corresponds to step control mode "C").

Note on Minimum Run Time:

The operator can shorten the minimum run time of the step in step control modes "C" and "T or C" by intervening sooner.

3.18 Setting the Execution Options

Setting the Execution Options

The execution options influence the behavior of the sequential control system. The individual execution options can be combined. The following execution options can be set in the runtime system:

- Instruction output
- Cyclic execution
- Time monitoring

Execution options	Meaning
Instruction output	With ☑ instruction output "on", the actions of the active steps are executed. With ☐ instruction output "off", the actions of the active steps are not executed.
Cyclic execution	With ☑ cyclic execution "on", execution is resumed automatically with "Starting" state after "Completed" state. A sequence that is to be processed in "Completed" state is exited again immediately in cyclic execution. Only the start step and final step are processed. With ☐ cyclic execution "off", the sequential control system remains in "Completed" state. As long as no command to exit this state is issued, the "Completed" state is processed cyclically on a continuing basis. Note: This applies to all states that can be exited only by means of commands.
Time monitoring	With ☑ time monitoring "on", the active time of each step being processed is compared with the maximum run time. If the maximum run time is exceeded, a step error is signaled to WinCC. In addition, an acknowledgement button for this step error is displayed in the SFC chart. With ☐ time monitoring "off", the active time and maximum run time are not compared.

3.19 Acknowledging Operator Prompts and Step Errors

Acknowledging Operator Prompts and Step Errors

The group acknowledgement button  enables you to acknowledge all pending operator prompts and step errors together without having to acknowledge them one at a time (using the "S" and "O" buttons for steps and transitions, respectively).

Note

In case of a step runtime error, the step is returned to the state which it had before the error occurred (active = "green", for example) after the error has been acknowledged.

3.20 "Properties" Dialog Boxes

"Properties" Dialog Boxes

The "Properties" dialog box displays the details of a sequence, step or transition. This dialog box shows information specific to the selected object (sequence/step/transition).

The dialog boxes for steps and transitions are displayed separately or in a combined display. In the combined display, the dialog box for the step includes the properties of the successor transition. In this case, the title bar also contains the name of the transition.

The combined display is shown when you click "Transition >>" in the properties for the step. You return to the step-only display by clicking on the "Step <<" button.

The information shown is identical in both display variations. The only difference is in the arrangement of the buttons.

In addition to the standard SFC buttons, the SFV properties dialogs feature two buttons for the "Loop in Alarm". The button on the left is assigned to the left-hand address and the button on the right to the right-hand address.

Display:

	When no operand is selected or an operand belongs to a block that has no faceplates.
	When an operand is selected and the operant belongs to a block that has a faceplate.

Automatic Trace

When you select the **Update** option, you enable the automated trace function. This displays the current properties based on the execution in the chart when the next step is enabled. The properties of the respective active step or active transition are displayed.

If the active step or active transition is outside the displayed window section as the chart is being executed, the chart is automatically moved in the window. The chart is moved in such a way that the step or transition being monitored is in the window section. The objects that are currently being monitored are shown highlighted in the chart.

Note: The automatic trace works even when no property window is open. It is then automatically positioned to the active sequencer and active step.

The following descriptions of the "Properties" dialog boxes is based on the separate display of step and transition.

- "Properties" Dialog Box for the Sequence
- "Properties" Dialog Box for the Start Condition
- "Properties" Dialog Box for the Step
- "Properties" Dialog Box for the Transition

3.20.1 "Properties" Dialog Box for the Sequence

"Properties" Dialog Box for the Sequence

Select the detailed window for the SFC in which you want to display the "Properties" dialog box of a sequencer.

Click "Sequencer Properties" in the control section to open the dialog box.

Note

You can open a separate dialog box for the start conditions with the "Start Condition" button.

"General" Tab

In this tab, you see the following:

- Name of the current sequencer
  The box is framed; the frame color indicates the result/state of the transition and is continuously updated.
- Comment of the sequencer
- Priority of the sequencer
  The priority decides which sequencer of an SFC is started when the start conditions of several sequencers are met simultaneously.

Note

If sequencers with identical start conditions also have the same priority, the sequencer furthest left in the chart will be started first.

"Preprocessing"/"Postprocessing" Tab:

In this tab, you see the actions for preprocessing or postprocessing the current sequencer.

These actions are executed as follows during cyclic execution of the SFC:

- Before the execution of the sequencers (preprocessing)
- After the execution of the sequencers (postprocessing)

3.20.2 "Properties" Dialog Box for the Start Condition

"Properties" Dialog Box for the Start Condition

In this dialog box, you see the conditions that cause the sequencer to start.

The values and conditions of the sequencer are displayed the same way as the transition.

For additional information, see:
"Properties" Dialog Box for the Transition

3.20.3 "Properties" Dialog Box for the Step

Procedure

Select the detailed window for the SFC in which you want to display the "Properties" dialog box for a step.

Click the desired step to open the dialog box.

"General" Tab

The run times, the "Confirmation" option, the comment and the step status are disabled in the "General" tab.
If no values were configured for the run times (time = 0), the respective boxes show "- - -".

The **step state** is displayed as text in the title bar and indicated by the corresponding icon to the left of the comment box in the dialog box.

State	Meaning	Symbol normal	Symbol with target step
INACTIVE, not running	The step was not being processed previously	n.a.	
INACTIVE running	This step is no longer being processed		
ACTIVE	The step is being processed.		
HOLD	The step has been held.		
ERROR	The step is in error state (timeout).		

"Initialization", "Processing", "Termination" Tabs

This tab shows the configured assignments for the individual actions of the step.

Operator Inputs in the "Properties" Dialog Box for the Step

The following operator inputs are possible in the dialog box:

- Closing the dialog box with the "Close" button
- Acknowledging a step error with the "S" button
- Selecting the previous or next active step with the "S <-" / "-> S" buttons
- Displaying the properties of the successor transition with the "Transition >>" button
- Option: Setting ☑ / resetting ☐ "Target step"

  If you set the "Target step" option, the current step is selected as the target step. The ▶ selection is made to the left of the step). You cannot set the target step when the sequence is in "Active" state. This means the following:

  - The next time you start, the inactive sequencer starts at the selected target step instead of the initial step.
  - The next time you press the "Resume" button, the "held" sequencer resumes at the target step after the interrupted steps have been processed properly.

  The target step remains selected until the next time you start or resume. The selection is cleared if you restart the CPU or change from "MANUAL" to "AUTO" operating mode.

  Note:

  You can select multiple steps as the target step (in simultaneous sequences, for example). You are responsible for selecting a suitable target step. Blockades or endless loops in the execution prevent efficient processing.

  If you use "programmed target steps", the target steps specified by the operator are deleted in the respective sequencers.
- Option: Setting ☑ / resetting ☐ "Update" This switches automatic tracing on or off.

3.20.4 "Properties" Dialog Box for the Transition

Procedure

Select the detailed window for the SFC in which you want to display the "Properties" dialog box for a transition.

Click the desired transition to open the dialog box.

The following is displayed:

- The Boolean operators of the transition logic
- The boxes of the comparison values (left and right)
- The boxes of the conditions (middle)

The dialog box consists of the following parts:

- Two pages with a total of 16 lines for the conditions
- A three-level transition logic

On the first page there are 2 x 5 conditions linked with the Boolean operators.

On the second page there are an additional 2 x 3 conditions.

An "arrow" button is located on the last operator. You use this to turn the pages.

The results of the Boolean logic operations for the conditions are visualized as colored connecting lines of varying thickness. A broad, green line means "fulfilled", a thin, red line means "unfulfilled" and a thin, black line means "inactive".

Transition State

State	Meaning	Color
INACTIVE	The transition is not being processed.	Gray
NOT SATISFIED	The transition condition is not satisfied.	Dark red
SATISFIED	The transition condition is satisfied.	Dark green

Operator Inputs in the "Properties" Dialog Box for the Transition

The following operator inputs are possible in the dialog box:

- Closing the dialog box with the "Close" button
- Confirming the operator prompt with the "O" button
- Selecting the previous or next active transition with the " T <- " / " -> T " buttons
- Option: Setting ☑ / resetting ☐ "Update" This switches automatic tracing on or off.

3.21 Messages

General

The following messages are generated during execution of an SFC in the AS:

- Operator prompts for transitions
- Step errors
- Status messages relating to the SFC status

Only the step error messages require acknowledgment.

Generation of Process Messages

The messages are generated generically. Mechanisms are stored with the messages that enable you to directly access the SFC that the message pertains to. If a picture does not appear in the block list, the corresponding SFC faceplate will be opened.

If you insert an SFC status display in a graphic display, the messages of the associated SFC are entered in the hierarchy of the group display.

Process Messages in the Runtime System

The WinCC message system archives the messages for operator prompts for transitions and step errors and displays them.

From the message system, you can open the detailed window of the associated SFC for an SFC message and the "Properties" dialog box for the relevant step and transition (button: "Loop In Alarm").

Operating Messages in the Runtime System

When you are controlling the process of an SFC, a message is generated for each operator input and entered into the operation list.

3.22 Operating State Logic

3.22.1 Operating State Logic for SFC (SFC OSL)

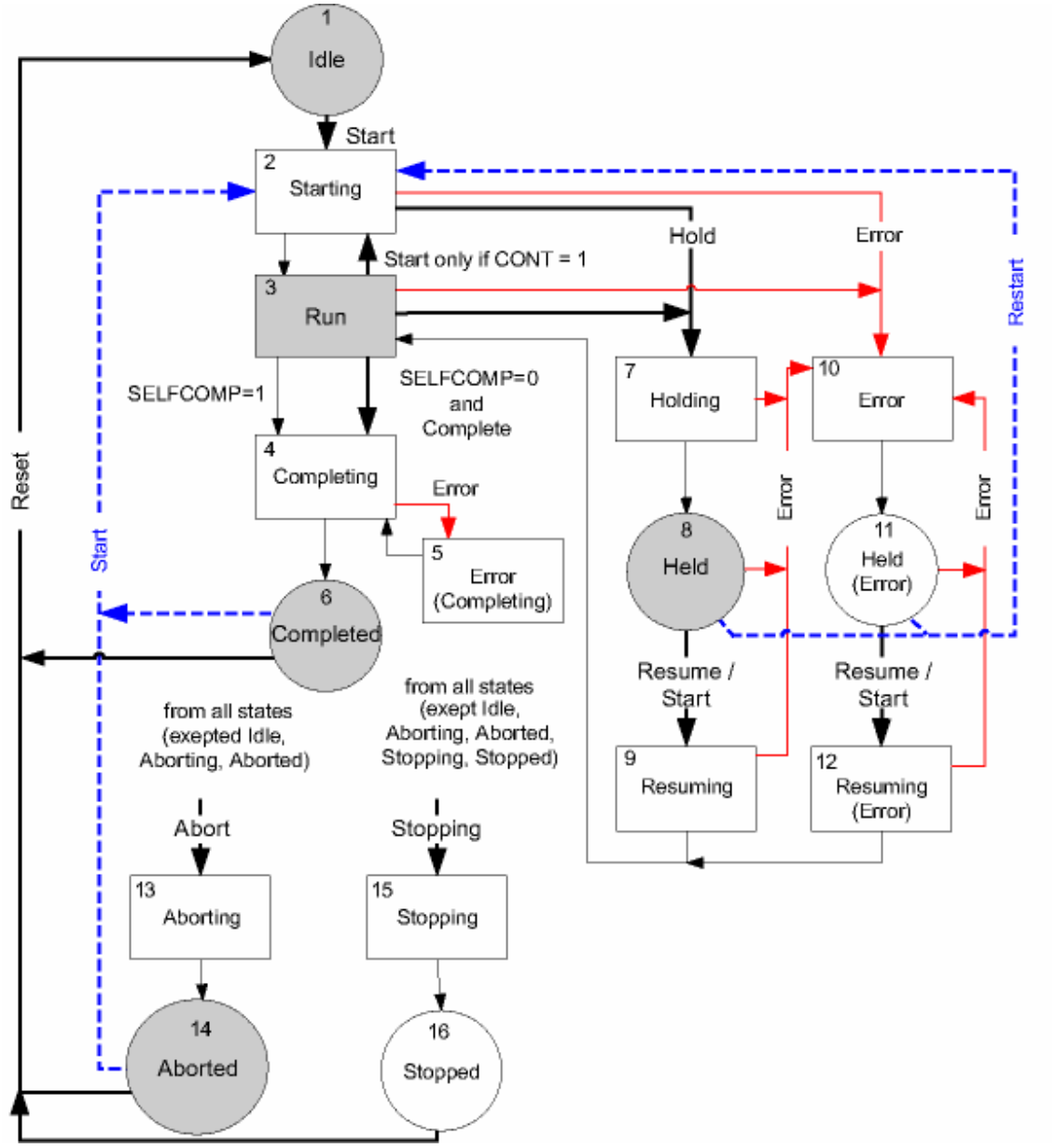
Introduction

The current operating state of the SFC OSL can be changed by the following events:

- Commands (Start, Resume, Hold, etc.) in operating modes "MANUAL" or "AUTO"
- External signals (inputs of the SFC, commands from another SFC, etc.)
- Internal signals (commands from own sequencers, from test mode or SFC Visualization)
- Implicit state change

The SFC-OSL diagram

The operating state logic of an SFC is defined by the diagram of the state changes:



Key

	States that are exited as a result of events
	Transitional states that are exited implicitly
	States taken from OSL for SFC V5
	Events: commands / conditions / external signals / internal signals
	Event: error
	Implicit transitions that are triggered by SFC when the active sequence has been completely processed or there is no sequence to process

Notes on the Diagram

The SFC OSL contains some state changes that were retained to ensure compatibility with older projects. These are displayed with **dashed blue lines** in the diagram.

The **numbers** in the diagram identify the individual operating states. The operating states are described in the following table:

Operating States (SFC OSL)

Nr.	State	Meaning
1	Idle	Initial state; waiting for Start command.
2	Starting	Start processing after Start command.
3	Run	Normal processing after completion of start processing.
4	Completing	Termination processing after Complete command or implicit completion.
5	Error (Completing)	Error processing during termination completion.
6	Completed	Termination processing is complete; waiting for Reset or Start command.
7	Holding	Hold processing after Hold command.
8	Held	Hold processing is complete; waiting for Resume command.
9	Resuming	Continuation processing after Resume command.
10	Error	Error processing after an error has occurred.
11	Held (error)	Error processing is complete and no more errors are present; waiting for Resume command.
12	Resuming (Error)	Continuation processing after Resume command.
13	Aborting	Cancellation processing after Abort command.
14	Aborted	Cancellation processing is complete; waiting for Reset or Start command.
15	Stopping	Stop processing after Stop command.
16	Stopped	Stop processing is complete; waiting for Reset command.

The following table describes the transitions between the states (Source State No. / Destination State No.) as well as their triggers.

X = Possible from several states.

State Changes by Means of Commands (SFC OSL)

Source/Target	Command	Meaning
X/2	Start	Triggers start processing by changing to "Starting" state.
3/4	Exit	Triggers termination processing by changing to "Completing" state.
2/7 3/7	Hold	Triggers hold processing by changing to "Holding" state.
8/9 11/12	Resume	Triggers continuation processing by changing to "Resuming" or "Resuming (error)" state.
X/10 4/5	Error	Triggers error processing by changing to "Error" or "Error (completing)" state.
X/13	Abort	Triggers cancellation processing by changing to "Aborting" state.
X/15	Stop	Triggers stop processing by changing to "Stopping" state.
X/2	Restart	Triggers start processing by changing to "Starting" state.
X/1	Reset	Changes to "Idle" state.

3.22.2 Operating State Logic for Sequencers (Sequencer OSL)

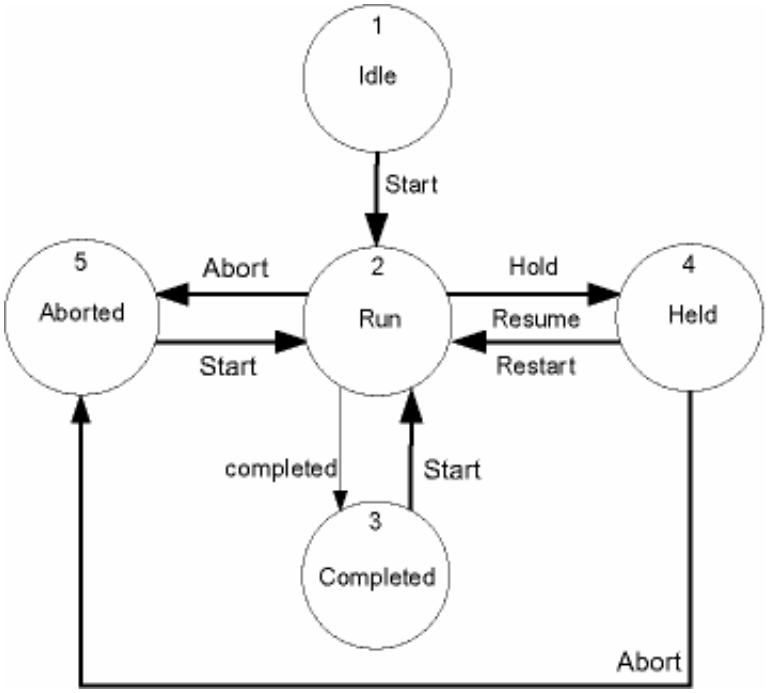
Introduction

The sequencer OSL controls processing of sequencers.

The operating state logic of the sequencer is defined by the diagram of state changes for sequencer OSL.

The sequencer OSL is executed independent of the SFC OSL when a sequencer is processed. This means that the sequencer has a state which differs from the SFC state. For example, the state of the SFC OSL can be "Holding", whereas the state of the sequencer OSL is "Active" - due to the processing of the sequencer to the "Holding" state. The execution of the sequencer OSL is subordinate to the SFC OSL. This means that the state change in the SFC OSL also results in a state change in the sequencer OSL.

Sequencer OSL Diagram



Key

◯	States that are exited as a result of commands or operator inputs
→	Operator commands
→	Implicit transitions that are triggered by SFC

States of the Sequencer OSL

Nr.	State	Meaning
1	Idle	Initial state Waiting for "Start" command.
2	Run	Normal processing
3	Completed	Normal processing is finished Waiting for "Reset" or "Start" command.
4	Held	Hold processing is performed. Waiting for "Resume" command.
5	Aborted	Cancellation processing is performed. Waiting for "Reset" or "Start" command.

State Changes by Means of Commands (Sequencer OSL)

The commands for the sequencer OSL are internal commands of the SFC runtime system, which are only available to the operator in test mode (menu command **Debug > Sequence Operation Commands > ...**).

The following table describes the transitions between the states (Source State No. / Destination State No.) as well as their triggers.

Source/ Target	Command	Meaning
X/2	Start	Triggers sequencer processing by changing to "Active" state.
2/4	Hold	Holds sequencer processing by changing to "Held" state.
4/2	Resume	Resumes sequencer processing by changing to "Active" state.
4/2	Restart	Restarts sequencer processing by changing to "Active" state.
X/5	Abort	Aborts sequencer processing by changing to "Aborted" state.

X = Possible from several states.

3.23 Operator Control and Monitoring via a Web Client

3.23.1 Running SFC Visualization on the Web Client

Introduction

The SFC visualization on the Web Client in first restricted in V7.0 to the operation of SFC block icons, SFC faceplates and SFC controls.

A further restriction: the "Section" button is not available for the faceplates.

Requirements for Using the SFC Block Icons and SFC Faceplates on the Web Client

Web Server:

- SFC Visualization is installed on the Web server
- The Web Navigator > Web Configurator command has been selected in the context menu of the Web Navigator node of WinCC Explorer on the Web server

Web Client:

- The relevant plug-ins are installed for SFC Visualization
  - WinCC Basic Process Control
  - WinCC Advanced Process Control
  - PCS 7 Faceplates
  - SIMATIC ES Common Services
  - SIMATIC SFC Common Displays
  - SIMATIC SFC Visualization

A Appendix

A.1 SFC System Variable

Overview

SFC Visualization requires the following variables for operator control and monitoring of SFCs:

Variable	Is required for...
<S7 Program>#AsRead	Reading data from AS <S7 Program>
<S7 Program>#AsWrite	Writing data from the AS <S7 Program>
@SFCDeltaLoaded	Downloading changes to the OS. As long as the variable has the value = 1, the data for the SFC visualization will be downloaded again from the ES.

A.2 SFC API Functions

SFC API Functions

BOOL SFCAbout(HWND projWnd, LPOHIO_ERRORSTRUCT lpdmError); Opens information about SFC Visualization (version information). Example: SFCAbout(NULL, (void*)0);
BOOL SFCSetProperties(HWND projWnd, LPOHIO_ERRORSTRUCT lpdmError); Opens the SFC "Properties" dialog box (read only) (dimensions, colors, authorization levels). Example: SFCSetProperties(NULL, (void*)0);
BOOL SFCSetChartProperties(HWND projWnd, LPCSTR chartName, LPOHIO_ERRORSTRUCT lpdmError); Opens the "Properties" dialog box for a chart or an instance (read only) (comment, last change, updating cycle, standard view). Parameters: chartName(in): SFC chart name/instance name Example: SFCSetChartProperties(NULL, "SFC1", (void*)0);
BOOL SFCOpenSection(LPCTSTR chartName, LONG left, LONG top, LONG width, LONG height, LPOHIO_ERRORSTRUCT lpdmError); Opens the specified chart or instance as a detailed window. Parameters: chartName(in): SFC chart name/instance name left(in), top(in), width(in), height(in): Pixel coordinates of the rectangle in which the SFC window can move Example: SFCOpenSection("SFC1", left, top, width, height, (void*)0);
BOOL SFCOpenOverview(LPCTSTR chartName, LONG left, LONG top, LONG width, LONG height, LPOHIO_ERRORSTRUCT lpdmError); Opens the specified chart or instance as an overview window. Parameters: chartName(in): SFC chart name/instance name left(in), top(in), width(in), height(in): Pixel coordinates of the rectangle in which the SFC window can move Example: SFCOpenOverview("SFC1", left, top, width, height, (void*)0);
BOOL SFCRtBrowser(LPCSTR* pChartName, LPCSTR* pTagName, LONG left, LONG top, LONG width, LONG height, BOOL alwaysOnTop); Calls up the runtime package browser and returns the selected chart or instance, if appropriate, with the server prefix, for example, "OS1_KH1234D::SFC1" Parameters: pChartName(out): SFC chart name/instance name pTagName(out): TagName (SFC chart name/instance name) (used for group display) left(in), top(in), width(in), height(in): Pixel coordinates of the rectangle in which the SFC window can move alwaysOnTop(in): 1, if the Browser is to always remain on top (recommended), otherwise 0 Example: SFCRtBrowser(&chartName, &tagname, left, top, width, height, 1);

BOOL SFCSaveWorkspace(LPCSTR pWsName); Saves all open SFC windows for a specific user under the workspace (desktop layout) "pWsName_user.SSM". Parameters: pWsName(in): Name of the desktop layout Example: SFCSaveWorkspace("TestLayout1");
BOOL SFCRestoreWorkspace(LPCSTR pWsName); Restores all the SFC windows saved using SFCSaveWorkSpace under the workspace "pWsName_user.SSM". Parameters: pWsName(in): Name of the desktop layout Example: SFCRestoreWorkspace("TestLayout1");
BOOL SFCDeleteWorkspace(LPCSTR pWsName); Deletes the specified workspace from the hard disk. Parameters: pWsName(in): Name of the desktop layout Example: SFCDeleteWorkspace("TestLayout1");
BOOL SFCCloseAllWindows(); Closes all open SFC windows. Example: SFCCloseAllWindows();
BOOL SFCGetStepName(LPCSTR pChartName, LONG stepnumber, LPTSTR pStepName, LONG length); (Function is only used with V5 projects) Provides the step name for the step number of a chart or instance. Parameters: pChartName(in): SFC chart name/instance name stepnumber(in): Step number pStepName(out): Step Name length(in): Maximum length of the step name
BOOL SFCGetStepNameV6(LPCSTR pChartName, LONG lSequenceNumber, LONG stepnumber, LPTSTR pStepName, LONG length); Provides the step name for the sequence number and step number of a chart or instance. Parameters: pChartName(in): SFC chart name/instance name lSequenceNumber(in): Sequence number stepnumber(in): Step number pStepName(out): Step Name length(in): Maximum length of the step name
BOOL SFCGetSequenceName(LPCSTR pChartName, LONG lSequenceNumber, LONG pSequenceName, LONG length); Determines the sequence name based on the sequence number. Parameters: pChartName(in): SFC chart name/instance name lSequenceNumber(in): Sequence number pSequenceName(out): Sequence name length(in): Maximum length of the sequence name

BOOL SFCGetChartProp(LPCSTR pChartName, LPTSTR pChartComment, LONG length); Determines the chart/instance comment. Parameters: pChartName(in): SFC chart name/instance name pChartComment(out): Chart comment length(in): Maximum length of the comment
BOOL SFCGetSequenceProp(LPCSTR pChartName, LONG lSequenceNumber, LPTSTR pSequenceComment, LONG length); Determines the sequence comment. Parameters: pChartName(in): SFC chart name/instance name lSequenceNumber(in): Sequence number pSequenceComment(out) Sequence comment length(in): Maximum length of the comment
BOOL SFCGetStepProp(LPCSTR pChartName, LONG lSequenceNumber, LONG stepnumber, LPTSTR pStepComment, LONG length); Determines the step comment. Parameters: pChartName(in): SFC chart name/instance name lSequenceNumber(in): Sequence number lStepNumber(in): Step number pStepComment(out): Step comment length(in): Maximum length of the comment
BOOL SFCGetPositiontext (LPCTSTR pChartName, long lNumber, LPTSTR pPositiontext, long length); Determines the position text for the position text number. Parameters: pChartName(in): SFC instance name lNumber(in): Position text number pPositionstext(out): Position text length(in): Maximum length of the position text
BOOL SFCGetNotetext(LPCTSTR pChartName, long lNumber, LPTSTR pNotetext, long length); Determines the note text for the note text number. Parameters: pChartName(in): SFC instance name lNumber(in): Note text number pNotetext(out): Note text length(in): Maximum length of the note text
BOOL SFCGetControlStrategyName(LPCTSTR pChartName, long lNumber, LPTSTR pControlStrategyName, long length); Determines the control strategy name for the control strategy number Parameters: pChartName(in): SFC instance name lNumber(in): Control strategy number pControlStrategyName(out): Control strategy name length(in): Maximum length of the control strategy name

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