zenon manual
Production and Facility Scheduler (PFS)

v.8.20

COPADATA

Contents

1 Welcome to COPA-DATA help

ZENON VIDEO TUTORIALS

You can find practical examples for project configuration with zenon in our YouTube channel (https://www.copadata.com/tutorial_menu). The tutorials are grouped according to topics and give an initial insight into working with different zenon modules. All tutorials are available in English.

GENERAL HELP

If you cannot find any information you require in this help chapter or can think of anything that you would like added, please send an email to documentation@copadata.com.

PROJECT SUPPORT

You can receive support for any real project you may have from our customer service team, which you can contact via email at support@copadata.com.

LICENSES AND MODULES

If you find that you need other modules or licenses, our staff will be happy to help you. Email sales@copadata.com.

2 Production and Facility Scheduler (PFS)

The Production & Facility Scheduler (PFS) allows executiong actions (e.g. changing of a variable's set value, executing a function) for a period of time or in a time grid.

PROJECT MANAGER CONTEXT MENU

Menu item	Action
New time model group	Opens the wizard for creating a new time model group.
New event	Creates a new event.

Menu item	Action
Editor profile	Opens the drop-down list with predefined editor profiles.
Help	Opens online help.

3 General

The optional module Production & Facility Scheduler (PFS) enables actions to be executed in relation to a specific period of time or according to a time model.
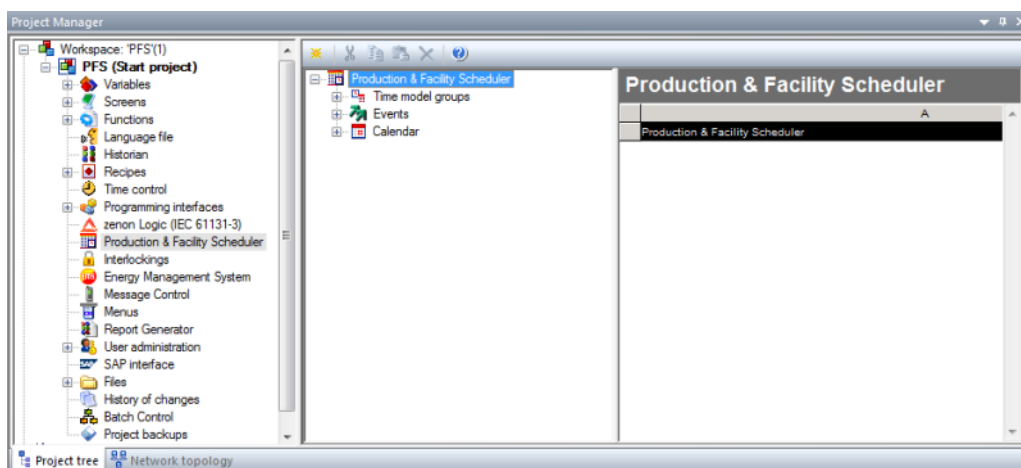
The PFS can be configured in both the Editor and Runtime environments. Configuration within the Runtime environment can be restricted by applying user rights. All configurations established in relation in the Runtime environment can be read back to the Editor; otherwise these configurations are specific.

All stated times are independent of time zone and daylight saving time and standard time.

<div>

💡 **Information**

If the project is not displayed after the Editor is started:

▸ open the menu **camera view**

▸ select the command **Project manager**

</div>

4 Toolbar and context menu PFS

Symbol	Description
Create	Depend on the selected element, a new element is created and the respective dialog is opened.
Cut	Cuts the selected element.
Copy	Copies selected element.
Paste	Pastes the element from the clipboard.
Delete	Deletes selected element
Help	Opens online help.

CONTEXT MENU

Menu item	Action
Save	Saves changes in the engineering of the PFS.
Undo	Rejects all changes since the last time the PFS has been saved.

Properties	Opens the dialog for configuring:
	    ▸ **Time change**
	    ▸ **Holidays**
	    ▸ **Table color**
	    ▸ **Record shift times**

Switching point preview	Opens the switching point preview dialog.
Filter criteria ...	Opens the dialog for selecting filters.
Help	Opens online help.

☀ **Information**

You can find explanations on context menus of individual elements of the tree and the table in the respective chapters especially in chapter Object types (on page 30).

5 Views in the Production Facility Scheduler

The visualization of the PFS is separated into two scopes: The hierarchical tree view (on page 10) on the left side and the table view (on page 10) on the right side.

5.1 Tree view

The tree view enables users to easily identify on which level an object is located, and to which element(s) it relates. The tree view's congruence is illustrated by level lines. This is important information as the behavior of objects depends on their relations.
A context menu, specifically related to each type of object, can be opened by right-clicking on the required object.

This area also enables users to copy, move and delete objects, provided that they are authorised to perform such operations.

5.2 Table view

The right-hand area of the PFS environment displays, according to the type of object selected in the tree view, the data related to the object. Some objects (e.g. schedules) can be configured in greater detail in this area, whereas other objects only enable users to display their current configuration, which cannot be modified here. For example: Events

If editing in the table is possible, you can access the necessary commands via context menus. So you can define the desired settings.

With some object types, users can also enter data directly into the table's cells e.g. times to be used in schedules.

6 Engineering with the Production and Facility Scheduler

In this section, we will proceed, step by step, to create a first PFS project; throughout this procedure, we will perform the following operations:

  ▸ Creating time model groups, models and schedules.

  ▸ Creating absolute and relative times using links to variables or functions.

  ▸ Creating and executing user-defined events.

  ▸ Using editing functions such as copying, moving and deleting.

  ▸ Linking schedules and models within the calendar.

  ▸ Checking over the created configuration using the switching point preview mode.

▶   Creating schedules in relation to the Runtime environment.

You should be familiar with creating projects, variables, functions, frames and screens. In this regard, only descriptions of the settings directly related to the PFS will be provided in the following section. If you need more information on these basic functionality, please refer to the appropriate chapter in the documentation.

🔆 Information

Labels in lists such as calendar, schedules, events etc, are always displayed in the language the project was created.

6.1   Task description

The task we must create is set as follows: a factory workshop (Hall I), containing two production lines (Line I and Line II) running on a shift from 06.00 to 18.00, must be heated, and its lighting system switched on and off. The heating needs a pre-heating time of 2 hours for line I and 1 hour for line II, where production line I has to be heated to 83° and production line II to 45°. If there is no production, heating should go down to 20°. Lights should be switched on 10 minutes earlier or switched off 10 minutes later. The production shift's start or end, as well as the various breaks' start and end, are signalled by a six-second horn tone. A break is scheduled for 15 minutes at 9.00, lunch break is scheduled for one hour at 12.00, and another break is scheduled for 15 minutes at 15.00. Production takes place 5 days a week; no production is scheduled on holidays or weekends. This workshop is located in Austria. Every 6 hours, the waste water pump must be activated for 30 seconds.

6.2   Step 1: Preparation

In this step, we will carry out some preparatory tasks prior to configuring the PFS. We will create a project, a driver is implemented and the necessary variables for our example are created.

1. Create a new project named **PfsSample** in a new workspace.

2. In the context menu of the project, go to **Runtime files** ->**Runtime changeable files...**.

3. Deselect the **Do not generate and transfer** checkbox for the PFS. This way, any changes made to the PFS in the Editor will be recompiled; changes made in the Runtime environment will however be lost.

4. Deselect the **Do not decompile** checkbox for the PFS. Changes made in the Runtime are transferred to the Editor with decompiling.

5. Integrate the simulation driver. Accept all settings of the configuration.

6. Create the following variables:

    ▶   HD-Bit; Offset 10; Bit 0; Name: Horn

> ▸ HD-Bit; Offset 10; Bit 1; Name: Light I

> ▸ HD-Bit; Offset 10; Bit 2; Name: Light II

> ▸ HD-Bit; Offset 10; Bit 3; Name: Waste water pump

> ▸ HD-Word; Offset 11; Name: Heating P I

> ▸ HD-Word; Offset 12; Name: Heating P II

7. Activate the PFS by clicking on the appropriate node in the project manager. The empty PFS workspace should now be displayed on the screen.

8. Enlarge the main window. To do this, move the border of a view area with the mouse button held down.
Note: An enlarged display area within the main window proves very useful when configuring the PFS.

6.3   Step 2: Settings Production and Facility Scheduler

In this step, we will configure parameters that apply to the whole of the PFS environment. To determine the appropriate holidays, the country in which the current PFS project is executed must be selected.

1. Right-click on the **Production & Facility Scheduler** entry in the detail view.

2. Select **Properties**.

   The dialog for configuring properties is opened.

3. Switch to to the Holidays tab.

4. Select the desired country in the list.
   In our example: *Austria*.

5. Click on **OK**.

The dialog is closed and the national holidays are applied.

6.4   Step 3: Create time model groups

In this step, we will create a new time model group, and configure it according to our requirements.

In this case, Hall I will be designated as the time model group, as this hall requires specifically designed models (refer to time model object). Whenever several different models are required for one same calendar day, you will be required to divide a project into several different time model groups.

Expand the main **Production & Facility Scheduler** node. You should now see 3 additional entries. **Time model groups**, **Events** and **Calendar**

Right-click on the **Time model group** entry to open the context menu, and click on Create. The **Time model group properties** page of the time model group is now displayed. The **Label** field remains empty, as we are creating a new time model group.

Type *Hall I* in the **Name** field - i.e. the new time model group name. The time model group's designation (i.e. label) must be unique throughout the whole of the PFS environment. In this particular case, we are quite sure it is.

The Start of day (00:00:00) and End of Day (23:59:59) parameters can remain as such. These statements define the time model group's cycle for one full day.

Note: With this definition of a complete day, the creation of night shifts is not possible, because the end time of the shift does not occur until another day. This is not possible however, because the defined time model group cycle is only applicable for one day. An error message is issued.

Once you have made sure that the time model group designation is valid, click on **OK** to save these settings and create the new time model group.

You can now see a new entry has appeared under the **Time model group** header, called **Hall I**; this entry contains two further entries: **Schedules** and **Time models**.

6.5   Step 4: Create model

Models are required to define relative times, and contain all the shift and break time information.

Select **New time model** in the **Time models** context menu.

A new time model, named **time model 0**, has now been created. When it appears on screen, this entry automatically switches to "Rename" mode, as the presence of the input field reveals. Rename the entry to **Workday**. Confirm the new name by pressing on the Enter key or by clicking outside the input field. Click twice (but don't double-click!) on **Working day** label to switch the time model back to "rename mode". You can also do this by selecting the **Rename** item in the relevant context menu. The designation provided must be unique throughout all of the time model group.

6.6   Step 5: Create shifts and breaks

Shifts are a decisive element in the process of defining relative switching times. This consideration not only concerns relative events such as **Shift start** and **Shift end**, but also the identification of production start and production end times.

Select the top cell in the **Shifts/Breaks** column. To create a new shift, select the **Create shift** context menu item. Be sure to provide a unique designation for the new shift. We name the shift **1**. With the tab key or the mouse we move to the column **Start time**. Our shift should start at 06:00:00 a.m. and last until 06:00:00 p.m. So as a **start time** we enter 06:00:00 and as an **end time** 18:00:00.

Shifts are displayed on a grey background, whereas breaks are displayed as white areas.

Our working forces fortunately also get to take some breaks throughout the day, which we shall now define. To do so, select a cell from a line within the shift, and open the relevant context menu. To define a new break, select the **Create break** menu item. We shall call this new break **Morning**. We want our first break to start at 09:00:00 and end at 09:15:00.

We shall now proceed to create the lunch break. Designation: Lunch break; start: 12:00:00; End: 1:00:00 PM

There remains one break, namely the afternoon break, which we have yet to create. Name: Afternoon; start: 15:00:00; End:

Our model named **Working day** should now be configured as follows:

CREATION OF NIGHT SHIFTS

Prior configurations are necessary in order to be able to create night shifts.

The defined time model group cycle must be amended in order to be able to accept sufficient shifts over a day.

Engineering:

1. Define the time model group cycle as described in the Create time model groups (on page 12) chapter.

    Example: Define the start of the day as 06:00:00 and the end of the day as 05:59:59. This setting makes it possible to have the **switch-off time** of the night shift considered as 05:59:59, i.e. not before the **switch-on time** of the shift at 22:00:00.

2. Create the desired **shifts/breaks** as described above.

6.7   Step 6: Define holiday model

As no production takes place on bank holidays - whereas such holidays can occur on any day between Monday and Friday -, holidays require the use of a specific model. This model is very simple, as it contains no shifts. In this situation, you should always remember that a model related to a special day has priority over default models used for "usual" Monday-to-Sunday weeks. The emphasis lies on "default models". To briefly explain this, let us simply say that single-day allocations have a higher priority level than special days. A model which does not comprise any shifts possesses the same priority level as a day to which no models are linked.

As described in step 4, create a model named Holiday. No shifts whatsoever are to be defined in this model.

6.8   Step 7:   User-defined event Horn Tone duration

We shall now configure the project in order to make a horn sound for 6 seconds, both at the start of shifts and breaks as well as at the end of shifts and breaks. This six-second horn tone can be defined very efficiently by means of a user-defined event.

What is a user-defined event? User-defined events are in fact relative switching times, which are special owing to the fact that they can be defined by the user proceeding to define the project. A user-defined event is triggered by calling up the **PFS - execute user-defined event** function. As a result of this, the time of the function call will be entered as a trigger for the user-defined event. The actual execution of the event will then occur, according to any offset value you may have configured.

Now that we have broached the principle, let us proceed to the creation. Right-click on the **Event** entry to open the context menu, then create a new event by clicking on the **Create item**. The event is created with the name **user-defined event 0** and is in rename mode. We are already familiar with this from the time model. Change the event's designation to Horn Tone duration. The event's designation must be unique throughout the whole of the PFS environment.

Go to function administration and add the **PFS - execute user-defined event** function to the **Horn Tone duration** user-defined event.

6.9   Step 8: Thoughts about schedule structure

The task we have been given comprises two production lines, which we shall show in separate schedules. At the same time however, some tasks will be identical for both lines. On both lines, the lights must be switched on 10 minutes before the shift starts, and be left on for 10 minutes after the shift has ended. This will be represented in an additional, upper-level schedule. Here, we'll make good use of the program's capacity to hand times from previously defined schedules down to subsequent schedules. However, only the switching point in fact remains identical here, as each production line is equipped with its own lighting system. The waster water pump must also be activated, and this will follow in the additional upper-level schedule.

After this, we will still need to configure the horn. This configuration is identical on both lines, since only one horn equips both halls; hence, this will be treated in the additional upper-level schedule.

Hall schedule. Hall designation. We must configure the horn, the waste water pump and the lighting system's timing.

Schedule for Line I: Additional lower-level Hall schedule. Designation for Line I; lights must be switched on and off. Set temperature.

Schedule for Line II: Additional lower-level Hall schedule. Designation for Line II; lights must be switched on and off. Set temperature.

Now that we have established these principles, we shall create the schedules themselves.

6.10 Step 9: Schedule for the hall

The first schedule we must create contains the switching points for Hall I. In addition, it also contains all the switching times, which must be identical in the additional lower-level schedules.

Let us start by creating our first schedule. In order to do so, expand the **Production & Facility Scheduler**, **Time model group**, **Hall I** branches in the tree view so that the **Schedule** entry located near time model group **Hall I** is visible. Right-click on the **Schedule** entry to open the appropriate context menu, and click on the **Create item**. The various schedule-related settings are now displayed on screen. In the field **Name** specify the schedule name Hall. The schedule should now be active (i.e. the checkbox **Activate schedule** checkbox should be selected), and should not be defined as a structure schedule (the **Structure schedule** checkbox should not be selected).

We must be able to execute the **Horn Tone duration** user-defined event. To do so, this function is added to the functions used in the schedule. Right-click on the **Function list** entry to open the appropriate context menu, and click on the item **Add function**. Apply the previously-defined function **PFS - execute user-defined event [Horn Tone duration]**. This function shall now be added to the schedule's list of functions, and can be used as of now.

In addition, we want to create and save the variables **Horn** and **Waste water pump**, which will serve to activate the horn and waste water pump. To do so, we must add these variables to the schedule-specific list of variables. Open the relevant context menu, and click on the item **Add variable**. The list of variables that then appears on screen enables you to add the required variables; to do so, double-click on a variable in the list of available variables, or select a variable before clicking on the **Add** button.

Once you have defined these actions, your schedule should be configured as follows.
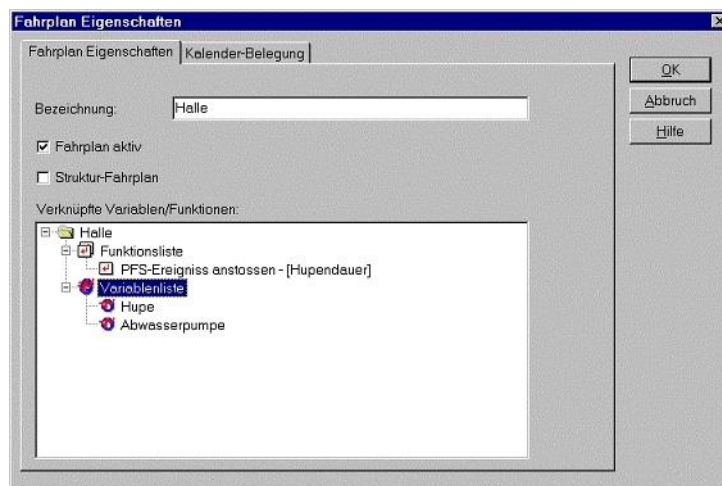
6.11 Step 10: Thoughts about the times

Times serve to define the point in time for the execution of switching points. Two different types of time are available:

Absolute time: this type requires you to directly provide a specific time. The switching point is executed at this time or not. The time of the execution does not change. Execution will only be withheld if the schedule or the switching point have been deactivated, or if the schedule has not correctly been linked to the day. This type of time is ideal when an execution time has been categorically defined.

Relative time: In this case, the effective execution time depends not only on the configured type of event, but also on the way models are positioned in the calendar, on the type of day (standard day or holiday), and a number of other factors. The execution conditions are described in detail in the Time types section. In short, the time of execution depends on a number of other factors, hence the "relative" denomination. The advantage in using this type of time is that, in the event where a reference needs to be modified, all related execution times will be updated automatically. However, there is also one disadvantage which users should bear in mind. Owing to the fact that the execution time is not directly displayed, times defined using this time type cannot be supervised as easily as absolute times. The switching point preview mode however provides a solution to this problem.

So, which time types should we use to meet the requirements of our task? To answer this question, let us briefly consider how and why various actions should be carried out or various elements switched on/off.

First of all, the horn. It should sound for 6 seconds whenever shifts and breaks start or end. The start of the horn tone is directly related to each shift or break. We know when the shifts or breaks start and end. Thus, it should be possible to use these times directly. However, if the shift changes, these times must also be amended. It is even the case that times that depend on this (switching of the horn) must also be amended. This can be the cause of quite a few mistakes. By using the relative times **Shift start**, **Shift end**, **Break start** and **Break end**, any necessary adjustments will be performed automatically. To obtain a 6-second horn tone, we shall apply a 6-second offset to our user-defined event, which will define the horn deactivation.

The light of the production line is also directly dependent on the shift. It is therefore executed as **shift start** and **shift end**.

The temperatures of the production line are also directly dependent on the shift.

The waste water pump is to be activated at specific intervals - every 6 hours, for 30 seconds. There is no specific relation to the shifts or breaks. Therefore, absolute times are definitely recommended here.

Now that we have analyzed the various execution times, we can proceed to the configuration itself.

6.12 Step 11: Times for the schedule Hall

We shall start by creating the starting time for the waste water pump operation. To do so, select the cell in the first row in the **Type of time** column. We use the **Create time grid** context menu item to open a dialog for the creation of a time grid. Once you activate the checkbox **As cyclic time**, the additional fields are activated.
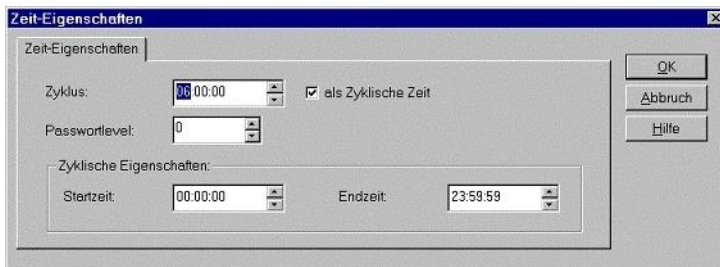
Fill in the required fields in the dialog according to the screen capture above. With our settings four absolute times are created. Midnight, 6:00 a.m., noon and 6:00 p.m.

30 seconds after activation, the pump must be switched off. Therefore, we shall now define another 4 switching times, applying, as we do so, a 30-second offset to the times we have already set. To obtain this offset, specify 00:00:30 as a start time.

We shall now proceed to configure the horn. Right-click on the table view to open the relevant context menu, and select **Create time**. A new absolute time period has now been created. However, we now require a relative time. Switch over to the Type of time column in the same line, and change the time type to Relative. Now, if you change back to the column **Time**, the time indication disappears, and a list box containing the available relative events is activated. Select **shift start**. The offset value remains 0, as the horn must be activated immediately at the start of the shift. The horn must not only announce shift starts, but should also sound at shift ends, break starts and break ends. Therefore, create 3 additional relative times with the matching relative events. The horn should be switched off 6 seconds after being activated. To configure this, add a relative time with the relative event **Horn Tone duration** to the list. **Horn Tone duration** is the user-defined event we previously defined. Specify a 0.1 minute offset, i.e. 6 seconds. This value defines the horn tone duration.

We shall now deal with the heating issue. Create 2 relative times; for the shift start, use offset values of -120 and -60 respectively.

We are still missing the activation times for the lighting system. Create 2 relative times - for the shift start, use an offset value of -10, and for the shift end, use an offset value of 10.

Zeittyp	Uhrzeit	Offset	Aktiv	Verknüpfungstyp	Verknüpfungen
Absolute Zeit	00:00:00	0,00			
Absolute Zeit	00:00:30	0,00			
Absolute Zeit	06:00:00	0,00			
Absolute Zeit	06:00:30	0,00			
Absolute Zeit	12:00:00	0,00			
Absolute Zeit	12:00:30	0,00			
Absolute Zeit	18:00:00	0,00			
Absolute Zeit	18:00:30	0,00			
Relative Zeit	Pausenende	0,00			
Relative Zeit	Hupendauer	0,10			
Relative Zeit	Pausenbeginn	0,00			
Relative Zeit	Schichtende	0,00			
Relative Zeit	Schichtbeginn	-120,00			
Relative Zeit	Schichtende	10,00			
Relative Zeit	Schichtbeginn	-10,00			
Relative Zeit	Schichtbeginn	-60,00			
Relative Zeit	Schichtbeginn	0,00			

Caption: Zeitansicht: Halle

6.13 Step 12: Switching points schedule Hall

We have used times to define moments at which events are executed, and must now define what will actually happen at the specified time. This is what switching times are used for.

Let us begin with the waste water pump. Select the absolute time **00:00:00**. In the context menu, click the **Create switching point** entry. A new line is added just after the selected time; this line represents the switching point. Switching points contain the following columns: Active, Type of link, Links, Action and Password. Let us take a quick look at these fields.

Active: This field enables you to deactivate a switching point. You can use it to block a switching point's execution.

Type of link: This field specifies if a variable must be modified, for instance, or if a function must be performed. The other types of links are broached in the Switching point object section.

Links: According to the selected type of link, this field enables users to select the required variable or function.

Action: When the Variable link type is selected, this field contains the set value which must be written. When dealing with functions, this field is just as important as the Active field.

Password: Enables specific permissions to be requested for the configuration of the Runtime environment.

We shall now proceed to define the switching point. The currently-selected column is **Type of link**. Select the **Variable** item from the combobox. Now, change to the column **Links**. Select the **Waste water pump** from the list box. Now, change over to the column **Action**. In this column, specify a value of "1". This means that at 00:00:00, the set value will be set to 1 for the Waste water pump variable.

Now, create the following switching points, proceeding as described above:

- 12:00:30 AM Variable: Waste water pump; Set value: 0

- 6:00:00 AM Variable: Waste water pump; Set value: 1

▸ 6:00:30 AM Variable: Waste water pump; Set value: 0

▸ 12:00:00 PM Variable: Waste water pump; Set value: 1

▸ 12:00:30 PM Variable: Waste water pump; Set value: 0

▸ 6:00:30 PM Variable: Waste water pump; Set value: 1

▸ 6:00:30 PM Variable: Waste water pump; Set value: 0

We shall now deal with the horn. As you recall, we have defined a number of relative times for the horn.
Shift start offset 0, Shift end offset 0, Break start offset 0, Break end offset 0 and Horn Tone duration offset 0,1.
Two switching points must be executed for the horn tone start and end, respectively. The first switching point activates the horn. The second switching point triggers the user-defined event **Horn Tone duration**.
The relative time **Horn Tone duration** must then deactivate the Horn. So, let us proceed to create the required switching points. Unlike the waste water pump configuration above, this configuration uses 4 different times, thus requiring several switching points. For instance, for the time **Shift start offset 0** we could activate the Create switching points function twice consecutively. However, a more convenient solution is provided. To do this, select the time **Shift start Offset 0**. In the context menu activate **Add switching points**. The program now displays the Create switching points dialog. Select the **PFS Event [Horn Tone duration]** function and the **Horn** variable. Then click on **Add** to effectively add these to the results list. After you have clicked on **OK**, two switching points using the relevant Type and Link parameters will be created. You must still set the set value to 1 for the switching point variable **Horn**.
Now, use the same method to define the switching points for the relative times Shift end, Break start and Break end. We shall now create the final switching point for the horn by defining for the relative time **Horn tone** a switching point which will sets the variable **Horn** to 0.

Tabellenansicht: Halle

	Zeittyp	Uhrzeit	Offset	Aktiv	Verknüpfungstyp	Verknüpfungen	Aktion	Passw
-	Absolute Z	00:00:00	0,00					
				☒	Variable	Abwasserpumpe	1	0
-	Absolute Zeit	00:00:30	0,00					
				☒	Variable	Abwasserpumpe	0	0
-	Absolute Zeit	06:00:00	0,00					
				☒	Variable	Abwasserpumpe	1	0
-	Absolute Zeit	06:00:30	0,00					
				☒	Variable	Abwasserpumpe	0	0
-	Absolute Zeit	12:00:00	0,00					
				☒	Variable	Abwasserpumpe	1	0
-	Absolute Zeit	12:00:30	0,00					
				☒	Variable	Abwasserpumpe	0	0
-	Absolute Zeit	18:00:00	0,00					
				☒	Variable	Abwasserpumpe	1	0
-	Absolute Zeit	18:00:30	0,00					
				☒	Variable	Abwasserpumpe	0	0
	Relative Zeit	Schichtende	10,00					
	Relative Zeit	Schichtbeginn	-10,00					
	Relative Zeit	Schichtbeginn	-60,00					
-	Relative Zeit	Schichtbeginn	0,00					
				☒	Funktion	FS-Ereigniss anstossen - [Hupendaue	Aktiv	0
				☒	Variable	Hupe	1	0
-	Relative Zeit	Pausenende	0,00					
				☒	Funktion	FS-Ereigniss anstossen - [Hupendaue	Aktiv	0
				☒	Variable	Hupe	1	0
-	Relative Zeit	Hupendauer	0,10					
				☒	Variable	Hupe	0	0
-	Relative Zeit	Pausenbeginn	0,00					
				☒	Funktion	FS-Ereigniss anstossen - [Hupendaue	Aktiv	0
				☒	Variable	Hupe	1	0
-	Relative Zeit	Schichtende	0,00					
				☒	Funktion	FS-Ereigniss anstossen - [Hupendaue	Aktiv	0
				☒	Variable	Hupe	1	0
	Relative Zeit	Schichtbeginn	-120,00					

> 💡 **Information**
>
> A decimal value can be entered with a colon as well as with a point, the decimal point will automatically be changed to a point.

6.14 Step 13: Schedule line I

When we previously considered the facility's structure, we decided to deal with the temperature and lighting system in additional, lower-level schedules.

We shall now create the schedule for Line I. To do so, select the **Hall** schedule in the tree view. Open the context menu and select **Create** to activate the Schedule Properties dialog, as we have already discussed. The **Name** should be Line I, and we shall not add any variables to the contents already provided. This section will provide the opportunity to learn about the subsequent modification of variable and function links.

For the new schedule **Line I**, select **Variable list** in the tree view. Use the context menu and **Add variable** to link the variables **Light I** and **Heating P I** to the schedule.

If schedule **Line I** is selected, all times defined in previous schedules are displayed on a gray background in the table. Times displayed on a grey background identify times that have been "inherited" from previously defined schedules. If a previously defined item is altered in the "parent" schedule, times in the "child" schedules will be updated automatically.

We shall now define the switching times for the Temperature and Lighting system elements. The process is the same as that for schedule **Hall**.

Tabellenansicht: Linie I

	Zeittyp	Uhrzeit	Offset	Aktiv	Verknüpfungstyp	Verknüpfungen	Aktion	Passwor
	Absolute Zeit	00:00:00	0,00					
	Absolute Zeit	00:00:30	0,00					
	Absolute Zeit	06:00:00	0,00					
	Absolute Zeit	06:00:30	0,00					
	Absolute Zeit	12:00:00	0,00					
	Absolute Zeit	12:00:30	0,00					
	Absolute Zeit	18:00:00	0,00					
	Absolute Zeit	18:00:30	0,00					
·	Relative Zeit	Schichtende	10,00					
				☒	Variable	Licht I	0	0
·	Relative Zeit	Schichtbeginn	-10,00					
				☒	Variable	Licht I	1	0
	Relative Zeit	Schichtbeginn	-60,00					
	Relative Zeit	Schichtbeginn	0,00					
	Relative Zeit	Pausenende	0,00					
	Relative Zeit	Hupendauer	0,10					
	Relative Zeit	Pausenbeginn	0,00					
·	Relative Zeit	Schichtende	0,00					
				☒	Variable	Heizung P I	20	0
·	Relative Zeit	Schichtbeginn	-120,00					
				☒	Variable	Heizung P I	83	0

6.15 Step 14: Schedule line II

Create a new schedule, named Line II, with the identical purpose of managing switching points.

6.16 Step 15: Thoughts about calendar allocation

Times defined in schedules are not related to any dates; these relations will be defined by allocating the times to days in a calendar. This allocation process must be carried out separately for absolute and relative times. Allocations can be carried out for each separate time model group.

6.16.1 Absolute times

When dealing with absolute times, the linking of the schedule to specific calendar days is decisive. In this case, the following types of links are supported:

Use schedule on this day.
Do not use schedule on this day.
Use schedule on this holiday.
Use schedule on weekdays.

6.16.2 Relative times

When dealing with relative times, the allocation of a model to a day is as decisive an aspect as the shifts defined within the model. The following types of links are supported:

▸ *Use model on this day*

▸ *Holiday model* if the day is a national holiday

▸ *Use model on weekdays*

Note: Relative times are not checked in the event of time conflicts.

6.17 Step 16: Execute calendar allocation

Select the **Calendar** entry in the tree view. The table now displays the current month. Each week has the lines **Models - Hall I** and **Schedules - Hall I**. Select the **Schedules - Hall I** cell from Monday. Access the appropriate context menu, and select the Selecting schedules item to activate the schedule selection dialog. Select the **Hall** schedule, then click on the **Add** button to add this item to the results list. The complete identification **Hall I.Hall**, as derived from the schedule, is now displayed. Exit the dialog by clicking on **OK**; the Duration of series dialog is now displayed on screen. Our schedule must be executed on a weekly basis, without any defined ending date, on days from Monday to Sunday. To define allocations to special days, access the **Properties** of the **Hall Calendar filling** schedule. It is also possible to carry out weekday allocation tasks there. No calendar filling is necessary for schedules **Line I** and **Line II**, as these schedules do not use any switching points with absolute times.

Relative times will require model allocation tasks to be carried out, which we will proceed with as follows. Select the **Model Hall I Monday** cell. Access the appropriate context menu, and select **Select model** to activate the model linking dialog. Select the **Workday** model and add it to the results list. Click on OK to close the dialog; you will be asked to confirm whether this model should be defined as a default. Click on Yes: this model will now be linked to every Monday. If you click on No, the model will only be linked to this particular Monday. We shall activate this model for every Monday. You can now repeat this process for weekdays from Tuesday to Friday. However, a simpler possibility would be to access the page **Properties** - **Calendar filling** for time model group **Hall I**, and to proceed with allocations from there. Select the model **Workday** for weekdays ranging from Tuesdays to Fridays, and select the model **Holiday** for special days. If you now switch back to the calendar view, you will see which models are allocated to which days.

6.18 Step 17: Checking the project

The Editor allows you to check over the current schedule configuration and calendar filling. This is possible in the switching point preview, whereby preview mode enables you to view any requested period of time, including past periods.

6.19 Step 18: PFS in the Runtime

In the Runtime, the activated switching points are processed and executed second by second. This process begins when the runtime environment is started up, and remains active until the runtime environment is closed.

The PFS also enables you to proceed to the entire configuration within the Runtime environment, which differs only slightly from the Editor.

The main differences are as follows:

▸ Authorization for viewing, modifying, adding and deleting entries is active.

▸ Context menu functions can be activated in the screen type by means of buttons.

▸ The switching point preview mode displays user-defined events with reference to the event's existing triggering times.

▸ Saving a modified configuration activates these triggering times instantaneously.

For our Runtime tests, we will configure:

▸ A start screen that is the **standard** screen type.

▸ A PFS screen of the screen type **Production & Facility Scheduler**.

▸ In the PFS screen, the default objects.

▸ In the start screen, a button that activates the screen switch function to switch over to the PFS screen. We shall not broach filter settings at this point.

▸ In the start screen, several display fields that are used to display the states of variables.

6.20 Step 19: Execution in the Runtime

When executing an absolute switching point, date and time indications are decisive. Relative and absolute times, which bear no relation to dates, are defined - using the calendar filling process - in relation to absolute switching times. To proceed to our tests now, we will have to change the system time - the alternative being that you have a lot of time on your hands, and can afford to wait for the end of the day!

The PFS is well aware of any changes made to the time, and such alterations can therefore, according to the current configuration and actual change in time, generate diverse reactions. For proof, let us take a look at the **Properties** section of the **Production & Facility Scheduler**. The **Time change** page defines the way the PFS will react when the time is changed.

6.20.1Positive time change

The **Make up for switching points** command initiates the execution of the switching points comprised in the period of time ranging from the command's execution to the corrected time, until the moment matching the new (i.e. corrected) time is reached.

The **Recalculate switching points** control initiates a recalculation of the switching points, proceeding from the corrected time onwards. Any switching points comprised in the period ranging from the command's execution time to the new (i.e. corrected) time are not executed.

6.20.2 Negative time change

The **Reject switching points** command does not initiate any new calculations, which means that switching points will only be executed again once the command's execution time (i.e. former time) has been reached.

The **Recalculate switching points** control redefines the absolute switching points, proceeding from the corrected time onwards. With this command, the switching points will be executed again.

The above statements related to time correction issues are only applicable as long as the Runtime environment has not been closed down. In the event of a restart, the calculation of all switching points will always occur on the basis of the current system time. In addition, any corrections made to the system time must be greater than the time tolerance defined in the program.

Bearing in mind the way the PFS reacts in the event of change of time, we recommend that you only "increase" (i.e. proceed to "positive" time changes) the time when attempting to check over a configuration you have created. If you need to reinitialize the time, close the Runtime environment, change the time, and restart the Runtime environment.

For the time being, restart the Runtime environment, and change the time. For the sake of testing, a particularly "exciting" moment occurs at 12 o'clock: at this time indeed, the horn must be activated for 6 seconds. Test this function.

As we have one trigger defined for the user-defined **Horn Tone duration** event, the execution time point appears in the switching point overview. Execution time point: 12:00:06.

6.21 Step 20: Resume

Throughout these 20 steps, we have learned about the basics of the PFS. You should now be able to create your own PFS projects.

The separation of the switching times into 3 schedules is not mandatory; we proceeded this way in order to illustrate the possibility of using "inherited" (i.e. previously defined) times. Had we used only one schedule, the configuration process would have required fewer operations.

Here is a short recap of the required steps:

1. Create user-defined events.

2. Creating the time model group

3. Creation of the time models.

4. Create the schedule.

5. Create the absolute times.

6. Create the relative times.

7. Create the switching points.

8. Link the schedule to the calendar for the absolute times.

9. Link the time models to the calendar for the relative times.

7 Advanced configuration in the Production and Facility Scheduler

7.1 Drag&Drop

Objects can be moved quickly and easily from one to another via drag&drop. Basically, this process is equivalent to a cut and paste operation. You must be aware that objects can only be moved towards objects of similar nature. The mouse pointer will visually indicate whether you can drop an object or not. If you attempt to drop an object on a forbidden target, the process is cancelled. This detail can prove useful, for instance if you have accidentally selected and started dragging an unrequested object to another branch in the tree view.

7.2 Filtering the PFS configuration

As the number of time model groups, models, schedules and switching times grows, you will find it harder to find a specific object, or to display a relevant detailed overview. A filtering function has been designed to lessen this problem. In the tree view window, select the Filter criteria item in the Production & Facility Scheduler context menu to activate the Filter dialog. You can read more specifically about the Filter dialog in the PFS filter dialog (on page 69) section; for the time being, we will concentrate on utilizing the function.

Filtering is only performed on the actual display of objects. An object which does not match the filter is not be displayed. However it still exist. This indication should clear any misunderstanding that may arise - for instance, when a new schedule is created, and its name is added to a filtered schedule. This situation will indeed display an error message stating that the specified name already exists.

If new objects are created that do not correspond to the filter, these remain visible until the display is next updated. For example, the creation of a time that is outside of the filter. As long as you do not

exit the current schedule, this time will remain visible. However, when the screen is next updated, the specified time will disappear - but it nonetheless remains available. The filter is first reused when the display is called up again.

Linked schedules and models within the calendar can be filtered in the same way.

7.3 Mass processing

Now, who has never run into the following problem: All absolute times between 06:00:00 a.m. and 08:00:00 p.m. should be moved by 00:43:25. Then you sit there, calculate and correct all the times, and that perhaps for a dozen of times. Mass processing was integrated to the PFS in order to meet such requirements. This function enables users to make changes to selected cells on a specific schedule level, according to the required type of column. The problem we previously mentioned can therefore be solved with just a few mouse clicks and data inputs.

By using this function in conjunction with filters, you can efficiently reduce the number of elements you wish to modify.

The following columns support the mass processing function:

Parameter	Description
Type of time	Enables you to change the type of time used.
Time	For absolute times the time can be changed. To do this open the dialog Change time.
Offset	For relative times the offset can be changed. To do this open the dialog Change offset.
Active	Allows you to change the activation status.
Action	Depending on the type of link, the activation or the macro to be executed can be changed. To do this open the dialog Change value.

7.4 Structure schedules

Structure schedules are used to create a visual structure for schedules in the tree view. A schedule is marked as a structure schedule when the **Structure schedule** checkbox in the **Schedule properties** dialog is activated.

Structure schedules have no allocated variables or functions, nor do they have any allocated times or switching points. The schedule plan can have different schedules. As a result, it is possible to display a logical belonging for the subordinate schedules.

7.5 Configuring Screen switch for PFS windows

When used on PFS screens, the filter dialog for the Screen: Switch to function allows you to define which type of data you wish to display, and to customize the table display accordingly.

Parameter	Description
Filtering the tree view	Select the object you wish to activate when switching to the screen. The object must match the defined filter criteria, or you must first deactivate the filter. Also refer to Tree view filter for Screen switch.
Filtering the table view	This function defines the table view format. Also refer to Table view filter for Screen switch.

7.6 Permissions for the Runtime environment

Permissions can be granted for each object contained in the tree view, according to the concerned object's functionality. In the Runtime environment, the currently logged in user can only execute a function if he knows the appropriate password. Permissions are always object-related.

If a user does not have the rights to see an object, this object and all it sub-objects are hidden. Even if the user has rights for one of the sub-objects.

The permission required to modify an object includes the right to modify permissions.

7.7 Using the PFS in a network

The PFS can be installed within a network, in which case the execution of switching points will only occur at server level. If a standby server is available, it will process the switching point list accordingly, but will not however execute any of the switching points it contains. Process synchronization is carried out according to the system's time.

The way in which the PFS reacts when changing from the standby to the server can be configured accordingly. The problem with such changes is that the standby server cannot determine with certainty when the last switching process from the (previous) primary server took place. For this, in the **Time switch** dialog in the **Production & Facility Scheduler**, the **Reject SB switch** option was envisaged.

Parameter	Description
Reject switching points	When switching points are cancelled, the process continues onwards from the current position in the standby server. This can imply that a number of switching points may not be executed.
Recalculate switching	Switching points are recalculated on the basis of the current time -30 seconds, and their execution then begins immediately. This can imply that a number of

Parameter	Description
points	switching points may be executed twice.

When the server once again becomes available on the network and the standby server switches over to it, the server is synchronized using the current PFS data. This ensures that the execution of the switching points continues seamlessly.

Parameter	Description
Server	Executes switching points. Saves the current PFS configuration. Unsaved project configurations on the server are discarded if a more recent project backup is saved by a client.
Client	▶ Does not ensure any switching point execution. ▶ Project data can be edited. ▶ If project data is amended by a project change by other clients, this is visualized on the client with a notice. ▶ Trigger time points for user events are always defined according to the client's system time.
Standby	▶ The standby server acts the same as the client. **Note:** If the standby server becomes the primary server, it acts as a server accordingly. ▶ The behavior for the process of upgrading can be configured. ▶ Saves the current PFS configuration.

7.8   Converting projects

When a project created using a program version prior to version 5.50 is activated, the profiles contained in the structure schedules are converted. Profiles are no longer supported in version 5.50 or later versions. For each profile, a structure schedule is created, containing the linked schedules. The linked schedules contain all the times which fall within the profile's activation/deactivation times.

The day information contained in the profile schedule is input into the calendar.

The configuration process can be viewed in the Editor's output window.

7.9   VBA interface

The PFS contains a VBA interface, which is integrated to the VBA object **Project**. In addition, switching points can be linked to a VBA macro of the Execute_Value type. In this case, the switching point is applied as a parameter to the VBA Macro.

Further, the VBA Macro is responsible for performing switching processing tasks.

8 Object types

Objects contain the configuration which users have defined for them. Two types of object types can be identified:

Editable object types (on page 30) and Fix defined object types (on page 30)

8.1   Fixed object types

Provided that the previous object (i.e. 'parent object') has been created and that the relevant display permission has been granted to users, these object types are always available. They cannot be moved, renamed or deleted. If these objects are masked, all the related 'child objects' also become unavailable.
E.g.: Time model groups always contain the fixed object types **Schedules** and **Time models**.

8.2   Editable object types

These object types are created according to the number of objects required during the configuration process.

8.3   Production and Facility Scheduler object

This constitutes the root object type for the whole of the PFS. Any settings defined in this object are then applied to the whole of the PFS. This is a fixed-type object.

Parameter	Description
Save	Saves the changes you have made.

Parameter	Description
	In the Runtime, all parameters are saved in the Runtime data, and a new calculation of the switching points is performed on the basis of the modified configuration.
Discard	After you have confirmed your choice by closing the confirmation dialog, all the changes you have made will be irrevocably discarded.
Properties	This item displays the settings pages for the PFS Properties section.
Switching point preview	Activates the switching point preview mode.
Filter criteria	Activates the Filter dialog.
Help	Activates the online help.

8.4   Object time model groups

This object contains all time model groups defined in the PFS. This is a fixed-type object.

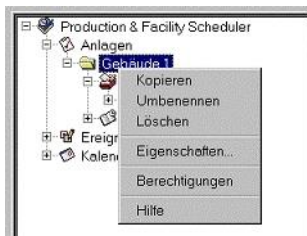| Parameter	Description
Create	Creates a new time model group and displays the Properties page for the new time model group.
Paste	If a time model group is currently stored in the clipboard, it can be pasted as a copy. When copies are created, their name is extended with a number, thus maintaining the uniqueness of their designation.
Authorization	Activates the object's rights dialog.
Help	Displays online help.

8.5   Object editable time model groups

Time model groups contain their specific schedules and time models. In addition, these objects allow users to define fundamental settings related to relative switching times.

In the calendar, users can allocate schedules and models to each day for each time model group listed.

Each time model group always contains the **Schedules** and **Time models** fixed object types.

Parameter	Description
Copy	Copies the selected time model group or groups to the clipboard.
Rename	In the tree view the identification of the time model group changes to the edit mode. Only the identification can be changed. The new designation provided must be unique throughout the whole of the PFS environment.
Delete	Deletes all selected time model groups after requesting confirmation.
Properties	Displays the page containing the time model group.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

8.6   Schedule object

This object contains all higher-level schedules of the 1st order. This is a fixed-type object.

CONTEXT MENU

Menu item	Action
Create	Creates a new schedule.
Paste	Pastes a schedule from the clipboard.
Authorizations	Opens the authorization dialog.

Menu item	Action
Help	Opens the Onlinehelp.

8.6.1 New schedule context menu

Menu item	Action
Create	Creates a new schedule.
Copy	Copies selected schedules.
Cut	Cuts selected schedules.
Paste	Pastes schedules from the clipboard.
Inactive/Active	Switches between *active* and *inactive* for selected schedules.
Rename	Makes it possible to rename the schedules.
Delete	Deletes the selected schedules after a confirmation message.
Properties	Opens the **Properties** window for the selected entry.
Authorizations	Opens the authorization dialog.
Help	Opens online help.

8.6.2 Context menu time display new schedule

The displayed menu items depend on the area in which the right-click was carried out. Entries which are not displayed all the time receive the additon (optional).

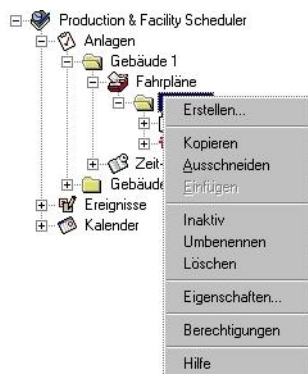| Menu item	Action
Create time grid	Opens the dialog for creating a time grid.
Create time	Inserts a new time in the list.
Create switching point	Creates a new switching point.
Creating switching points	Opens the dialog for creating several switching points.
Delete time	Deletes the selected time.
Delete switching points	Deletes the selected switching point.

Menu item	Action
Change time(optional)	Opens the dialog for changing the time.
Absolute point of time(optional)	Changes the time type in *absolute time point*.
Relative point of time(optional)	Changes the time type in *relative time*.
All values active(optional)	Sets value*active*.
All values inactive(optional)	Sets value*inactive*.
Help	Opens online help.

8.7   Editable schedule object

Schedules are the core of the PFS. They contain the times and switching points necessary to the execution of important objects.

Schedules can be replicated into new schedules, in which case the "child" schedules "inherit" any times defined in the "parent" schedules. No limitations apply to the multiple schedule's organizational depth.

Parameter	Description
Create	Creates a new "child" schedule, and displays the relevant settings page.
Copy	The selected schedules are copied to the clipboard.
Cut	The selected schedules are cut and placed in the clipboard. Cut schedules are identified in a special manner, and will only disappear fully once they have been inserted (i.e. pasted) in another schedule. A schedule which you have cut cannot be pasted into itself or into the schedule located

Parameter	Description
	directly above it.
Paste	Inserts (i.e. pastes) schedules from the clipboard. The inserted schedule's designation is then modified, in order to preserve the uniqueness of each schedule's name.
Inactive/Active	Activates or deactivates the schedule. Switching points contained in deactivated schedules will not be executed!
Rename	Allows users to change the schedule's name. The new designation must be unique throughout the schedule level.
Delete	Deletes the selected schedules and their "child" schedules, after asking you to confirm this.
Properties	This command displays the settings pages for the Schedule properties section.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

8.8 Functions list object

This object contains the array of functions related to the schedule. Only functions related to a schedule can indeed be used in said schedule. This is a fixed-type object.
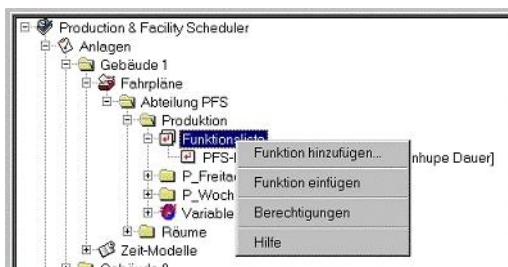
CONTEXT MENU FUNCTION LIST

Menu item	Action
Add function	Enables users to allocate a new function to the schedule. When the list of defined functions appears on screen, select the required function and accept it by clicking on **OK**.
Insert function	Inserts (i.e. pastes) functions from the clipboard into the list.

Menu item	Action
Authorizations	Opens the authorization dialog.
Help	Opens online help.

CONTEXT MENU FUNCTION

Menu item	Action
Copy	Copies selected functions.
Cut	Cuts selected functions.
Replace function	Opens the dialog for replacing selected functions.
Remove function	Deletes selected functions from the list.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

8.9   Object time

Times define the time point at which linked switching points must be executed.

Two different types of time are available:

▶   absolute

▶   relative

Previously defined times are replicated in "child" schedules, in which they are displayed on a grey background.

8.9.1 Absolute time type

Times are directly defined in the Time field. If the schedule is linked to a specific day, any active switching times linked to the absolute time point are executed. The Offset field is of no importance here.

The time model group cycle or the model allocation fields are not used here either.

8.9.2 Relative time type

For this time type an event is selected at the time. This event is changed to an absolute switching point in the preview or in the Runtime. The criteria according to which the absolute switching point is created, depends on the event and the related engineering. An offset can be specified for each event, and will delay the execution time point accordingly.

Parameter	Description
Start of cycle	Performed daily at midnight.
Start of cycle without production	Activated on days which are not linked to any shift. The time point is the start of the day for the relevant time model group. A day is also considered to be without production when, for instance, the last shift ends at only 02:00:00 on the same day.
Start of cycle with production	Activated on days for which at least one shift has been defined. The time point is the start of the day for the relevant time model group.
Begin of production	This event is executed at the start of the first shift, provided that the first shift follows a day without production.
End of production	This event is executed at the end of the last shift, provided that the last shift is followed by a day without production. Thus, if further production is scheduled to take place on the following day, the shift at the end of the day is not considered as an end of production.
Shift start	This event is executed at the start of each shift.
Shift end	This event is executed at the end of each shift.
Break start	This event is executed at the start of each break.
Break end	This event is executed at the end of each break.
User-defined event	Various previously defined user-defiend events can be allocated. The switching point will be initiated when the trigger event related to the user-defined event occurs.
Shift start first shift	Executed at the start of the first shift in the time model group's cycle.
Shift end last shift	Executed at the end of the last shift in the time model group's cycle.
Shiftfree start	Activated at the end of the shift, if the start of the next shift occurs with an offset greater than 1 second.
Shiftfree end	Activated at the start of a shift following a shift-free period of time.
Shift-free start	Activated at the start of a shift-free period of time, provided that no

Parameter	Description
without production end	End of production is scheduled immediately after.
Shift-free end without production start	Activated at the end of a shift-free period of time, provided that no Start of production is scheduled immediately after.
Shift start first shift without production start	Activated at the start of the first shift, provided that no Start of production is scheduled simultaneously.
Shift end first shift without production end	Activated at the end of the last shift, provided that no End of production is scheduled simultaneously.
Shift start without production start	Activated at the start of the shift, provided that no Start of production is scheduled simultaneously.
Shift end without production end	Activated at the end of the shift, provided that no end of production is scheduled simultaneously.

8.9.3 Offset

When working with relative times, the execution time point can be modified by means of an offset. An offset cannot be greater than +/- 1 day -1 second. When working with user-defined events, only positive offsets can be specified. The offset is specified in minutes, seconds being defined after the decimal point with a precision of 1/100th of a minute.

Parameters	Description
Create time grid	This command displays the settings page required for the cyclic creation of an absolute time period.
Create time	Creates a new time.
Create switching point	Creates a new switching point at the given time.

Parameters	Description
Creating switching points	Enables users to define switching points for several variables or functions within once same task, if no switching points have previously been defined.
Delete time	Deletes the selected times, including all related switching points.
Delete switching points	Deletes the selected switching points.
Absolute time period	Changes the type of time to Absolute.
Relative time	Changes the type of time to Relative.
Help	Activates online help.

8.9.4 Context menu time

The menu items not broached here are identical to those described in the Time type context menu section.

▶ **Change time**: This menu item activates the time change dialog.

8.10 Object switching point

The switching point defines the action to be executed once the execution time point is attained.

8.10.1 Active

This setting enables users to authorise or block the execution of a switching point.

8.10.2 Type of link

The type of link defines which element must be executed. The following types of links can be specified:

Parameters	Description
Variable	The set value is defined using the value specified for the action.
Function	The function specified for the action is executed.
VBA Macro with Variable	The macro defined in **Macro -> Browser -> ModuleScheduler -> ExecuteValue** referring to the specified variable is executed.

Parameters	Description
VBA Macro with function	The macro defined in **Macro -> Browser -> ModuleScheduler -> ExecuteValue** referring to the specified function is executed.

8.10.3 Links

Contains the list of the variables or functions linked to the schedule.

8.10.4 Action

According to the selected link type, the cell has the following significance:

Parameters	Description
Variable	The set value which must be defined for the relevant variable.
Function	Contains the state of the Active parameter.
VBA Macro with Variable	Name of the macro which must be executed.
VBA Macro with function	Name of the macro which must be executed.

8.10.5 Authorizations

Necessary authorization level (on page 69) needed for editing in the Runtime.

8.11 Object time model

This object contains all the time models defined for the current time model group. This is a fixed-type object.

A time model contains the definition of the shifts and pauses which are required for the relevant relative events.

CONTEXT MENU TIME MODEL

Menu item	Action
New time model	Creates a new time model.
Paste	Pastes time models from the clipboard.
Authorizations	Opens the authorization dialog.
Help	Opens online help.

CONTEXT MENU TIME MODEL

Menu item	Action
Copy	Copies the selected models.
Cut	Cuts selected models.
Rename	Makes it possible to rename the time model.
Delete	Deletes selected models.
Authorizations	Opens the Permissions dialog.
Help	Opens online help.

8.11.1 Context time model group

CONTEXT TIME MODEL GROUP

Menu item	Action
Create	Creates a new time model. When creating a new time model, you can immediately specify a new and unique name for it.
Paste	Inserts (I.e. pastes) time models from the clipboard to the list.
Authorizations	Opens the authorization dialog.
Help	Opens online help.

CONTEXT MENU TIME MODEL

Menu item	Action
Save	Saves changes in the engineering of the PFS.
Undo	Rejects all changes since the last time the PFS has been saved.
Properties	Opens the **Properties** window for the selected entry.
Switching point preview	Opens the switching point preview dialog.
Filter criteria ...	Opens the dialog for selecting filters.
Help	Opens online help.

8.12 Shift object

A time model contains the defined shifts. Shifts are required to execute relative events. Shifts must not overlap, and must be defined within the limits of the time model group cycle.

Shifts are displayed on a grey background in the table view.

Parameters	Description
Create shift	Creates a new shift.
Create break	Creates a new break during the shift.
Delete shift	Deletes the selected shift, including all related breaks.
Help	Opens online help.

Note: Time is saved as local time. For details see chapter Handling of date and time in chapter Runtime.

8.13 Break object

Several breaks can be defined for one same shift. Breaks must not overlap, and must be defined within the shift.
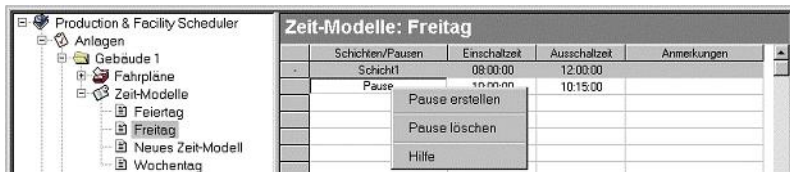
Parameters	Description
Create break	Creates a new break during the shift.
Delete break	Deletes the break during the shift.
Help	Displays online help.

8.14 Event object

This object contains various user-defined events for the PFS. This is a fixed-type object.

Parameter	Description
Create	Creates a new user-defined event. When creating a new user event, you must specify a new and unique name for it.
Paste	Inserts (i.e. pastes) user-defined events from the clipboard.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

8.15 Object user event

User events are events created by the user. These are defined for the whole of the PFS environment. User events are initiated when a triggering time point is input by means of the **Execute PFS event**. The number of user events is only limited by the available disk space or memory.

Owing to the missing required triggers, the Editor does not display user events in the switching point preview mode. In the Runtime, triggers are kept in the memory for 14 days at most to allow previous switching points to be analyzed. When the Runtime environment is closed down, these triggers are deleted.

The table view window contains a list of all the defined user events (displayed on a grey background) as well as the schedules they are linked to.
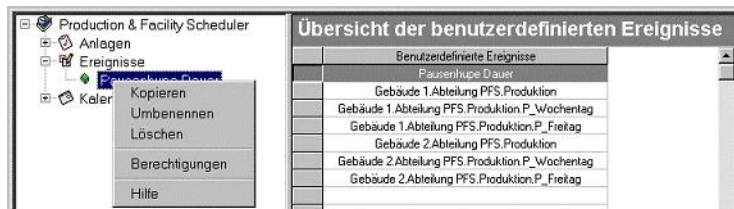
CONTEXT MENU EVENT

Menu item	Action
Create	Creates a new user event.
Paste	Pastes a user event from the clipboard.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

CONTEXT MENU USER EVENT

Menu item	Action
Copy	Copies the selected user event to the clipboard.
Rename	Enables users to specify a new name for the required user event.
Delete	Deletes the selected user events.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

8.16 Calendar object

The absolute and relative switching times defined in a schedule bear no actual relation to days, as only times are defined for them. The calendar enables users to define on which days a specific schedule must be executed. To this end, users can allocate an active model and active schedules to each day, for each time model group listed.

The calendar offers various views, which can be selected according to the level of detail required for the information.

CONTEXT MENU CALENDAR

Menu item	Action
Create	Creates a new calendar.
Paste	Pastes a calendar from the clipboard.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

💡 **Information**

In the calendar you can define single days as special days. On these days the schedules defined for special days are carried out. Every day (Monday to Sunday) can be defined as special day.

8.16.1 Absolute time

In order to execute absolute switching points on a specific day, the relevant schedule must be linked to the required day. To do so, select the **Schedules** cell on the required day. Open the context menu to access the schedule selection dialog, and create the link. The linked schedule identification is input into the cell. In Day view, these schedules can be displayed in full detail.

8.16.2 Relative time

When executing relative times in conjunction with absolute switching points, the way a model is linked (or not) to a specific day is a decisive element. The calendar day always starts with the start of day defined for the time model group. Should the time model group's cycle extend beyond the day, any times defined prior to the start of the day are considered to belong to the previous day.

For example: Start of day, 02:00:00 - End of day, 01:59:59. When only one user-defined event trigger occurs on Monday 15.10.2001 at 00:30:00, the model defined for Sunday 14th shall be used. If the trigger in fact occurs around 02:00:00, the model defined for Monday shall be used.

e.g.: Start of day, 6:00:00 AM - End of day, 9:59:59 PM. When only one user-defined event trigger occurs on Monday 15.10.2001 at 00:30:00, the model defined for Monday15th shall be used.

8.16.3 Month view

The month view aims to display the complete month in the calendar window. Should the available display space not be sufficient, the interface will attempt to display the current day in the window. The large display area is designed to allow a quick overview.

Double-click on a schedule cell to open the relevant schedule(s) in the table view, where you can edit it (or them).

CONTEXT MENU MONTH VIEW

Menu item	Action
Selecting models	Opens the dialog for selecting a model.
Select schedules	Opens the dialog for selecting schedules.
Day view	Switches to daily view.
Week view	Switches to weekly view.
Month view	Switches to monthly view.
Go to today	Switches to the current date.
Switch to date	Opens the dialog for selecting a date.
Show previous element	Displays the previous element.
Show next element	Displays the next element.
Help	Activates online help.

8.16.4 Week view

The weekly view displays the allocation pattern on a weekly basis.

CONTEXT MENU WEEKLY VIEW

Menu item	Action
Selecting models	Opens the dialog for selecting a model.
Select schedules	Opens the dialog for selecting schedules.
Day view	Switches to daily view.
Week view	Switches to weekly view.
Month view	Switches to monthly view.
Go to today	Switches to the current date.
Switch to date	Opens the dialog for selecting a date.
Show previous element	Displays the previous element.
Show next element	Displays the next element.
Help	Activates online help.

8.16.5 Day view

The Day view offers detailed information about the way schedules are linked to days.

CONTEXT MENU DAILY VIEW

Menu item	Action
Select schedules	Opens the dialog for selecting schedules.
Show schedule	Opens the selected schedule in a new window.
Day view	Switches to daily view.
Week view	Switches to weekly view.
Month view	Switches to monthly view.
Go to today	Switches to the current date.
Switch to date	Opens the dialog for selecting a date.
Show previous element	Displays the previous element.
Show next element	Displays the next element.
As default	The schedule must systematically be executed on the current weekday.
As single day	The schedule is executed on this day only.
Delete	When a schedule is defined as a default, an exception is made for this day. In the event of an execution on this day only, the single-day execution will be deleted.
Help	Activates online help.

8.16.6 Types of model allocations

When using models, the following allocation types can be defined:

Use model on this day.
Holiday model if the day is a national holiday
Use model on weekdays.

8.16.7 Schedule allocation types

Schedules can be allocated to days as follows:

Use schedule on this day.
Do not use schedule on this day.
Use schedule on holiday, if the concerned day is a holiday
Use schedule on weekdays.

8.16.8 Model allocations in the Calendar view

Models can also be allocated directly in the Calendar view. Once you have selected the cells to define the models you wish to use for a specific time model group and day, the various models available for the time model group are listed. Select a model to allocate it to the current day. When you exit the cell, the PFS will ask you to confirm whether or not you wish to use the selected model as a default model for that day.

8.16.9 Model context menu

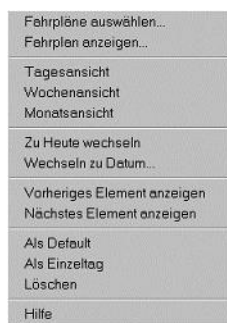This context menu can be accessed by right-clicking on the Model field in the monthly and weekly calendar view window.

Parameter	Description
Selecting models	Opens the model selection dialog.
Show model	Activates the table view Edit model.
Day view	Switches over to Day view.
Week view	Switches over to Week view.
Go to today	Switches over to Day view for the current date.

Parameter	Description
Switch to date	Switches over to Day view for the selected date.
Previous element	Accesses the previously displayed element.
Next element	Accesses the next element.
As default	Defines the current model as a standard model for the weekday for the current time model group.
Delete	Deletes the model allocation for the selected day. If the allocation concerns the standard model selected for the day, the weekday allocation for the time model group is deleted.
Help	Activates online help.

8.16.10 Context menu schedule

To activate this context menu, select the schedules' cell for a specific day, and right-click on a time model group. The menu items not specifically broached here are identical to those described in the Model context menu section.


Parameter	Description
Select schedules	Opens the schedule selection dialog.
Show schedule	Activates the table view **Edit schedule**.
As default	The schedule is entered as default for the selected week day.
As single day	The schedule is executed on this day only.
Delete	Opens a dialog for selecting what should be deleted: ▸ **Delete all elements**: All schedule of this type are deleted. ▸ **Delete only this element**: For this element an exception

Parameter	Description
	is created for the selected day.

8.17 Variable list object

This object contains the array of variables related to the schedule. Only variables related to a schedule can indeed be used for the relevant switching points. This is a fixed-type object.
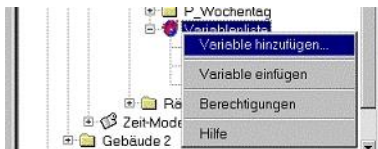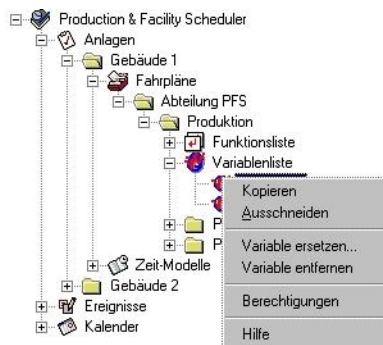

Context menu variable list

Menu item	Action
Add variable	Adds a new variable to the schedule. This is also possible in the Runtime.
Insert variable	Inserts (i.e. pastes) variables from the clipboard.
Authorizations	Opens the authorization dialog.
Help	Opens online help.

CONTEXT MENU VARIABLE

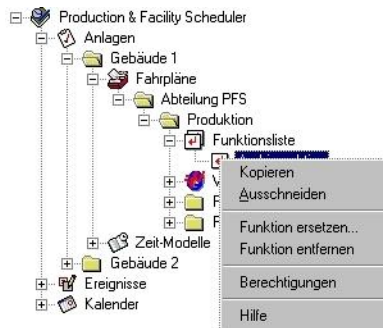| Menu item	Action
Copy	Copies selected variables
Cut	Cuts selected variables.
Replace variable	Opens the dialog for replacing selected variables.
Remove variable	Deletes selected variables from the list.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

8.17.1 Object variable

The set value of variables linked to a schedule can be modified using the switching points.

Parameter	Description
Copy	Copies the selected variables to the clipboard.
Cut	Copies the selected variables to the clipboard, and marks them for deleting. The variables are only deleted once they have effectively been inserted into another schedule. Switching points using these variables will be deleted.
Replace variable	Allows users to replace a variable with another variable. If the new variable is already available in the schedule, the original variable is deleted. All switching points using the original variable are transferred to the new variable.
Remove variable	Deletes the variable allocation link to the schedule. Switching points using these variables will be deleted.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

8.18 Functions object

Functions linked to the schedule can be allocated at the level of the switching points, and executed this way.

Parameter	Description
Copy	Copies the selected functions to the clipboard.
Cut	The selected functions are copied to the clipboard and are marked for deletion. The functions are only deleted once they have effectively been inserted (i.e. pasted) into another schedule. Switching points using these functions will be deleted.
Replace function	Allows the selected function to be replaced with another function. All switching points using the source function are modified in order to match the target function. If the target function is already linked to the schedule, the source function's allocation is deleted.
Remove function	Deletes the function's allocation link to the schedule. Switching points using this function will be deleted.
Authorizations	Opens the Permissions dialog.
Help	Activates online help.

9 Properties

In order to configure the properties of the **Production & Facility Scheduler**:
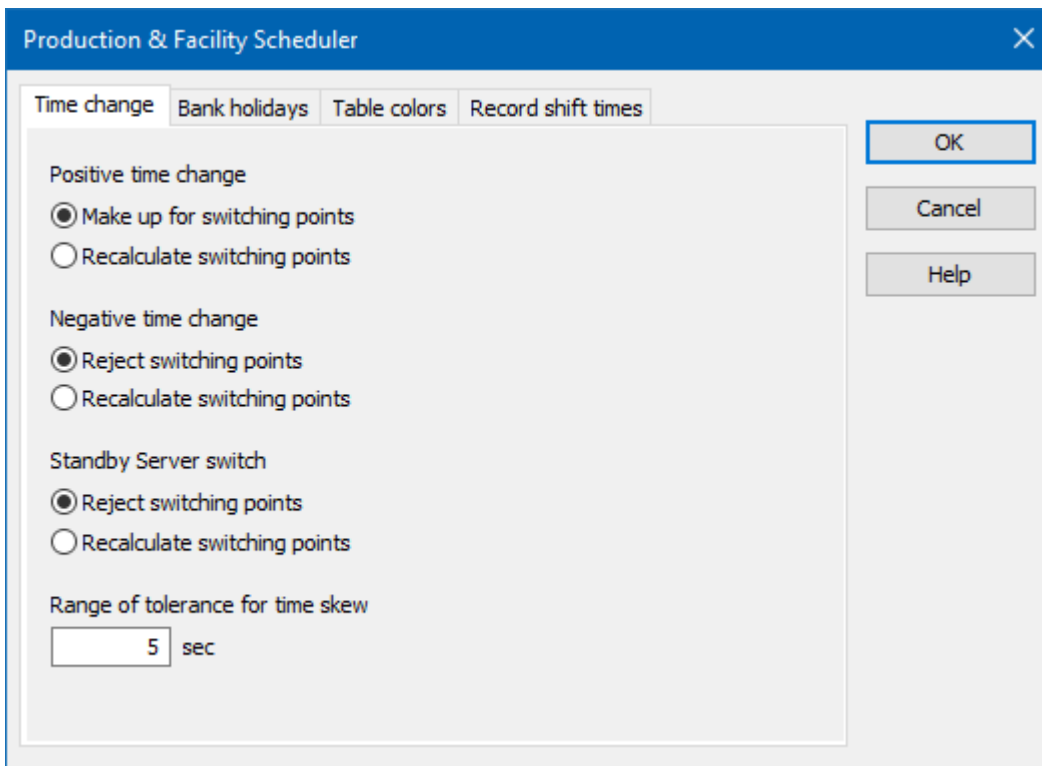
▸ right-click **Production & Facility Scheduler** in the detail view of the project manager

▸ select **Properties** in the context menu

▸ select the tab you want to edit

▶ Time change (on page 54): offers settings for switching between daylight saving time and standard time

▶ National holidays (on page 56): configures national holidays

▶ Table colors (on page 58): defines the colors of the switching points

▶ Record shift times (on page 59): makes it possible to record shift data

Note: The behavior of the time control alway relates to a point in time. The same point in time can have a different local time depending on the location of the computer. If, in the Editor of the time control, a time function is entered for 12:00 and the Runtime PC is in the time zone UTC +1, the time function is executed at 13:00 local time.

9.1 Time change

This page defines the PFS' reaction in the event where the system time is changed (e.g. summer time to winter time).

Option	Description
Positive time change	The time is set ahead, the Systemtime is set into the future (e.g. summer time)
Make up for switching points	Actions between the current time and the newly set time, are executed directly after the time setting.

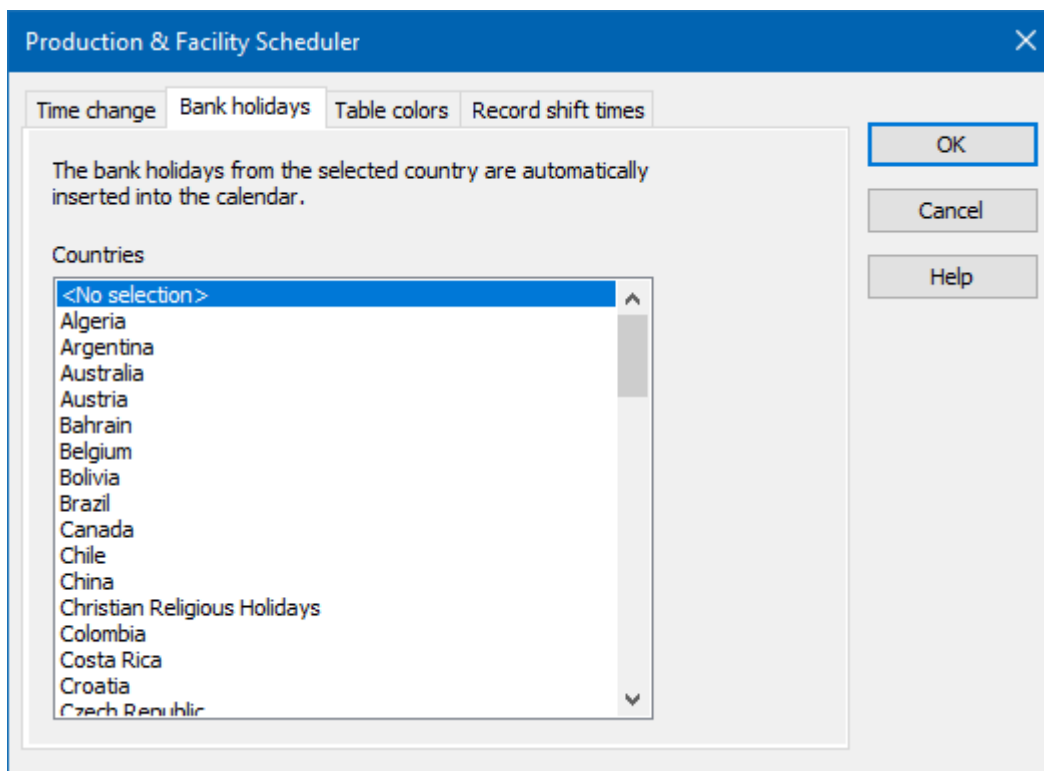| Option	Description
Recalculate switching points	Actions between the current time and the newly set time, are ignored and not executed. Switching points are recalculated.
Negative time change	The time is set back, the Systemtime is set into the past (e.g. winter time)
Reject switching points	Switching points are recalculated. Switiching points are calculated when the original time is reached.
Recalculate switching points	Action, between the current time and the newly set time, are recalculated. (That means that when the defined time is reached, they are executed.) This causes a double execution of switching points in the corrected time period.
SB Switch	Standby Server switch, valid for timeout during redundance switch.
Reject switching points	The execution of switching points starts according to the current position of the Standby. Switching points in the switching period might not be executed.
Recalculate switching points	The switching points are recalculated and exectued according to the new time. This might cause a double execution of switching points.
Range of tolerance for time skew	Tolerance, in how far the systemtime can be changed, without causing a recalculation of switching points according to the criteria described above.

CLOSE DIALOG

Option	Description
OK	Applies all changes in all tabs and closes the dialog.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

> ⚠ **Attention**
>
> Always carry out a switch to daylight saving time/standard time with the automatic Windows time switching. Never change the time manually, because this could lead to errors with times that are relevant to zenon.

9.2 Bank holidays

You select the country-specific national holidays in this tab.

Option	Description
List of countries	Selection of a country from the list. The national holidays of the selected country are entered in the calendar by clicking on **OK**.
	▸ *No selection*: No national holidays are entered. Pre-existing national holidays are removed.

CLOSE DIALOG

Option	Description
OK	Applies all changes in all tabs and closes the dialog.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

DATES FOR NATIONAL HOLIDAYS

The base data for the national holidays is in the file called **Feiertage.txt** in the folder called *%programdata%\COPA-DATA*\zenon820. It can be edited with a text editor.
The entries for a country start with the country's identification in English, enclosed in square brackets, followed by a key number, as is also the case in Microsoft Office. The definition of holidays can be found in the following line, the name and date of the holiday. There is one entry in a line for each national holiday.

<u>Structure:</u>

- ▶ **[Country] number**
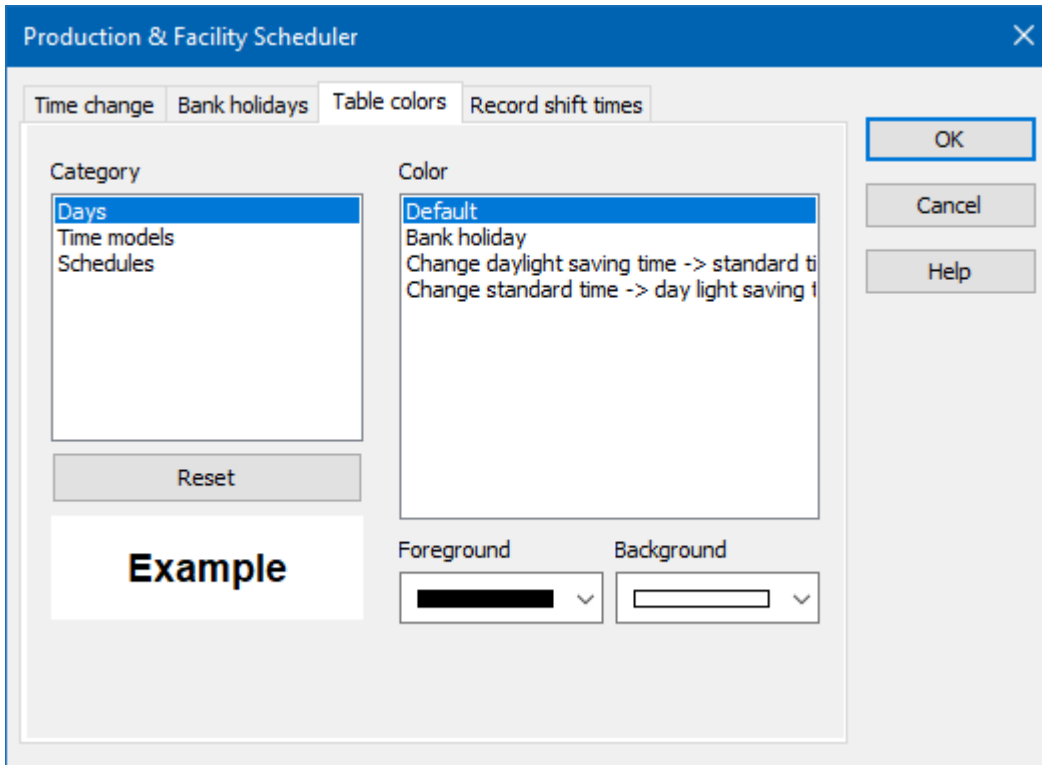- ▶ **Entry, YYYY/MM/D**

<u>For example:</u>

[Austria] 45

Allerheiligen,2009/11/1

Allerheiligen,2010/11/1

…

9.3   Table colors

This section defines the colors used to represent switching points in the calendar.

Parameters	Description
Days	
Default	Calendar day without any specific characteristics.
National holiday	Date is a holiday.
Change day light saving time -> standard time	Date of the change from day light saving time to standard time.
Change standard time -> day light saving time	Date of the change from standard time to day light saving time.
Time models	
Default	Time model used for this weekday is active.
Exception	Use time model on this day only.
Special day	The specific time model for holidays is being used.

Parameters	Description
Schedules	
Default	The schedule is active on this weekday
Special day	Schedule is active on this special day
Skip	Schedule is not active on this day only.
Single day	Schedule is active on this day only.
Multiple entry	Several properties match this day.

CLOSE DIALOG

Option	Description
OK	Applies all changes in all tabs and closes the dialog.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

9.4   Record shift times

In the **Production & Facility Schedule** you can save and archive shift data. Every finished shift is stored in a SQL database.

> **⚠Attention**
>
> For historic shift data to be saved in a SQL databse, the respective time model group must be linked to an equipment model group (on page 63).

The saved data can also be evaluated with the zenon Analyzer.

In order to activate the saving of shift times:

1. Right-click **Production & Facility Scheduler** in the detail view of the project manager.

2. select **Properties** in the context menu

3. Select the tab **Record shift times**
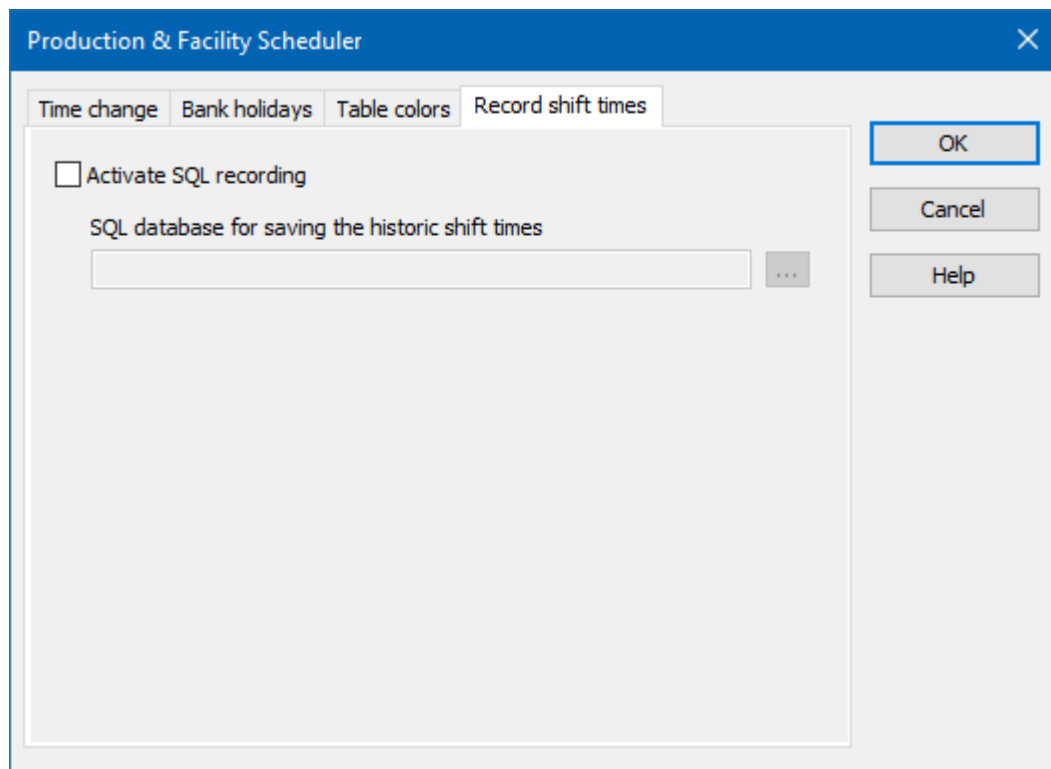
4. Activate the property **Activate SQL recording**.

5. Select the SQL database in which you want to store the data.

   The table name is created in accordance with the following model: **ProjectGUID_SHIFT_GUID of the equipment group**
   For example:
   292af0ac-d33d-4123-8484-e359cd0a6ae3_SHIFT_989ef705-d6a6-4b81-9eb5-f76483ecaac1

6. Create a link between the time model group of the shift and an equipment group (on page 63)

   Note: If several equipment groups are linked, historic shift data are saved in several tables. If the link of a equipment model group to a time model group is changed, a new table is created. At this no data of the existing table is taken over. The existing table is however not deleted.

In the Runtime the shift data are cyclically controlled and the shifts and breaks which have been finished since the last saving operation are stored in the database. The shift data are always saved at the active server. Breaks are only saved if the shift is finished and saved; as breaks contain the shift ID.

At the start of the Runtime all finished shifts and breaks which have occurred since the last saving operation are transferred to the database. Even over a period of days or weeks. If Runtime is started on the standby server and Runtime does not run on the server or cannot be reached there, the standby fills the database with the data since the last save.

Note: Not true for simulation mode.

LIST OF SHIFT RECORDING

The list contains the following columns:

Column titles	Type	Contents
ID	int	Primary key.
REFERENCE	nvarchar(128)	Saves GUID of the shifts and breaks.
VISUALNAME	nvarchar(128)	Name of the shift or the break.
START	datetime	Starting point of the shift or break in UTC. **Note:** Time is saved in UTC. For details see chapter Handling of date and time in chapter Runtime.
END	datetime	End point of the shift or break in UTC. **Note:** Time is saved in UTC. For details see chapter Handling of date and time in chapter Runtime.
BREAK	boolean	TRUE if it is a break.
PARENT_ID	int	Name of the shift if it is the name of a break.
SAVETIME	int	Time the saving operation to the database took place.

ERROR MESSAGE

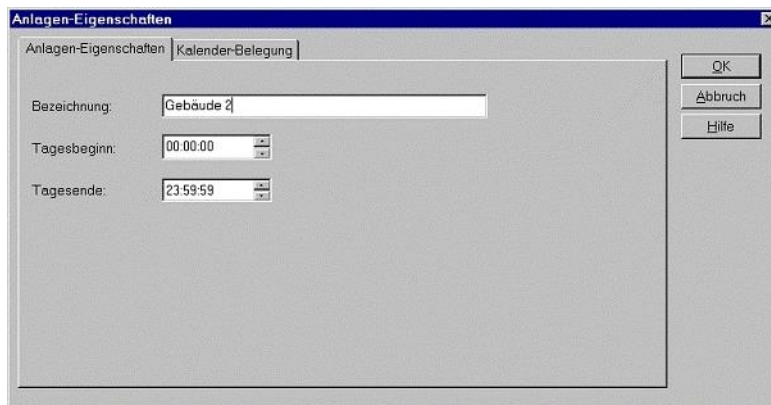If the database cannot be reached, the following entry is created in the Diagnosis Server:

Error when opening data connection in CFpmStorage::OpenDataConnection with HRESULT: 80040154

10 Editable time model groups

The properties of the time model groups make it possible to adjust the time model group cycle times and to make model allocations. To open the dialog, access an existing time model group's context menu and click on menu item **Properties ...**.

10.1 Time model group properties

This settings page contains the designation and the time model group cycle information.

The following settings can be defined:

Setting	Description
Identification	Defines the time model group's name. This field cannot be left empty, and the designation provided must be unique throughout the PFS environment.
Start of day	Defines the start of the day for this time model group.
End of day	Defines the end of the day for this time model group.

Note: Time is saved as local time. For details see chapter Handling of date and time in chapter Runtime.

10.2 Default allocation of the models

This settings page enables users to specify a default model to be used on each weekday, as well as on holidays.
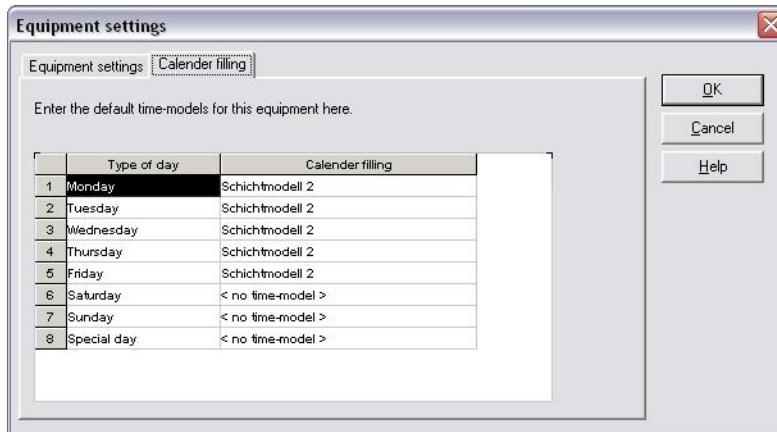
10.3 Linkng of an equipment group

To link an equipment group with a time model group:

1. Select the time model group

2. Select the **Property** command in the context menu.

   The settings dialog of the time model is opened

3. Select **Equipment modeling** tab.
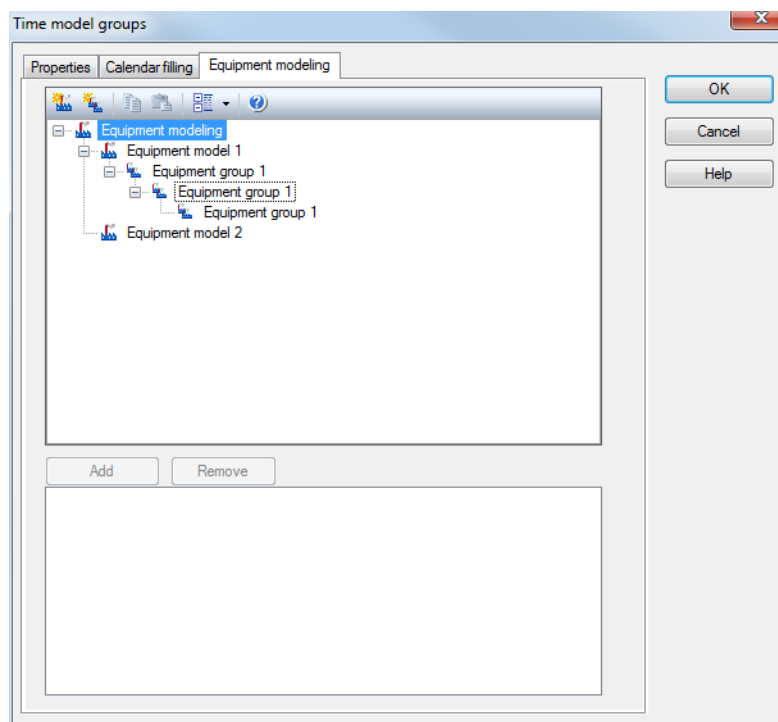
4. Select the desired equipment group.

5. Add it via button **Add**

6. Confirm by clicking **OK** as soon as you have added all desired equipment groups

Note: The linking of equipment model groups with time model groups is the requirement for recording shift times in a SQL data base. If several equipment model groups are linked, historic shift data are saved in several tables. If the link of a equipment model group to a time model group is changed, a new table with the GUID of the new equipment model group is created. For this, the following applies:

▸ The data of the existing table are not taken over.

▸ The existing table is however not deleted.

11 Editable schedules

The settings page enable users to configure schedules, and to proceed to calendar-filling operations. The dialog box can be opened by accessing an existing schedule's context menu and clicking on the command Properties...

11.1 Schedule properties

The schedule is configured in this tab; available variables or functions are linked to it.
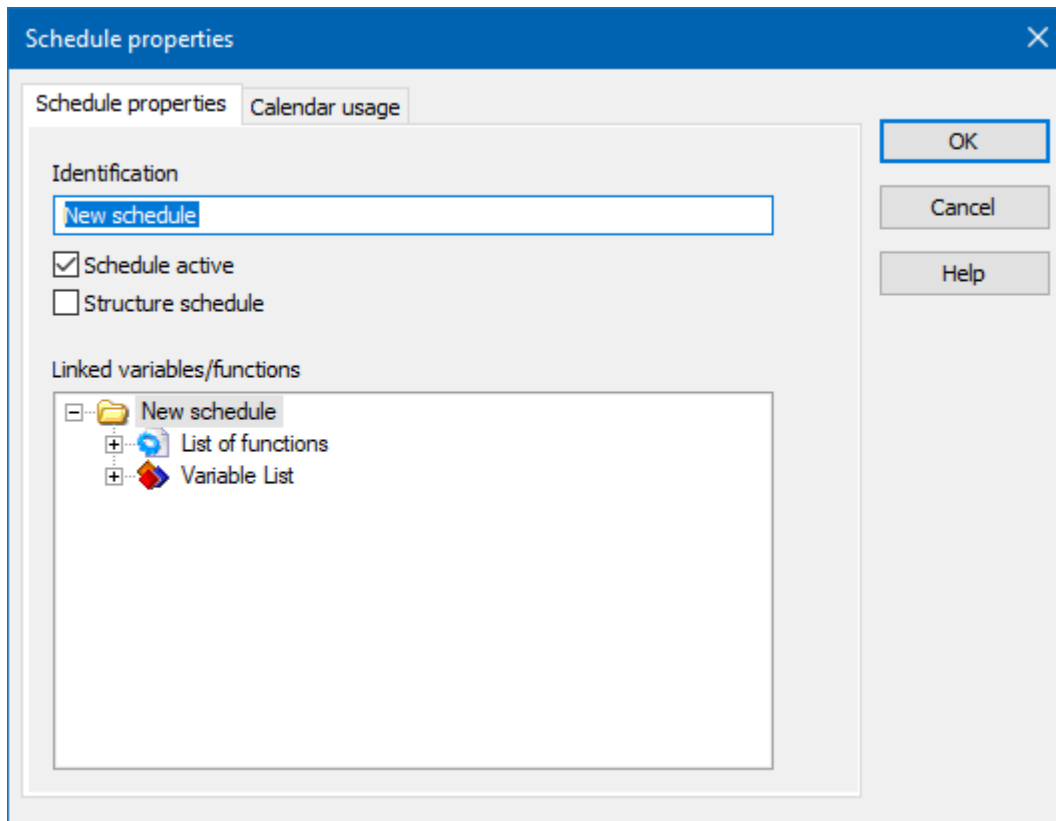
Parameter	Description
Label	Schedule name This name (i.e. designation) must be unique throughout the whole of the schedule's level.
Schedule active	Switches the schedule to active or inactive mode. Switching points contained in inactive schedules will not be executed. Default: *active*
Structure schedule	A structure schedule does not comprise any allocated functions or variables. It is only used to structure the schedules. Default: *inactive*
List of functions	Contains the functions which have been linked to the schedule. Processing is carried out according to the Functions object.
Variable list	Contains the variables which have been linked to the schedule. Processing is carried out as usual with Variables objects.

11.2 Calendar filling

This settings page enables users to perform the weekday allocation process for the schedule.
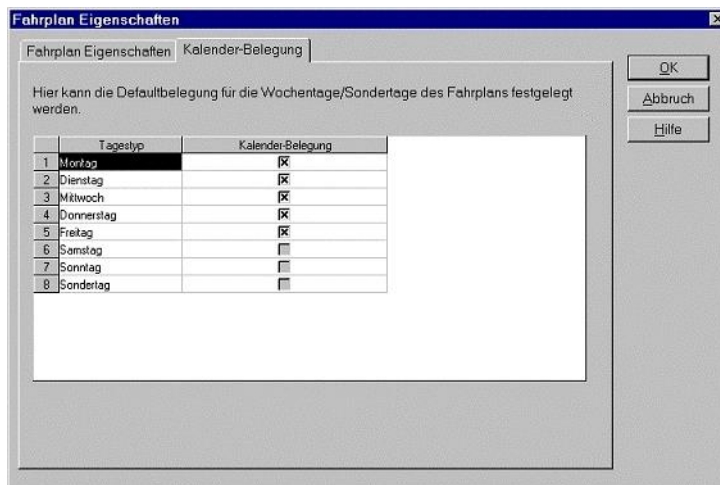
Calendar filling	Activates the schedule for the relevant weekday. For more information, please also refer to the Calendar section.

12 Dialogs

12.1 PFS switching point preview

The **Production & Facility Scheduler** context menu enables users to access the switching point preview mode.

The switching point preview mode is a powerful diagnosis tool enabling users to check over the PFS configuration. It defines and displays, according to the selected filter criteria, absolute and relative switching points and absolute execution times. Therefore, it enables users to assess the effects of the changes they have made before they actually apply them to the equipment. This preview can also be used to display a history of times. The definition is always performed on the basis of the current configuration.

User-defined events cannot be executed in the Editor. In the Runtime, trigger time points for user-defined events are kept in memory for 14 days at the most; therefore, the history of execution times can only be traced back in time over this period of time.
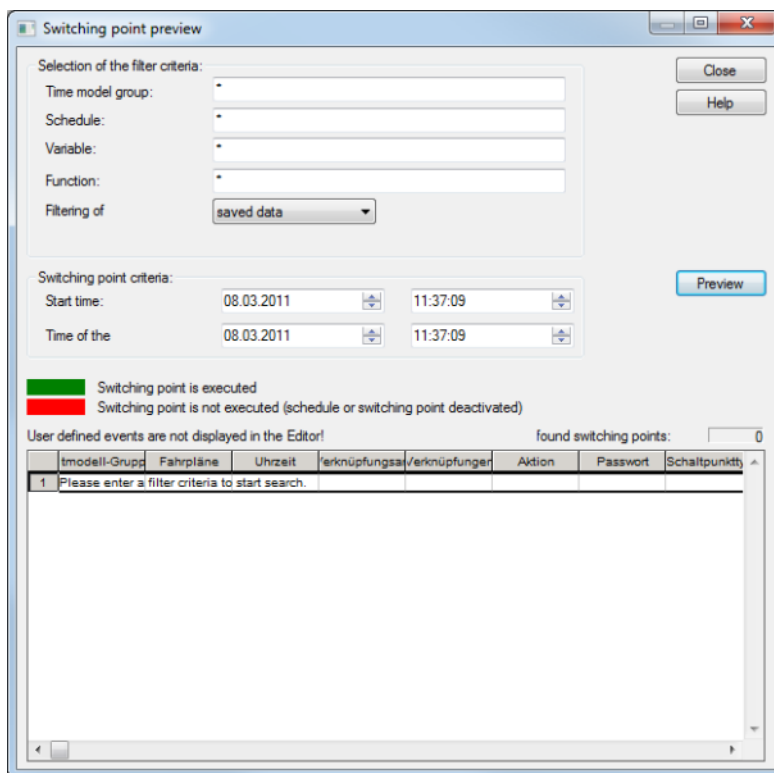
You can also filter the configured objects, for instance if you only wish to search within a specific schedule.

When you close the dialog by clicking on **OK**, the settings you have defined are saved, and will remain available until the next time you open access the dialog.

SEARCH DIALOG IN TEXT FIELDS

Fields **Time model group**, **Schedule**, **Variable** and **Function** support wildcards at the filtering:

| Placeholder	Meaning
text	The naming have to be Text
*Text	The naming have to end with Text
Text*	The naming have to start with Text
T??t	Any character is possible on second and third place.

Property	Description
Selection of the filter criteria	
Time model group	Defines the filter to use with the equipment you are examining. Only switching points inherent to the relevant equipment will appear in the preview. Attention: Input is case sensitive!

Property	Description
Schedule	Defines the filter to use with the schedule you are examining. Only switching points inherent to the relevant schedules will be displayed in the preview window. Attention: Input is case sensitive!
Variable	Defines the filter to be applied to the variables you are searching. Only switching points linked to relevant variables and matching the criteria defined in the mask will be displayed in the preview window. Attention: Input is case sensitive!
Function	Defines the filter to be applied to the functions you are searching. Only switching points linked to relevant functions and matching the criteria defined in the mask will be displayed in the preview window. Attention: Input is case sensitive!
Filtering of	Selection of the data which are used for the creation of the preview via drop-down list: ▸ *editable data* considers the changed data for determine the preview. The preview thus enables you to check over your configuration before saving any new settings. ▸ *saved data* creates the preview on the basis of the configuration used for the switching points execution.
Switching point criteria	This option enables you to define the period of time for which you wish to create a preview.
Preview	Starts defining execution times according to the established criteria. Contains the table with the switching points which are executed throughout the specified period and match the filter criteria. Deactivated switching points or switching points contained in deactivated schedules are highlighted.

12.2 PFS filter dialog

The filter dialog enables you to reduce the number of visible objects in the PFS to the objects matching the filter criteria.
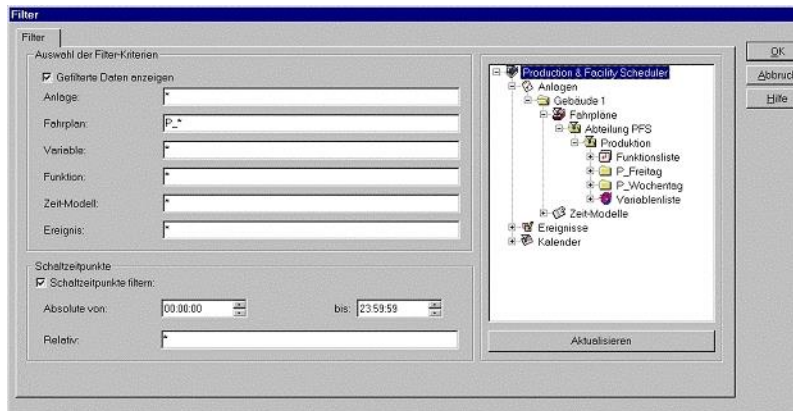
Note: Time is saved as local time. For details see chapter Handling of date and time in chapter Runtime.

The filter function enables you to fill in a filter mask to isolate certain types of objects. When a filter is activated, the filtered branch is identified with a funnel symbol, designating the filtering process. The filtering function is case-sensitive.

Fields **Time model group**, **Schedule**, **Variable** and **Function** support wildcards at the filtering:

| Placeholder	Meaning
Text	The naming have to be Text
*Text	The naming have to end with Text
Text*	The naming have to start with Text
T??t	Any character is possible on second and third place.

When "child" objects match the filter criteria, the "parent" objects are also displayed, even if they do not match the criteria defined in the filter. The exception to this rule is the time model group. If the time model group filter does not match the time model group criteria, the whole of time model group is masked, even in the event where some lower-level objects indeed match the filter criteria.

12.3 Authorizations

These enable you to define the user password level required to perform the relevant actions on the object. If the object does not support a specific functionality, this setting is locked.

If the permissions are edited in the Runtime environment, these can then only be modified on levels at which the logged in user currently owns permissions.

Permissions are only taken into account in the Runtime environment.
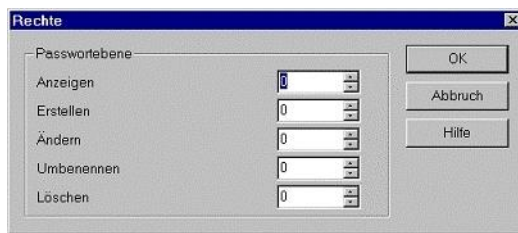
Parameters	Description
Display	These levels enable users to display an object and all its related lower-level branches.
Create	These levels enable users to authorise or block the creation of lower-level objects.
Change	These levels enable users to modify the object's settings or permissions.
Rename	Levels allowing renaming operations.
Delete	Levels enabling users to delete an object and all its related lower-level branches.

12.4 Cyclic creation of switching times

This dialog enables you to create, in one single process, several absolute switching times within a defined period of time for a specific, configurable domain.

To open the dialog , access an existing schedule's context menu in the table view, and click on the "Create time grid" item.
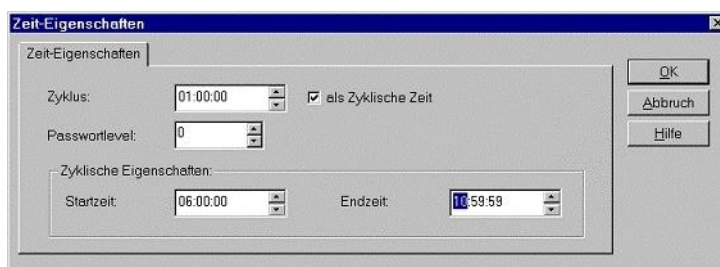
Parameter	Description
Cycle/Time	Defines the time or the creation grid.
As cyclic time	When this option is activated, several switching times can be created.

Parameter	Description
Password level	Is not yet supported! Should be 0.
Start time	Time with which the creation process begins.
End time	Time with which the creation process ends.

Note: Time is saved as local time. For details see chapter Handling of date and time in chapter Runtime.

12.5 Schedule selection

This dialog enables you to select schedules which shall be linked to a day. When you select the required schedules and add these to the list, the schedules are then inserted into the list of linked schedules.

To open the dialog , access the calendar Day view's context menu, and click on the Selecting schedule item.
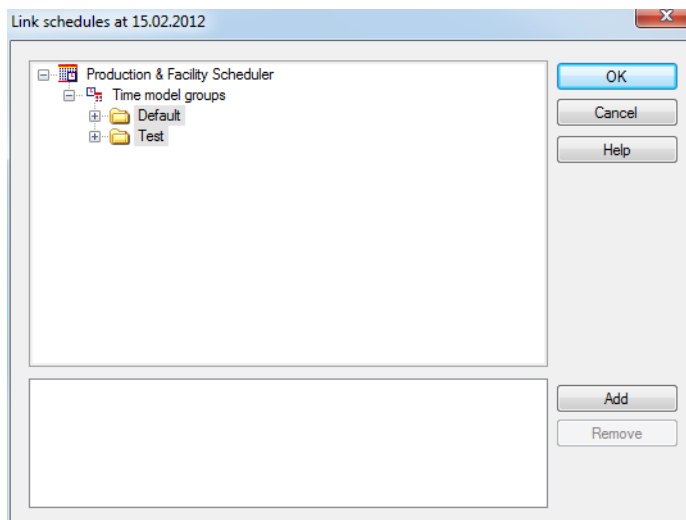

12.6 Schedule activation period

This dialog enables you to define the required schedules for a specific period or time, or to select them according to a model in the calendar.
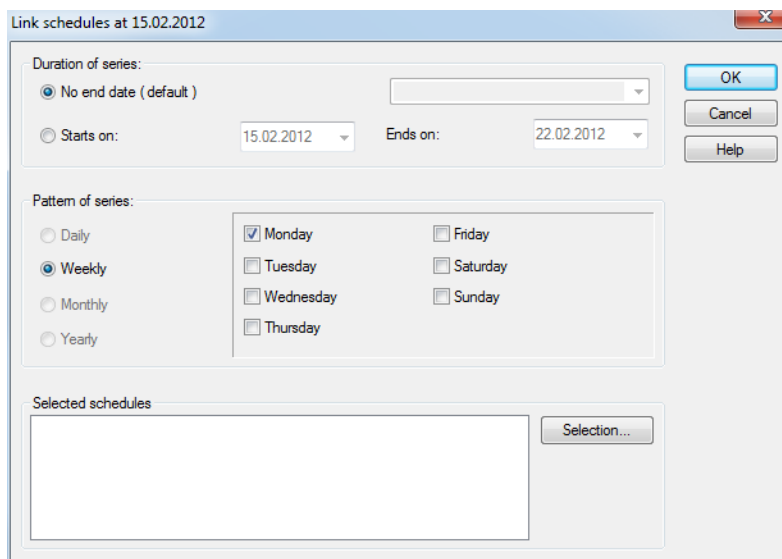
To open the dialog:

1. Right click on the line or cell with schedule in the calendar view.
2. Select **Select schedules** in the context menu.

3. The dialog for selecting schedules is opened.

4. Highlight the desired schedules and confirm them by clicking on **OK**.

5. The dialog for setting the duration of series is opened.

DURATION OF SERIES

Parameter	Description
Duration of series	Settings for the duration of series.
No end date	Execution starts with creating the series and does not have an end date (default setting). Series is executed weekly.
Starts on	Date for start.

Parameter	Description
Ends on	Date for end.

RECURRENCE PATTERN

| Parameter	Description
Recurrence pattern	Type of execution.
Detail field	Options for serial pattern depending on the selection of: ▸ Daily ▸ Weekly ▸ Monthly ▸ Yearly
Daily	Execution can be set in the detail field to: ▸ Every [number] days: Enter a number for the execution rhythm. Default: *1* ▸ Every work day: Series is executed on every work day (in accordance with the set official holiday calendar).
Weekly	Execution can be set in the detail field to certain week days.
Monthly	Execution can be set in the detail field to: ▸ on: Selection of the date ▸ every month: Enter a number for the execution rhythm.
Yearly	Execution can be set in the detail field to certain dates.

SELECTED SCHEDULES

Parameter	Description
Selected schedules	List of selected schedules.
Selection	Click on button in order to open the schedule selection dialog.
OK	Accepts input and closes dialog.
Cancel	Discards entries and closes the dialog.
Help	Opens online help.

12.7 Model selection

This dialog enables you to allocate one model per time model group to the required day.

1. Click on the **Models** cell in the calendar view.
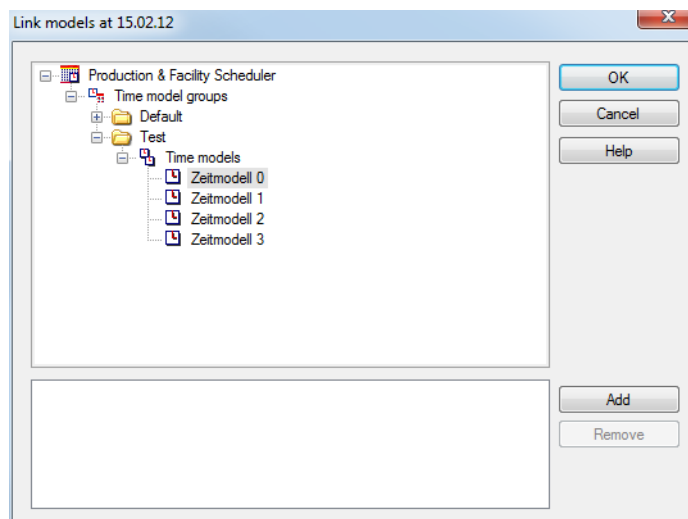
2. Select **Select models** in the context menu.

3. Select the desired model.

4. Click on the **Add** button.

5. Confirm the dialog by clicking **OK**

12.8 Table view schedule editing

Right click on a schedule in the calendar view in order to open the context menu. Command **Display schedule** opens the configuration dialog.
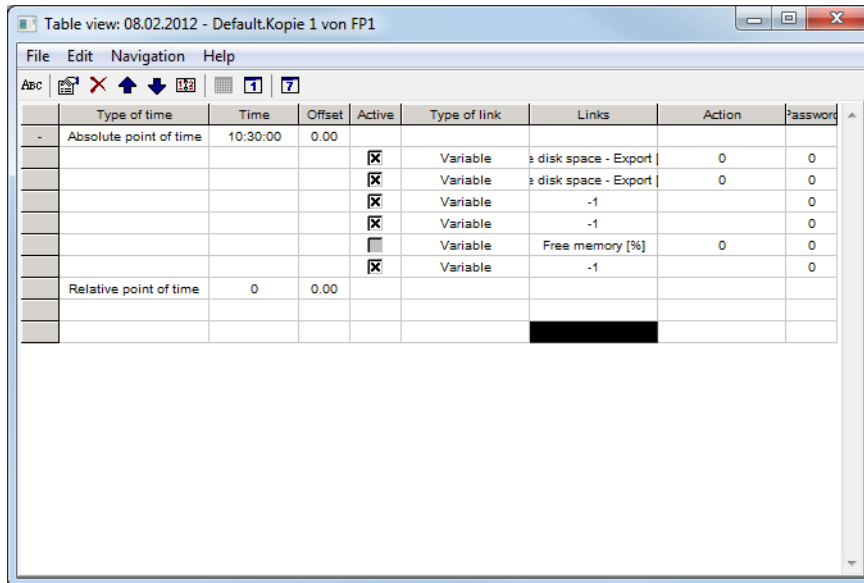
This view enables you to modify the schedules linked within the calendar. The function scope is identical to that of the Time or Switching point tables.

12.9 Model editing table view

Right click on a time model in the calendar view in order to open the context menu. Command **Display model** opens the configuration dialog.
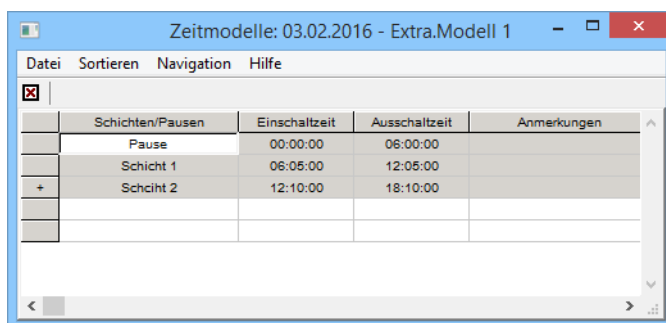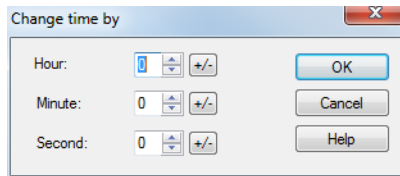

This view enables you to modify the models linked within the calendar. The editing possibilities are identical to those for shifts and breaks.

12.10 Change time

This dialog enables you to delay the selected times according to an offset you have defined.
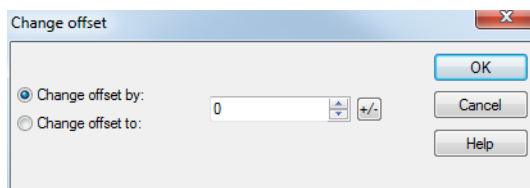
To open the dialog box, access a selected time entry's context menu, and click on the **Change time** command.

12.11 Adjust offset

Enables you to modify the selected offsets.

To open the dialog box, access a selected offset's context menu, and click on the **Adjust offset** command.
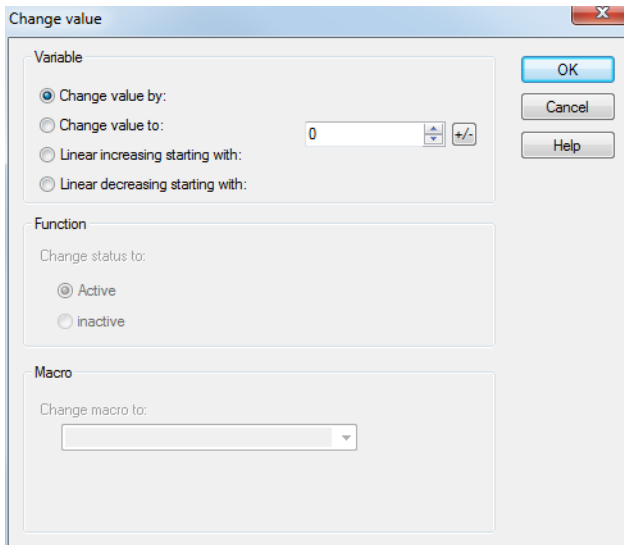

12.12 Change value

This command enables you to change the selected cells in the **Action** column.

To open the dialog box, access a selected value's context menu, and click on the **Change value** command.

Parameter	Description
Variable	
Change value by	Changes the contents of the currently selected cells by the specified value.
Change value to	Changes the contents of the currently selected cells to the specified value.
Linear increasing starting with	Changes the content of the currently-selected cells from the specified value. The value is increased by one with each modified cell.
Linear decreasing starting with	Changes the content of the currently-selected cells from the specified value. The value is reduced by one with each modified cell.
Function	
Change state to	Changes the activation of the currently selected switching points to the specified state: ▸ active ▸ inactive
Macro	
Change macro to	Changes the macro to the selected macro. Selection of the macro from a drop-down list.

12.13 Creating switching points

The dialog box is opened via the context menu of a selected time entry and the command **Create switching points**.
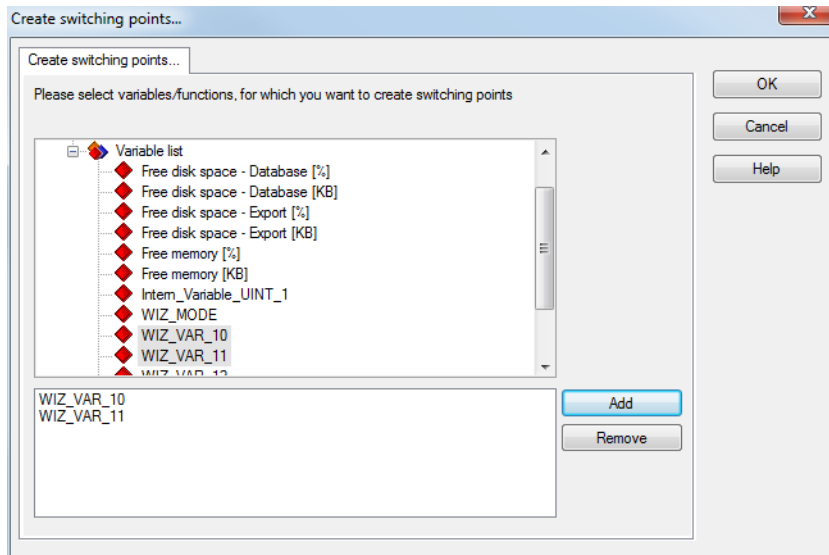
In the upper list, select the entries for which you wish to create switching points, and insert these by clicking on the **Add** button in the lower list.

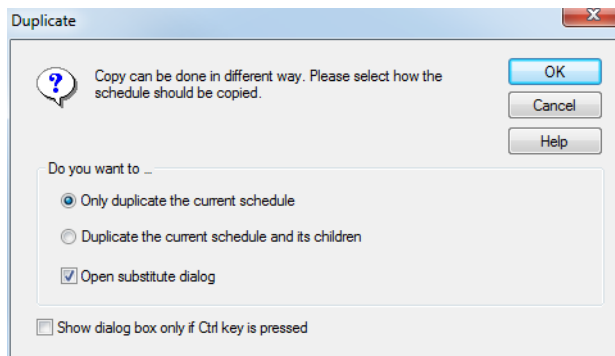---

💡 Information

Per default switching points are always created as inactive in the Runtime and must be activated decidedly in order for them to work. Per default switching point are created as active in the Editor.

12.14 Duplicate

The dialog can be called up during copying a schedule in order to control:

▸ whether subordinate child schedules should be also copied when pasting

▶ whether variables are substituted when pasting

Parameter	Description
only duplicate the current schedule	Inserts (i.e. pastes) only the top-level schedule from the clipboard.
Duplicate the current schedule and its children	The schedule will be inserted (i.e. pasted) along with all its related lower-level schedules. This embodies the standard method when this dialog is deactivated.
Open substitute dialog	Display the replacement dialog. This enables you to exchange variables when inserting them.

Display dialog box if Ctrl key is pressed only	Suppresses the dialog. The schedule and the child schedules are always copied without substitution. Pressing the **Ctrl key** whilst pasting enables the dialog display to be shown.
	
	Note: This function can also be controlled via an entry in project.ini:
	
	`[PFM]`
	
	`AnzeigenMitStrg = [Value]`
	
	Values:
	
	1: The dialog is only shown if the **Ctrl key** is pressed whilst the schedule is inserted.
	
	0: The dialog is always displayed.

OK	Accepts input and closes dialog.
Cancel	Discards entries and closes the dialog.
Help	Opens online help.

13 Function PFS - execute user-defined event

This function executes a configured PFS event in the Runtime.

14 Screen type Production and Facility Scheduler

Schedules and profiles are administered in the Runtime with a *Production & Facility Scheduler* screen. This screen type is only available, if the PFS has been licensed, otherwise the screen type Scheduler can be selected.

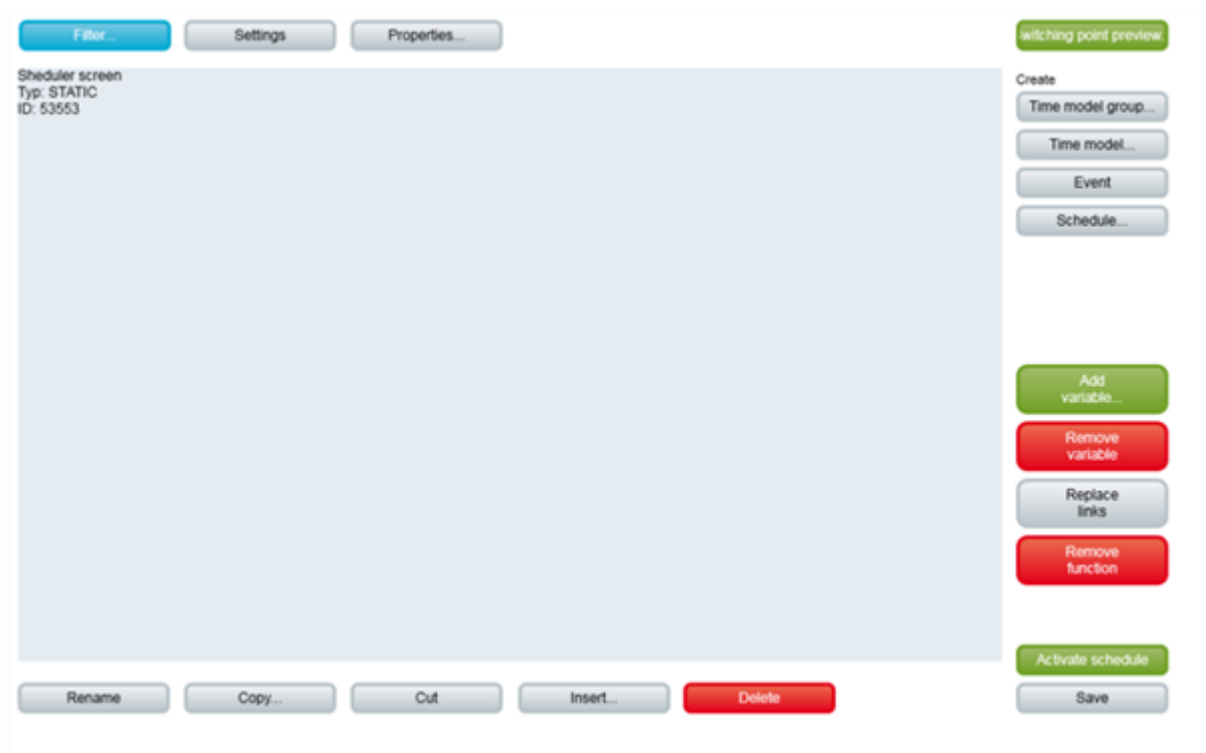## CREATE A PRODUCTION & FACILITY SCHEDULER SCREEN

ENGINEERING

Two procedures are available to create a screen:

▸ The use of the screen creation dialog

▸ The creation of a screen using the properties

Steps to create the screen using the properties if the screen creation dialog has been deactivated in the menu bar under **Tools**, **Settings** and **Use assistant**:

1. Create a new screen.

   To do this, select the **New screen** command in the tool bar or in the context menu of the **Screens** node.

2. Change the properties of the screen:

   a) Name the screen in the **Name** property.

   b) In the **Screen type** property, select *Production & Facility Scheduler*.

   c) Select the desired frame in the **Frame** property.

3. Configure the content of the screen:

   a) Select the **Elements (screen type)** menu item from the menu bar.

   b) Select *Insert template* in the drop-down list.
      The dialog to select pre-defined layouts is opened. Certain control elements are inserted into the screen at predefined positions.

   c) Remove elements that are not required from the screen.

   d) If necessary, select additional elements in the **Elements** drop-down list. Place these at the desired position in the screen.

4. Create a screen switch function.

CONTROL ELEMENTS

INSERT TEMPLATE

Control element	Description
Insert template	Opens the dialog for selecting a template for the screen type.
	Templates are shipped together with zenon and can also be created by the user.
	Templates add pre-defined control elements to pre-defined position in the screen. Elements that are not necessary can also be removed individually once they have been created. Additional elements are selected from the drop-down list and placed in the zenon screen. Elements can be moved on the screen and arranged individually.

CONTROL ELEMENTS

Control element	Description
Schedule window	The schedule is displayed.

GENERAL

General control elements:

Control element	Description
Filter criteria...	Opens the dialog to select filters.
Settings...	Opens the dialog for color settings for days, time models and schedules in the table.
Properties...	Opens the properties dialog for time model groups.
Switching point preview...	Opens the dialog for switching point preview.
Save	Saves the changes made in the schedule.
Cancel	Rejects the changes.
Copy...	Copies an element selected in the schedule.
Cut	Cuts out an element selected in the schedule.
Paste...	Pastes an element from the clipboard into the schedule.
Rename	Renames the selected element.
Delete	Deletes the selected elements.
Sort ascending	Sorts elements in the schedule in ascending order.
Sort descending	Sorts elements in the schedule in descending order.

SCHEDULE

Control elements for schedules

New time model group...	Create time model group.
Time model	▸ New time model... ▸ New shift... ▸ Delete shift ▸ Create pause... ▸ Delete pause...
Schedule	▸ New schedule... ▸ Activate schedule ▸ Add variable...

New time model group...	Create time model group.
	▸ Remove variable
	▸ Remove function
	▸ Replace links...
	▸ New time grid...
	▸ New time...
	▸ Delete time
	▸ New switching point...
	▸ New switching points...
	▸ Delete switching points
New event	Create event.
Calendar	▸ Select models ...
	▸ Select schedules ...
	▸ Show this day
	▸ Go to today
	▸ Switch to date ...
	▸ As default
	▸ As single day
	▸ Forwards
	▸ Backwards
	▸ Day view
	▸ Week view
	▸ Month view
Mass processing	▸ All values active
	▸ All values inactive
	▸ Absolute time point
	▸ Relative point of time
	▸ Change time ...
	▸ Change value ...
	▸ Select event ...
	▸ Adjust offset ...

You can find more information on amendable Runtime files in the Runtime changeable files chapter.
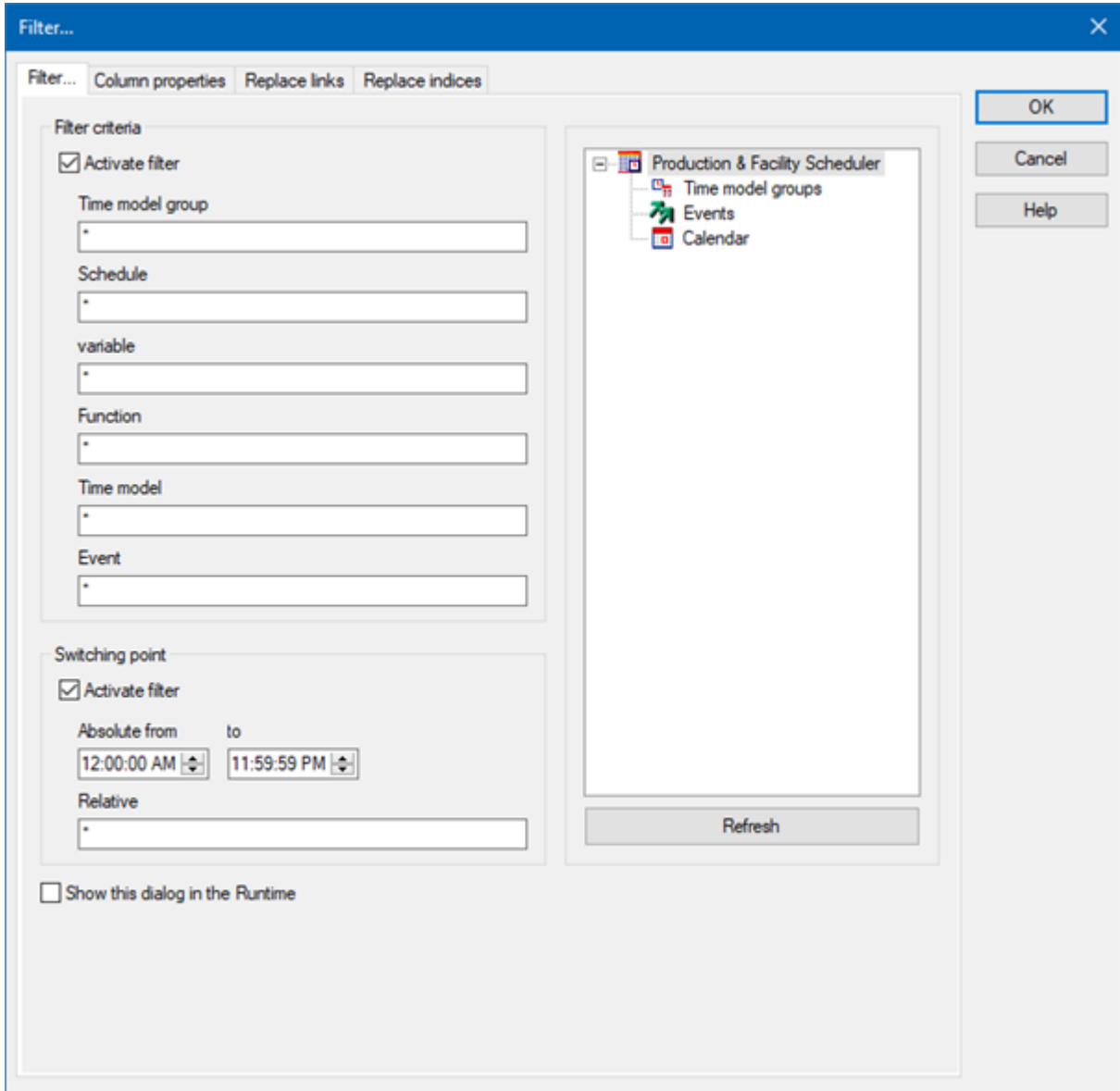
15 Screen switch - PFS

In the following chapters, you can find detailed information about the individual tabs in the screen switching dialog.

- ▶ Filter...
- ▶ Column properties
- ▶ Replace link
- ▶ Replace indices

15.1 Filter…

The available settings are identical to those in the PFS filter dialog. An additional option enables you to specify whether or not the filter dialog is activated before switching to screen activation. The object selected in the tree view is also selected again on screen switching.

Filter criteria

Option	Description
Activate filter	Enables the activation/deactivation of the **activate filter** property in the **switching points** area.
	Wildcards can be used.

Option	Description
	Default: *active*
Time model group	Input field for the time model group according to which filtering is to take place. Wildcards can be used.
Schedule	Input field for the schedule according to which filtering is to take place. Wildcards can be used.
Variable	Input field for the variable according to which filtering is to take place. Wildcards can be used.
Function	Input field for the function according to which filtering is to take place. Wildcards can be used.
Time model	Input field for the time model according to which filtering is to take place. Wildcards can be used.
Event	Input field for the event according to which filtering is to take place. Wildcards can be used.

Switching points

Parameters	Description
Activate filter	Enables the definition of time displays in the **switching points** area. **Note:** Only available if the **activate filter** property under **filter criteria** is active. Default: *active*
Absolute from	Indication of the start time for the execution of command sequences in hours, minutes and seconds.

Parameters	Description
	Example: *14:12:01*
to	Indication of the end time for the execution of command sequences in hours, minutes and seconds. **Example:** *15:16:03*
Relative	Enables the definition of a relative time period for the execution of command sequences. Wildcards can be used.

Note: Time is saved as local time. For details see chapter Handling of date and time in chapter Runtime.

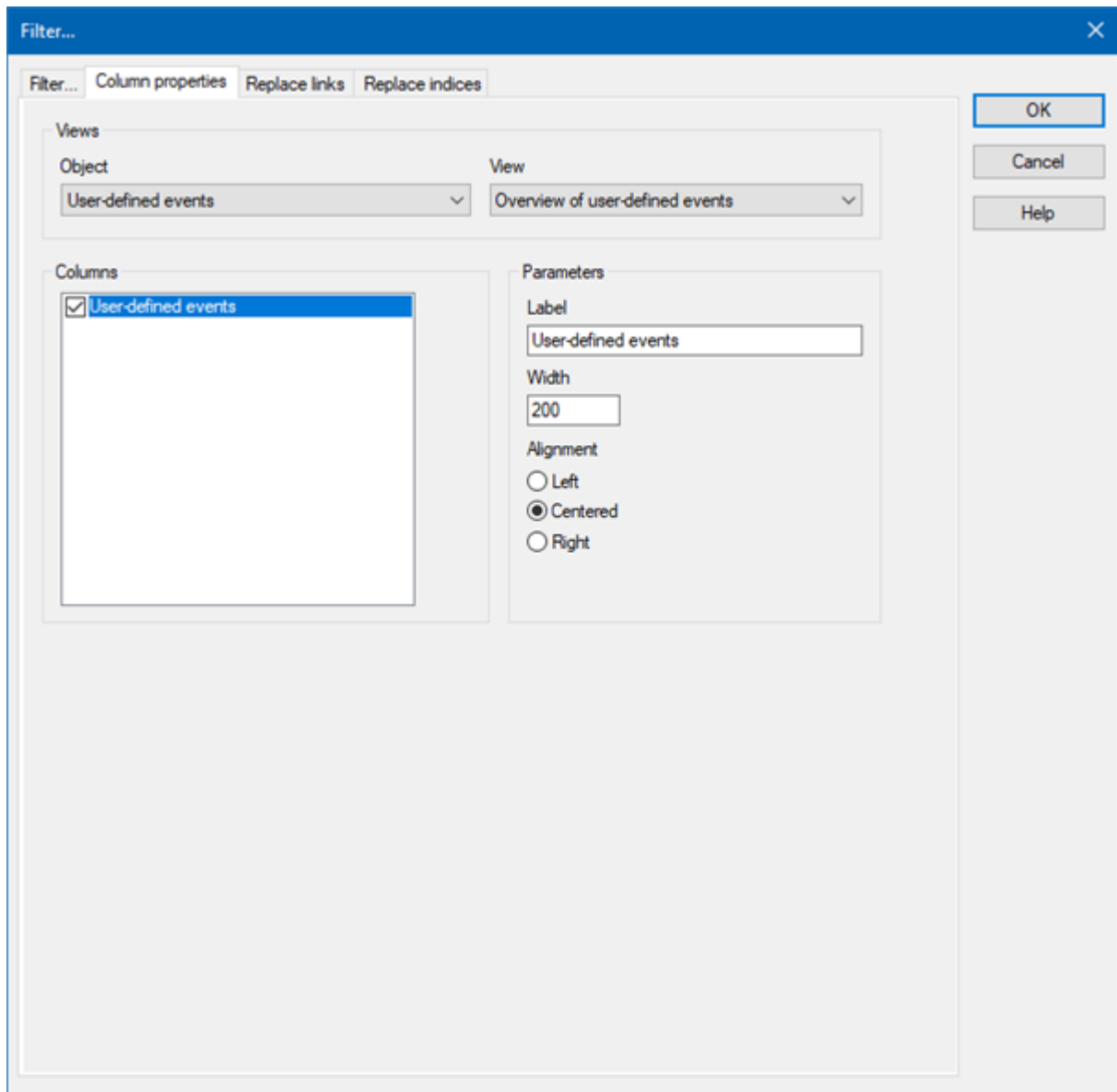| Parameters	Description
Show this dialog in the Runtime	*Active*: This dialog is opened in the Runtime before the function is executed. Default: *inactive*

Wildcards:

▸ *****: Replaces desired characters in the desired quantity. Can be used as a search term at any desired place.
red* finds all texts that start with **red**.

  ▸ **?**: Replaces precisely one character.
  r?d finds **red**, **rad**, ...

Click on **Refresh** to refresh the view of the tree structure.

15.2 Column properties

The tab enables the stipulation of the columns and labels for different table views.

Option	Description
Views	Enables the allocation of **object** and **view**.
Object	Contains the different objects for which the views can be configured: ▸ *User-defined events* ▸ *Schedule* ▸ *Calendar*

Option	Description
	▸ *Time models*
	▸ *Time model groups*
View	Select the desired view. The entries available depend on the selection made in **Object**.
Columns	Shows the columns available for the object type selected under **Object**. **Example: User-defined events**
Parameter	Allows the setting of the desired column settings.
Label	Contains the table's heading. This text can be identified as requiring translation by means of a @ character. The labeling depends on the settings made in **Object** and **View**.
Width	The column width set is pre-defined and depends on the settings made beforehand.
Alignment	Alignment of the columns' headings. Define the desired alignment: ▸ **Left** ▸ **Centered** ▸ **Right** Default: **Centered**

15.3 Replace links

There are two procedures available:

▸ Replacement of linkings using the **Apply…** button

▶ Replacement of linkings using the **Variable/function...** button

Entries displayed under **Target** can also be edited in this view if the desired **Target** is known.

Procedure:

1. Highlight the desired entry under **Target** by clicking on the left mouse button.
The entry is shown with a blue background.

2. Add the new target name using the keyboard.

3. Confirm the entry by clicking on the Enter key. Alternatively, you can also navigate with the arrow keys of the keyboard.
The change to the target name is applied.
Note: If the new target is not found, a corresponding message appears in its own dialog.
Close the dialog by clicking on **OK**. The original target name is retained.

CONTEXT MENU

If an entry under **Source** or **Target** is clicked on with the right mouse button, a context menu with the following entries is available:

Option	Description
Select target	Opens the dialog to select the desired target.
Copy	Copies the selected entry to the clipboard.
Add	Pastes the content from the clipboard. **Note:** Only available if content to be copied has been selected and the context menu is opened in an area in which insertion is possible.
Reset	Resets the amended target selection of the highlighted line entry. The **source text** then corresponds to the **target text** again.

NAVIGATION WITH THE CURSOR KEYS ON THE KEYBOARD

It is also possible to move with the cursor keys on the keyboard in edit mode.

Option	Description
Left key	Moves to the left in the line entry to be edited.
Right key	Moves to the right in the line entry to be edited.
Up key	Leaves the line entry being edited and switches to the line entry above. Carries out the substitution of the target exists. Otherwise the mouse pointer remains in the line entry and an error message appears. Close the dialog by clicking on **OK**. The original target name is retained.
Down key	Leaves the line entry being edited and switches to the line entry below. Carries out the substitution of the target exists. Otherwise the mouse pointer remains in the line entry and an error message appears. Close the dialog by clicking on **OK**. The original target name is retained.

REPLACEMENT OF LINKINGS USING THE APPLY BUTTON

Example: Variable1 is to be replaced by Variable2.

Procedure:

1. Carry out the preparations to replace linkings or indices.

2. Then click on the **Replace...** button in the **Filter...** dialog in the **Data** tab.

   The **dialog to substitute filter objects** is opened.

3. Enter the origin of the linking to be replaced in the input field under **Source (with `*´ or `?')**.

   Example: Variable1*

   The variable is visible under **Source** and **Target**.

   Initially, **Source** and **Target** are filled with the same variable.

4. Enter the variable with which Variable1 is to be replaced in the input field under **Target**.

   Example: Variable2

   Note: Variable 2 given in the example must have already been created and must be an archive variable.

5. Click on **Accept**.

   A dialog shows how many connections have been replaced.

6. Confirm the dialog by clicking on **OK**.

   The variable that replaces the source variable is now entered under target.

7. Click on **OK** to close the dialog.

8. Click on **OK** to close the filter dialog.

   The next time Runtime is opened, the curve is available in the ETM with the replaced variable (**Variable 2**).

REPLACEMENT OF LINKINGS USING THE VARIABLE/FUNCTION BUTTON

Example: Variable1 is to be replaced by Variable2.

Procedure:

1. Click on **Variable/Function...** in the **Substitute filter objects** dialog.

   The **Archive variable selection** dialog is opened.

2. If there are entries in the lower list area of the dialog, highlight these by clicking on the left mouse button.

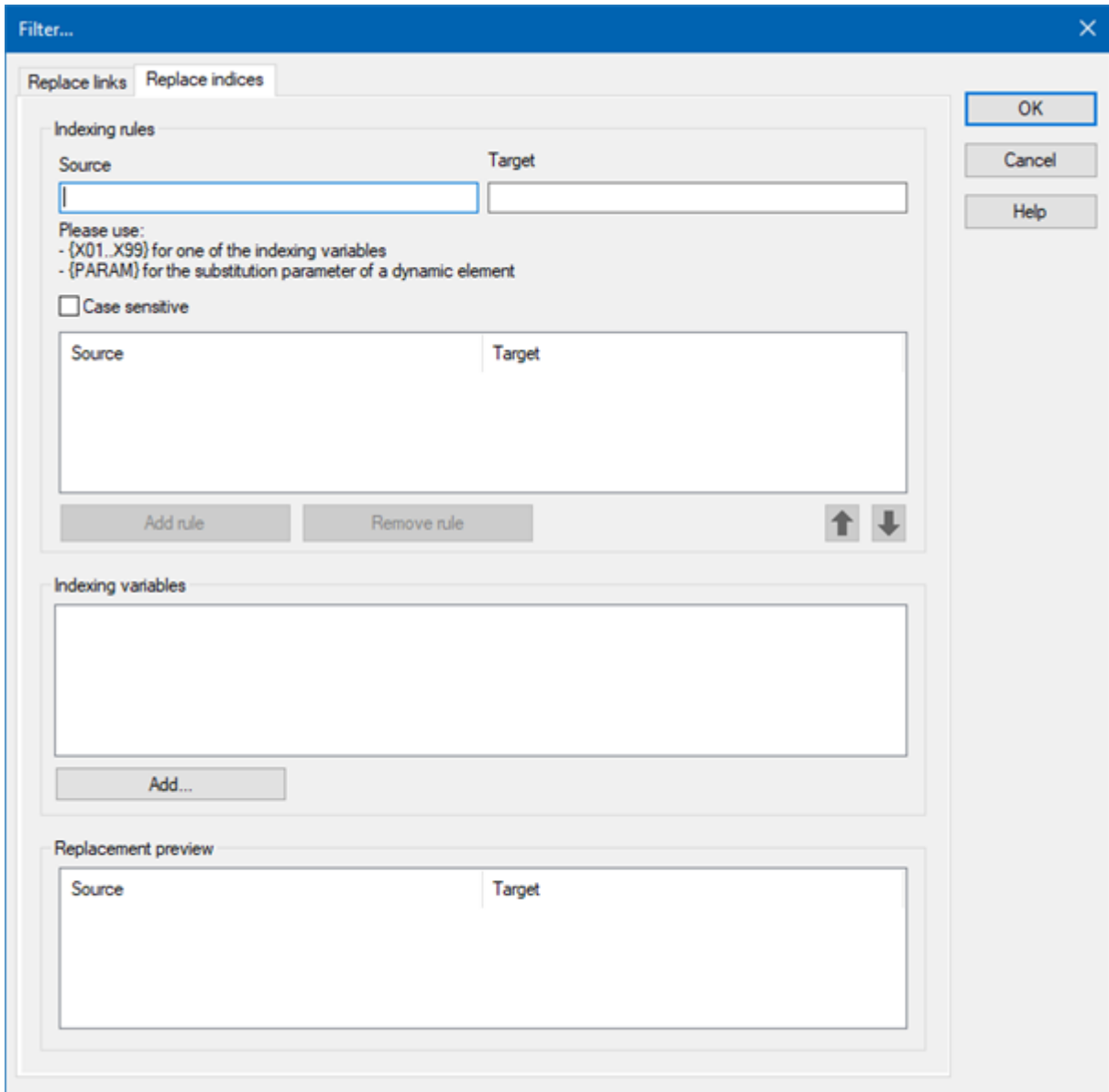3. Click on the **Delete** button to remove the entries.

4. From the archive variable displayed, select the variable that you want to replace with the source variable.

5. Confirm the selection by clicking on **Insert**.

   The selection is shown in the lower list area.

6. Click on **OK** to close the dialog.

   The selected variable is now visible in the **Substitute filter objects** dialog under **Target**.

7. Click on **OK** to close the dialog.

8. Click on **OK** to close the filter dialog.

   The next time Runtime is opened, the curve is available in the ETM with the replaced variable (**Variable 2**).

15.4 Replace indices

There are two procedures available:

▶ Replace indices with indexing variables (*X01-X99*)

▶ Replace indices with substitution parameters of a dynamic element {*PARAM*}

Example: **Variable1** is to be replaced with an indexing variable or the substitution parameter of a dynamic element.

REPLACEMENT OF INDICES

Procedure:

1. Carry out the preparations to replace linkings or indices.

2. Click on the **Replace indices** tab in the **Substitute filter objects** dialog.

   The variable to be replaced is shown in the **replacement preview** under **Source**.

   Example: Variable1

3. In the **replacement preview**, click on the variable to apply this to the **indexing rules** in **Source** and **Target**.

4. To work with indexing variables (*X01-X99*), change the naming of the variable under **Target** as desired.

   Example: Variable(X01)2 The indexing variable *X01* is used.

   Note: Always start with *X01*, because variable assignment under indexing variables automatically starts upwards.

5. Click on the **Add rule** button to apply the information in **Source** and **Target** from the indexing rules.

6. Click on the **Add...** button under **Indexing Variables**.

   The **variable selection** dialog is opened.

7. Select the variable that is to be replaced.

8. Click on **Add** to accept the variable.

9. Click on **OK** to close the dialog.

   The *X01* assigned variable is visible under **Indexing Variables**.

10. You can add further rules if you rename the variable in the **indexing rules** under **Target** and click on **Add Rule**.

    You can also use the substitution parameters of a dynamic element {*PARAM*} for this.

    Example: Variable{PARAM}2

11. Click on **OK** to close the filter dialog.

    The next time Runtime is opened, the curve is available in the ETM with the replaced variable.

Note: If there are several indexing rules, these are gone through from top to bottom. The first applicable rule is executed. The order of the rules can be amended with the arrow keys.