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User Guide

PowerDiff Version 14.3

Issue 14.3

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1 OVERVIEW

PowerDiff is a diff tool for IBM® Rational® Statemate®. Statemate® is a system specification tool that uses graphical elements and charts to model complex systems. Thereby it supports a structured analysis. PowerDiff analyses the logical and textual differences between two Statemate® charts or two versions of one chart, highlights the differences in the charts and lists the differences in a tree structure (interactive mode). In addition to the visual representation, PowerDiff generates reports (batch mode) that capture the differences found in multiple pairs of charts.

1.1 Input File Format

PowerDiff compares all chart files generated by IBM® Rational® Statemate® version 3.3.1, 4.0, 4.1, 4.1 MR1, 4.1 MR2, 4.2, 4.3, 4.4, 4.5, 4.5.0.1, 4.6, 4.6.0.1, 4.6.0.2, 4.6.0.3, 4.6.1, 4.6.1.1, 4.6.1.2, 4.6.1.3, 4.6.1.4, 4.6.1.5, 4.6.1.6, 4.6.1.7, 4.6.1.8, 4.6.1.9, 4.6.1.10, 4.6.1.11 except Module-charts.

To get a chart file from a Statemate® model, use the file export interface of Statemate®. Alternatively, chart files can be read directly from the Statemate® repository, which typically resides within the “chart” subdirectory of the project database. The original chart files remain unchanged by PowerDiff.

Important: All chart files to be compared by PowerDiff have to be semantically consistent. Thus as a precondition, all chart files to be used must have passed the Statemate® model check successfully.

Note: The input chart files may be modified by the sub-application PowerDiffConvert. For detailed information please refer to Chapter 7 “PowerDiffConvert”.

1.2 Installation and Registration

For information about installing and registering PowerDiff please refer to the “Setup and Installation Guide”. It also contains a list of the software that must be installed prior to the installation of PowerDiff.

2 GETTING STARTED

This chapter provides a short overview of PowerDiff. Please refer to chapter 3 "Interactive Mode" and chapter 4 "Batch Mode" for a more detailed description.

PowerDiff provides two modes: The interactive mode compares pairs of Statemate® chart files. The user can directly change the filter (specify chart elements to be compared) and adjust the display settings of the comparison. This mode allows a quick analysis of the differences between two versions of a Statemate® chart. The batch mode supports the comparison of multiple pairs of charts (usually a whole Statemate® model at once) and generates a report in the PDF data format. Although PowerDiff does not allow user interaction during an execution in batch mode, options set in the interactive mode and saved to a pcl file will be honoured by the batch mode.

2.1 Interactive Mode

There are three ways to start PowerDiff in interactive mode:

1. Select the "PowerDiff" icon on your desktop.
2. Select the menu item "PowerDiff" from the menu "PowerDiff" in the menu "All Programs" in the Windows Start menu.
3. Type "PowerDiff" on the command prompt window.

After displaying a licence information dialog (for information on licencing refer to the PowerDiff "Setup and Installation Guide") the PowerDiff main window appears. PowerDiff started in interactive mode features a multi document interface. Thus multiple chart list editor and compare windows may be opened simultaneously.

On start-up, there is an empty chart list editor window already opened in the document area of PowerDiff.

Now add two chart files to be compared to the chart list editor by using the "Add File" button in the "before" and "after" section. Next, select both chart files by clicking at them separately and press "Assign" to bind them together for a comparison. This action moves the bound chart files in the lower section of the chart list editor.

To view the comparison result, you may either double click at the bound chart files or select them and press the "View differences" button.

The result of the comparison is displayed in a separate window as depicted in Figure 1.

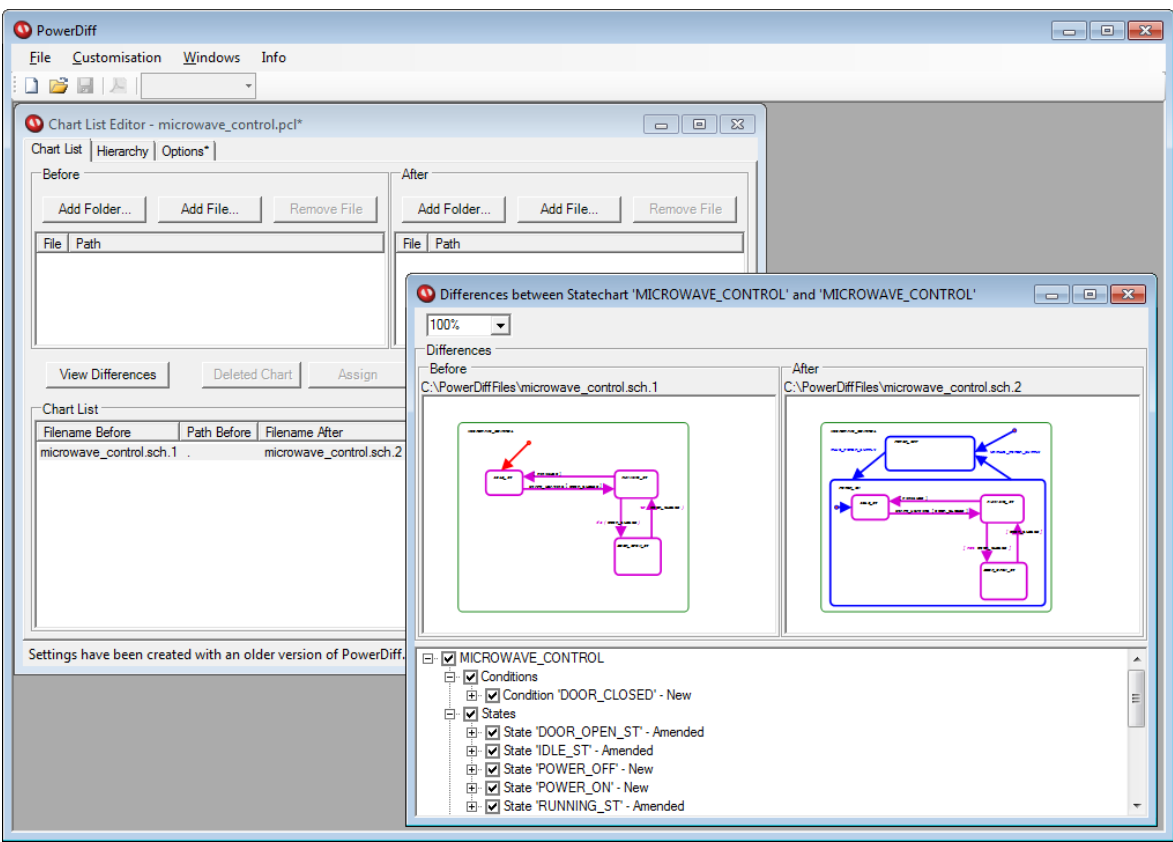


Figure 1: PowerDiff chart diff dialog

The PowerDiff difference window is split into three sections. The upper left frame contains the graphical representation of the chart selected first (called “before view”), whereas the upper right frame displays the chart selected as second (called “after view”). The differences are marked according to the following colour coding scheme:

Colour			
Meaning	Amended object	New object	Deleted object

Table 1: Colour coding scheme for graphical objects

The third (bottom) section displays a tree structure that shows all textual differences between both charts.

2.2 Batch Mode

There are various ways to start PowerDiff in batch mode:

1. Open a command shell by executing the Windows application “cmd.exe”.
2. To display the PowerDiff command syntax Insert the following call in the command shell (if required replace the default path by the correct location for your own system).

“%PROGRAMFILES%\PowerDiff\PowerDiff.exe” -?

3. Call PowerDiff.exe followed by any other valid parameter in the command prompt window

When using PowerDiff in batch mode use the syntax:

```
PowerDiff <pcl-infile> [<pdf-outfile>]
```

Where <pcl-infile> is the name of a “PowerDiff Chart List (*.pcl)” and <pdf-outfile> is the name of the report file to be created.

The chart list specifies the file names of the Statemate® chart pairs that should be compared. A chart list “PowerDiff Chart Lists (*.pcl)” can be created and edited with the “Chart List Editor” dialog in PowerDiff interactive mode as described in chapter 3.1.

For a detailed description of the batch mode and its valid parameters please refer to chapter 4 “Batch Mode”.

3 INTERACTIVE MODE

This chapter describes the features and usage of PowerDiff in interactive mode in detail. It is recommended to read chapter 2 "Getting Started" before proceeding with this chapter.

When starting PowerDiff in interactive mode, a licence dialog appears (refer to Figure 2). If PowerDiff is started for the first time, you need to specify the path to a valid licence file. As long as the licence file is valid, PowerDiff will continue to use this file, so you do not need to specify a licence file again.

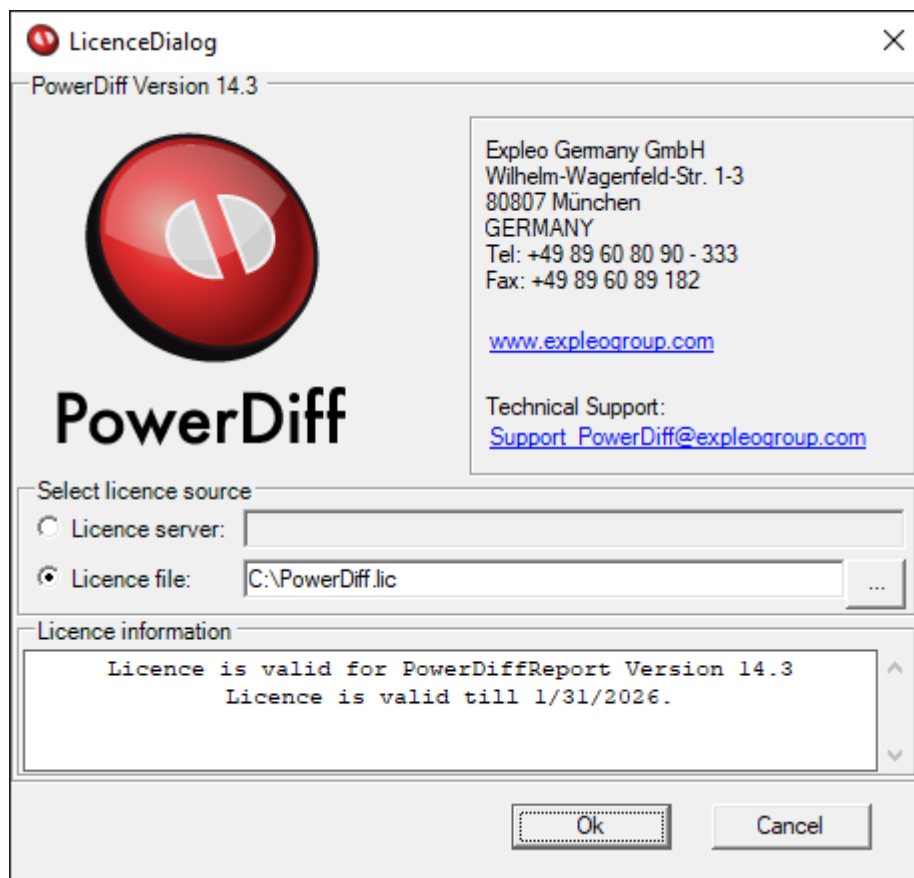


Figure 2: PowerDiff licence dialog

For further details on licencing, please refer to the PowerDiff "Setup and Installation Guide".

3.1 PowerDiff Menu Structure

The interactive mode of PowerDiff features a multi document interface to allow the concurrent handling of different sets of chart pairs. One set of chart pairs is managed by one instance of a "Chart List Editor" window as described in 3.2 "Chart List Editor". Every instance of a "Chart List Editor" may be loaded from or saved to a so called "PCL" file.

All menus reachable in the main window are bound to the currently active "Chart List Editor" window. That means, any change of settings is only valid for this active instance.

3.1.1 The “File” Menu

As shown in Figure 3, this menu contains the commonly used functions for file input and output handling:

“New”	Open a new empty “Chart List Editor” window.
“Open”	Load an existing PCL file into a new “Chart List Editor” window.
“Save”	Save a “Chart List Editor” window to its associated PCL file.
“Save As”	Save a “Chart List Editor” window into a newly created PCL file.
“Create PDF”	For convenience reasons, also the creation of a PDF report can be started from within this menu. The resulting PDF file is identically to a file generated in batch mode using the saved PCL file from the currently active “Chart List Editor”.
“Exit”	Exit the PowerDiff application.

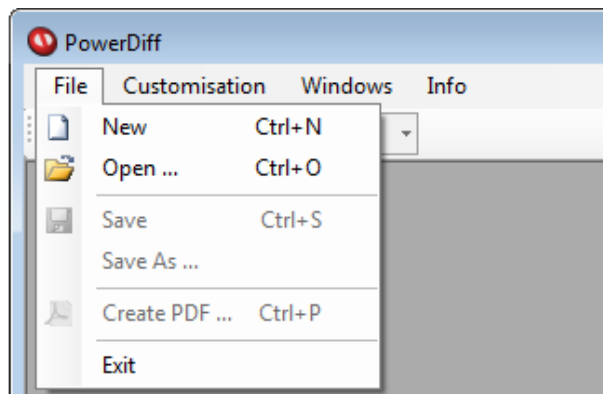


Figure 3: PowerDiff “File” menu

3.1.2 The “Windows” Menu

This menu is for handling the multiple windows opened within the PowerDiff main window. It features the well known functionality from all MDI based applications and will not be described further.

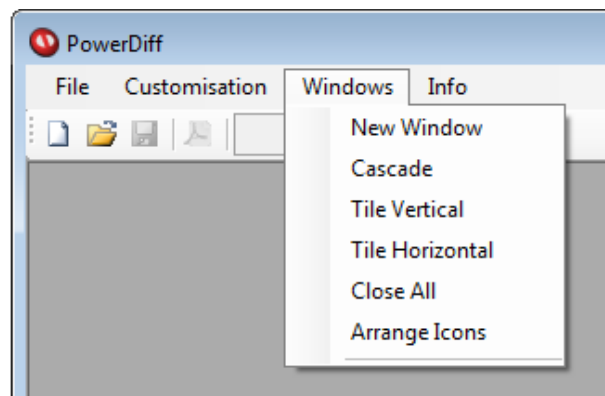


Figure 4: PowerDiff “Windows” menu

3.1.3 The “Settings” Menu

All settings done from within this menu are strictly bound to the currently active “Chart List Editor”. All the functionality is described in following chapters.

“Import Options”	See chapter 5.7 Classification Settings”
“Source/Sink-Analysis”	This enables/disables the source/sink analysis. (See chapter 8 “PowerDiffFlow”)
“Assure File Format Compatibility”	This option enables/disables PowerDiffConvert. (See chapter 7 “PowerDiffConvert”)

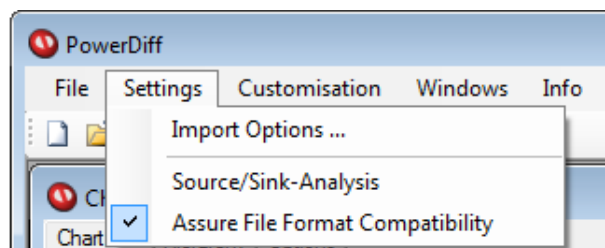


Figure 5: PowerDiff “Settings” menu

3.1.4 The “Customisation” menu

This menu provides functionalities to customise default values for new Chart Lists and the PowerDiffConvert settings. As “PowerDiff Customised Settings” (PCS) the following groups of system values are concluded.

- Options that can be edited on the “Options” tab page in a “Chart List Editor” window (please refer to chapter 5 “Options”).
- Chart Hierarchy that can be edited on the “Hierarchy” tab page in a “Chart List Editor” window (please refer to chapter 3.5 “Chart Hierarchy Editor”).
- FrontPage Settings that can be edited on the “Front Page” tab page in a “Chart List Editor” window (please refer to chapter 3.4 “Front Page Editor”).
- Document Settings that can be edited on the “Document” tab page in a “Chart List Editor” window (please refer to chapter 3.3 “Document Settings and Filtering”).
- PowerDiffConvert Settings that may be edited by the Convert Settings dialog (please refer to chapter 7.4 “Convert Settings Dialog”).

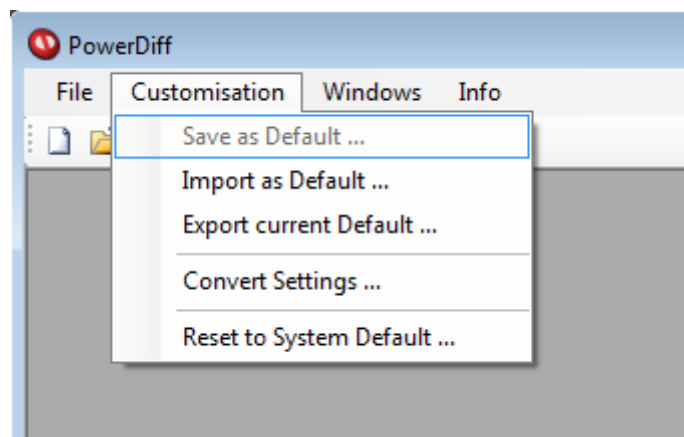


Figure 6: PowerDiff “Customisation” menu

“Save as Default”

Saves the checked settings of the current “Chart List Editor” window as default for new “Chart List Editor” windows. This menu item is disabled when no “Chart List Editor” window is opened.

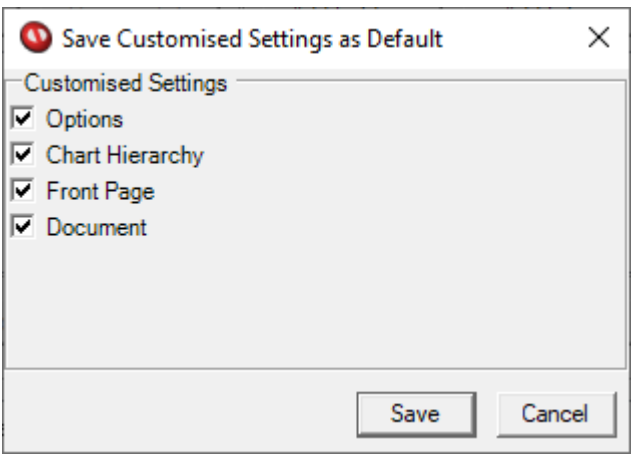


Figure 7: Save Customised Settings Dialog

“Import as Default”

Imports the checked settings from the specified “PowerDiff Customised Settings” file (*.pcs) as customised default settings for new “Chart List Editor” windows.

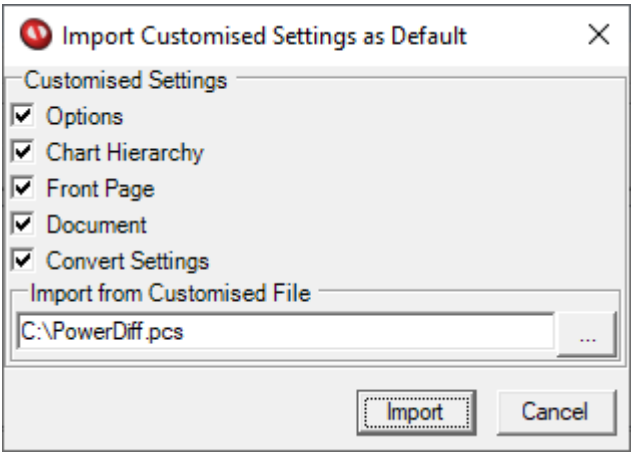


Figure 8: Import Customised Settings Dialog

“Export current Default”

Exports the checked customised default settings for new “Chart List Editor” windows to the specified “PowerDiff Customised Settings” file (*.pcs).

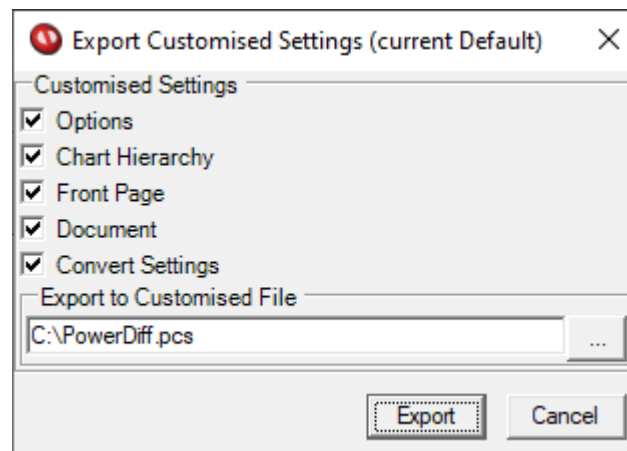


Figure 9: Export Customised Settings Dialog

“Reset to System Default” Resets the checked customised default settings for new “Chart List Editor” windows to the factory settings.

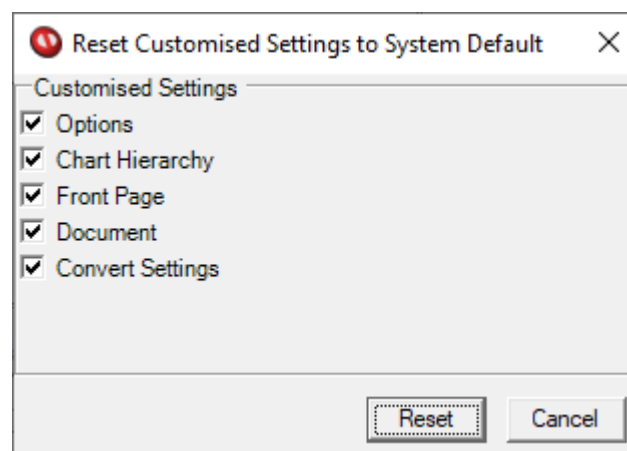


Figure 10: Reset Customised Settings Dialog

3.1.5 The Toolbar

Some functionality may also be reached using the toolbar shortcuts. See chapter 3.1.1 “The “File” Menu” for the description of the “New”, “Open”, “Save” and “Create PDF” buttons.

3.1.5.1 Relative / Absolute Paths

This option allows you to specify the save mode for the currently active “Chart List Editor”. All paths in the “Chart List Editor” chart pair section will be shown in the selected mode. A following save action will write a PCL file containing path informations as selected here.

If “Relative Paths” is selected, paths are written relatively to the PCL file associated to the currently active “Chart List Editor”. If no PCL file has been saved yet, absolute paths are used. This is also true, if a relative path cannot be determined, e.g. if the PCL file resides on a different file system than the chart files.

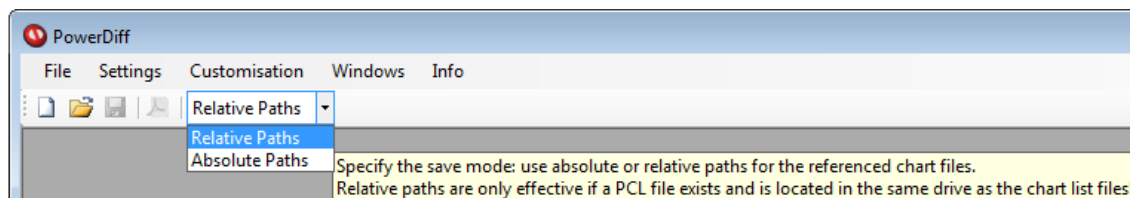


Figure 11: PowerDiff toolbar

3.2 Chart List Editor

Using the “Chart List Editor” window (see Figure 12) you may create and edit “PowerDiff Chart Lists (*.pcl)”, that are used as input for PowerDiff in batch mode. It is also the starting point for viewing differences in interactive mode.

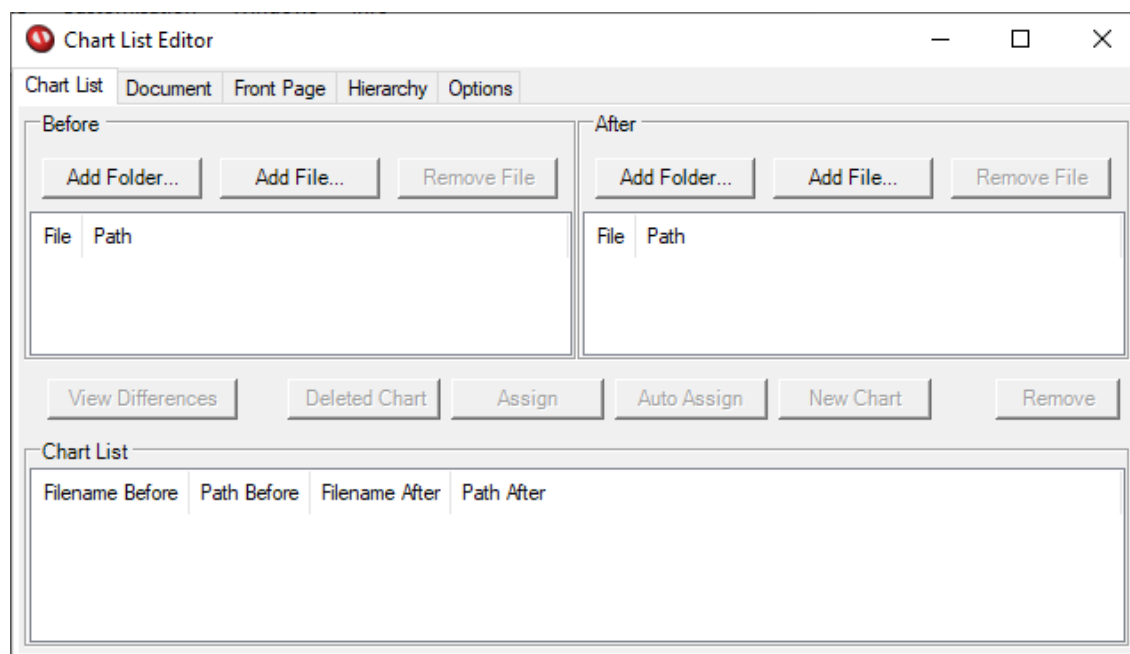


Figure 12: Chart List Editor

On start-up, there is already an empty chart list editor window opened in the document area of PowerDiff. Refer to chapter 3.1.1 “The “File” Menu” for opening further windows.

You can add file names to the “Before” and “After” lists either by using the button “Add Folder ...” or the button “Add File ...”.

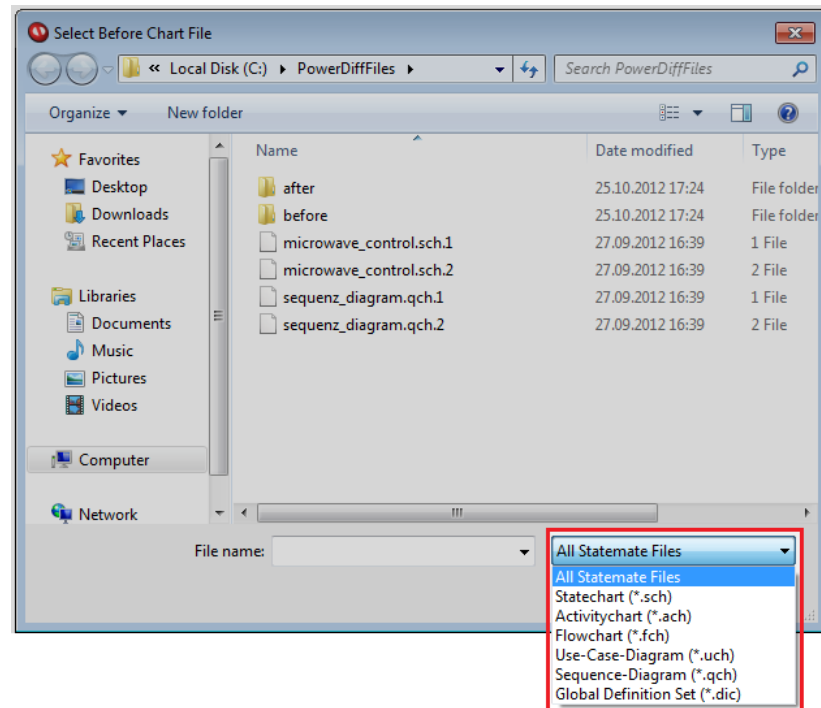


Figure 13: File open dialog

With “Add Folder ...” you can select a folder on your hard disc. All the Statemate® related files (files with an extension used by Statemate®) in this folder are added to the corresponding list. Additionally, you can use “Add File ...” to add individual files to the list.

When browsing through the directories it is convenient to use the file type filter as shown in Figure 13. It hides all files that do not match the type defined by the filter. The default value for the file type filter is “Statechart” (files with the extension “.sch”).

With button “Remove File” the selected file entries in “Before” list respectively in “After” list are excluded from the corresponding list.

Figure 14 shows the chart list editor after two directories have been chosen. The Statemate® chart files contained in the chosen directory are added to the corresponding lists.

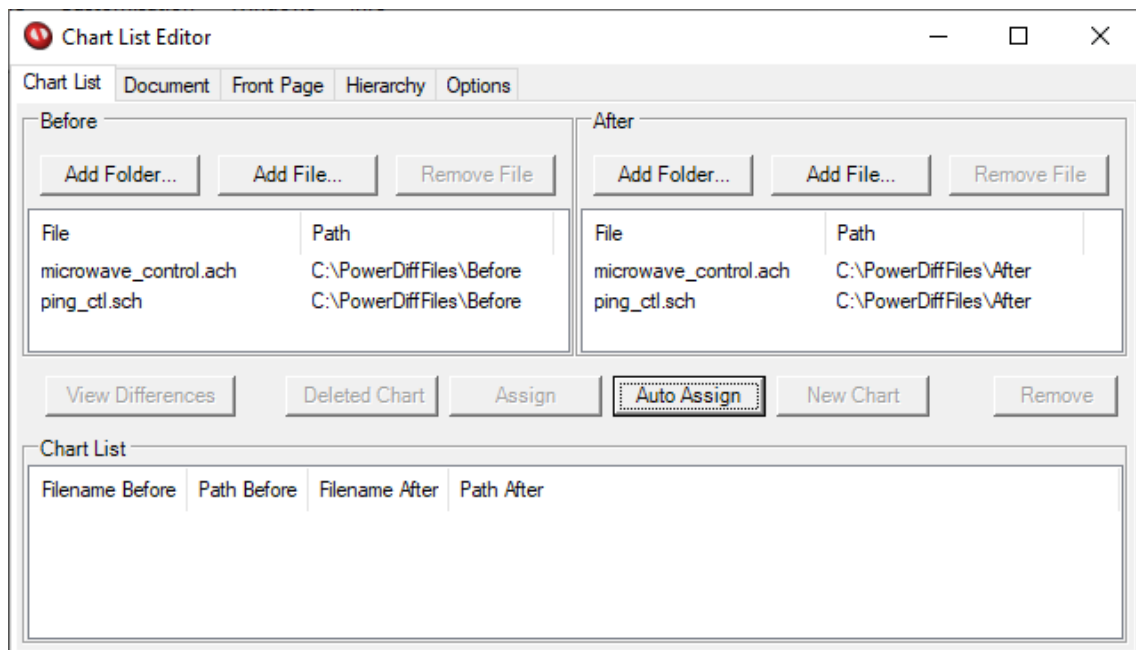


Figure 14: Some files have been added to the Chart List Editor

“Auto Assign” automatically assigns pairs by matching files with identical file names from the upper lists and adds them as entry to the chart list below. To add additional pairs to the chart list, you have to select one file from each of the upper lists and use the “Assign” button. Figure 15 shows the Chart List Editor after “Auto Assign” has been applied.

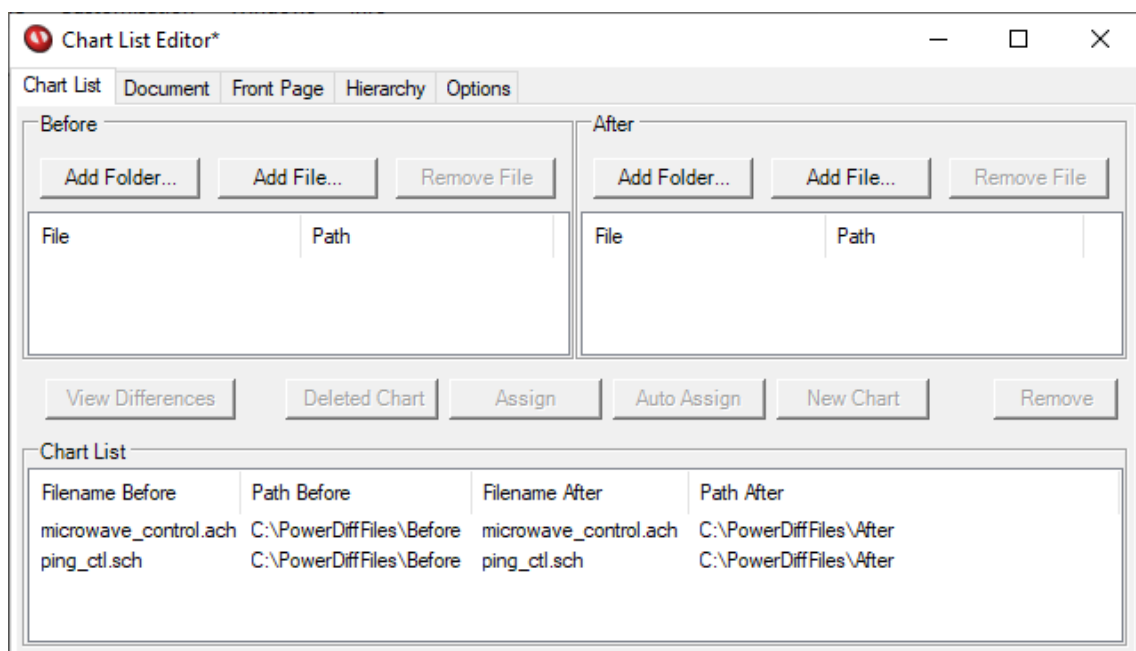


Figure 15: Pairs of Statemate® files to be compared

In order to add files to the chart list that have no counterpart (as for added and deleted charts) select them in the upper list and use the buttons “Deleted Chart” (if the chart is present only in the “Before” list of charts) or respectively “Added Chart” (for charts that are listed only in the “After” list).

You can remove selected pairs from the chart list by pressing “Remove”. The related file names are transferred back to the corresponding upper lists.

After building the chart list has been finished, it can be saved to be used by PowerDiff in Batch Mode by using the file menu or toolbar.

- If “Relative Paths” is selected on the toolbar, all chart files in the chart list are saved with a path relative to the path where the PCL File is located.
- If “Absolute Paths” is selected on the toolbar, all chart files in the chart list are saved with their absolute paths.

Alternatively, the “Generate PDF” can be triggered using the menu or toolbar to start PowerDiff in batch mode for the selected charts. Upon pressing the button, a file dialog opens, which asks for the Folder and Name of the resulting PDF-file.

An existing chart list can be loaded and edited with “Open” using the menu or toolbar.

An individual set of options can be assigned to each chart list. These options can be modified by choosing the “Options” tab page of the “Chart List Editor” window. For further information about all PowerDiff options please refer to chapter 5 “Options”.

After editing the chart list options, the chart list has to be saved to retain the options. If no options are assigned to a chart list, a default set of PowerDiff options are used when PowerDiff is started in Batch Mode for the chart list.

3.3 Document Settings and Filtering

The Document Editor provides functionalities to modify some features for the generation of difference reports. There are some general settings as well as some specific settings that are provided only for customers with classification licence.

3.3.1 General Document Settings

The view containing only the general document settings and their default values is displayed in Figure 16.

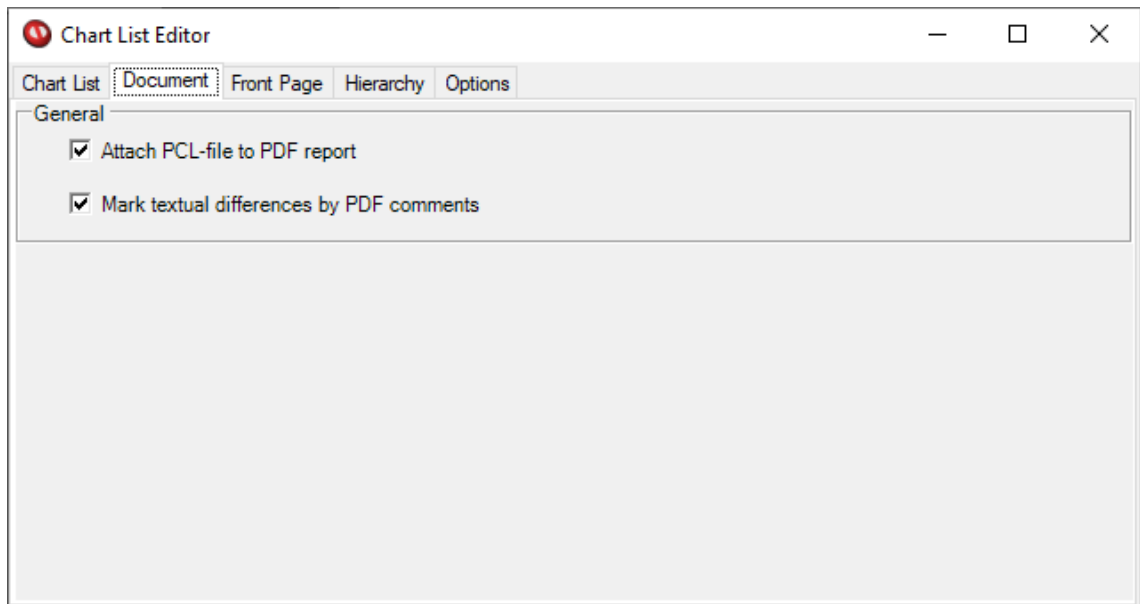


Figure 16: General settings for the generation of PDF difference reports (default values)

Attach PCL-file to PDF report

When this setting is checked (default) the PCL-file is added as file attachment to the generated PDF difference report.

When this setting is unchecked the PCL-file wouldn't be added as file attachment to the generated PDF difference report.

Mark textual difference by PDF comments

When this setting is checked (default) each textual difference is marked with a PDF comment. By this feature navigation from diff to diff is usable in the PDF difference report.

When this setting is unchecked no PDF comments are added to the generated PDF difference report. This may ease the usage of PDF comments for other purposes.

3.3.2 Document Filter Settings

The view containing the document filter settings and their default values (for customers with classification licence only) is displayed in Figure 17.

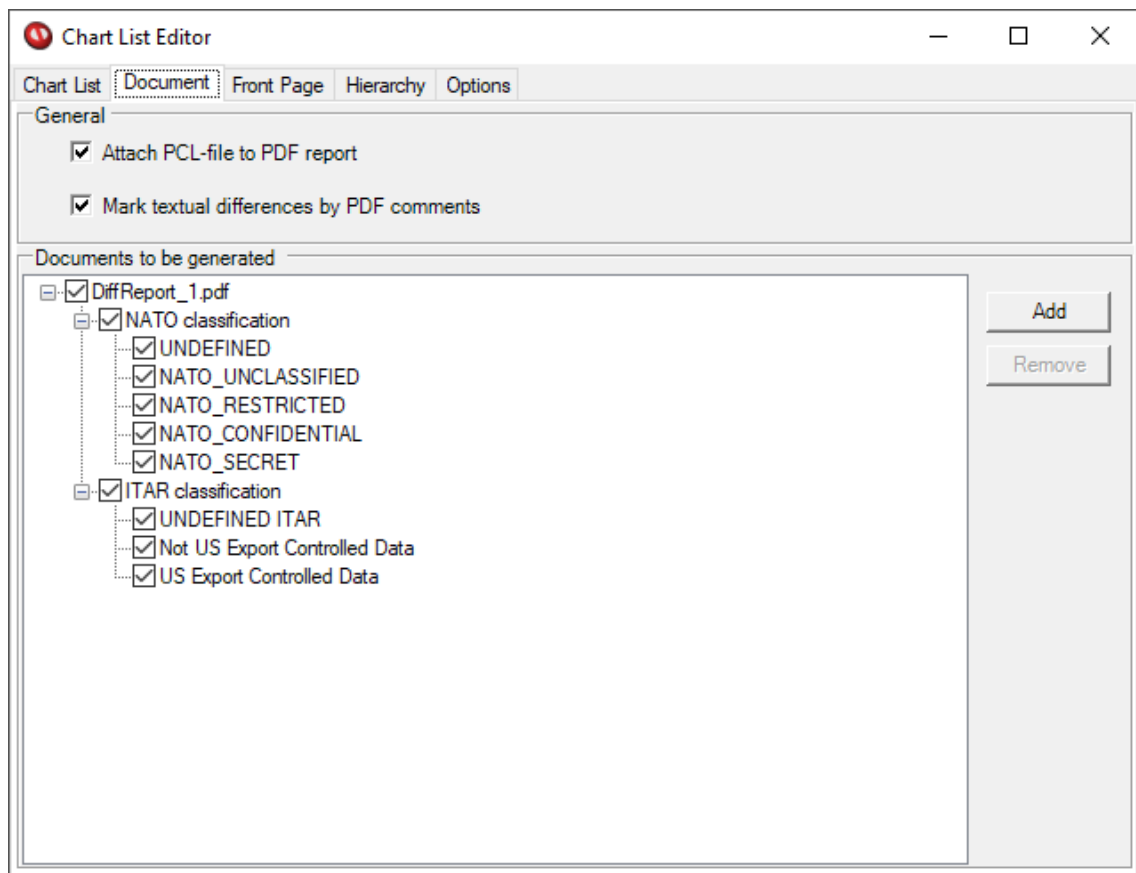


Figure 17: Document Filter Settings (default values)

Concerning the general document settings please refer to section 3.3.1 “General Document Settings”.

By default, one PDF document will be generated in batch mode containing all security classification levels as well as all ITAR classification levels. To generate reports restricted to specific classification levels (NATO and ITAR), check the classification level (NATO and ITAR) to be reported within the document. In a report for specific classification levels (NATO and ITAR), only the differences of Statemate® elements assigned to the selected classification levels (NATO and ITAR) are reported.

To generate multiple reports with different classification levels (NATO and ITAR), use the “Add” button to specify an additional document for which the classification levels (NATO and ITAR) can be selected as described before.

An unchecked document will not be generated.

If multiple reports are generated, the index of the report item in the tree view of Figure 17 is attached to the end of the name of the report file.

Remarks

When the selected NATO classification level excludes the selected ITAR classification level within one document the resulting PDF difference report may be empty or not generated.

Tips

When for example a PDF difference report shall be generated containing exclusively NATO UNDEFINED Statemate® elements, it is advised to check only “UNDEFINED” as NATO classification level, but all listed ITAR classification levels. This will assure that indeed all NATO UNDEFINED Statemate® elements will be contained in the generated PDF difference report.

When for example a PDF difference report shall be generated containing exclusively ITAR UNDEFINED Statemate® elements, it is advised to check only “UNDEFINED” as ITAR classification level, but all listed NATO classification levels. This will assure that indeed all UNDEFINED ITAR Statemate® elements will be contained in the generated PDF difference report.

Concerning the restrictions of filtering NATO classification levels, please refer to section 5.7 “Classification Settings”.

Concerning the restrictions of filtering ITAR classification levels, please refer to section 5.8 “ITAR Layout”.

3.4 Front Page Editor

The Front Page Editor provides functionalities to edit some user defined formatted texts to be displayed on the front page of the difference report. The layout of the Front Page Editor is shown in Figure 18.


Enabling / Disabling the Front Page Textboxes

When the “Enabled” checkbox is checked as depicted in Figure 18 the associated user defined formatted text can be entered into the textbox. The location of the specific user defined text on the front page is illustrated in the front page layout at the left hand side of the associated textbox within the Front Page Editor.

When the “Enabled” checkbox is unchecked the associated user defined formatted text is not displayed on the front page of the difference report.

For customers with classification licence the Front Page Editor is displayed as shown in Figure 18 if “ITAR evaluation from” on tab page “ITAR Layout” is set to “None”. Otherwise the Front Page Editor is displayed as shown in Figure 19. The top most user defined text in the Front Page Editor located on the middle of the front page within the difference report may be overwritten by the list of all ITAR licences detected within the report. In this case an appropriate message is printed to the console and to the log file. Via editor “for Reports with ITAR” a text may be specified to be displayed on the front page when ITAR information is contained within the difference report. When “ITAR Nation” is set to “UK” via editor “for Reports without ITAR” a text may be specified to be displayed on the front page when no ITAR information is contained within the difference report. The default values for both editors can be obtained from Figure 19.

Formatting the Front Page Text

As formatting features the font size, bold, italic and underlined text is supported. To edit the formatting of a text passage the text to be formatted has to be selected at first and afterwards the selected text can be formatted by selecting a font size (from 6pt, to 12pt) and by clicking format button “


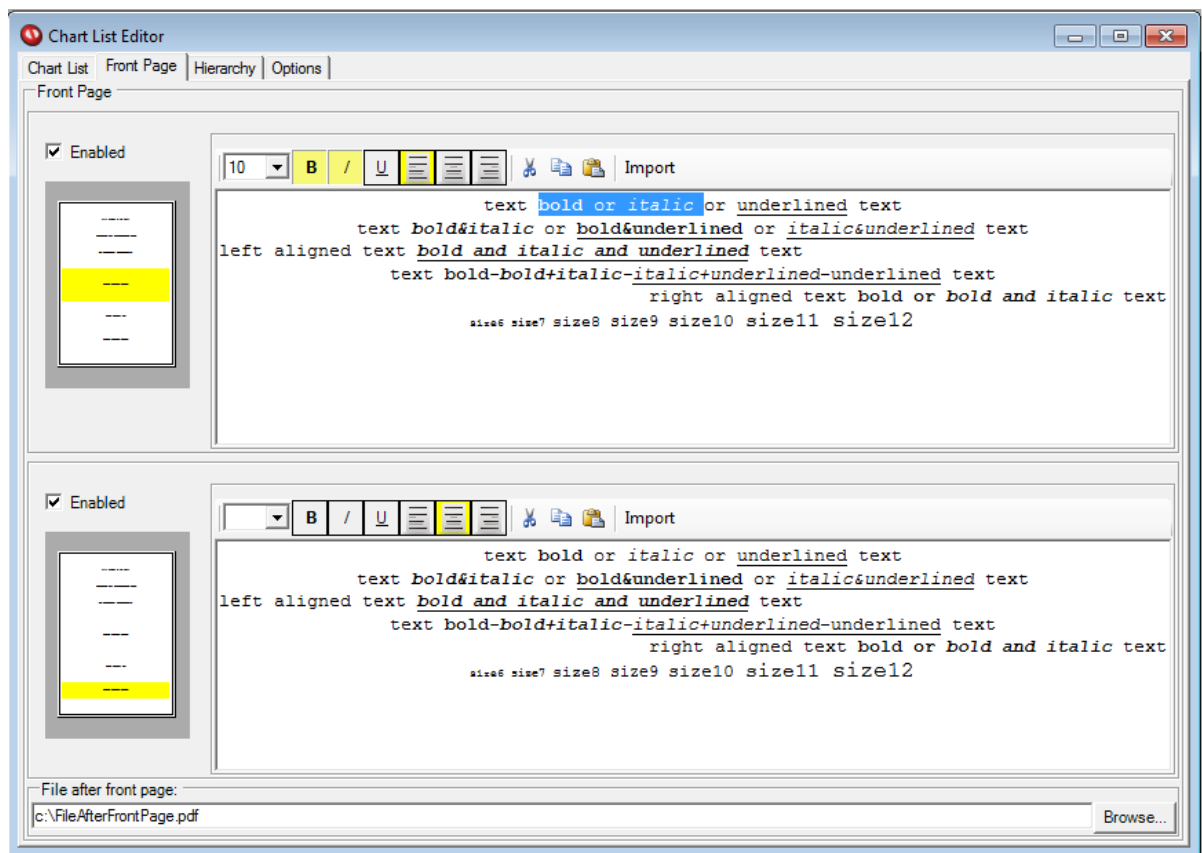

When the cursor is moved through the textbox, the formatting of the current text is displayed by font size combo box and the format buttons “


Figure 18: Front Page Editor

Using the Clipboard to edit the Front Page Text

To cut a text passage from the textbox to the clipboard, please do select the text to cut first and afterwards click the Cut button  or press the corresponding hotkey combination "Ctrl+X". The selected text passage (including its formatting) will disappear from the textbox and be moved to the clipboard, to be pasted anywhere else.

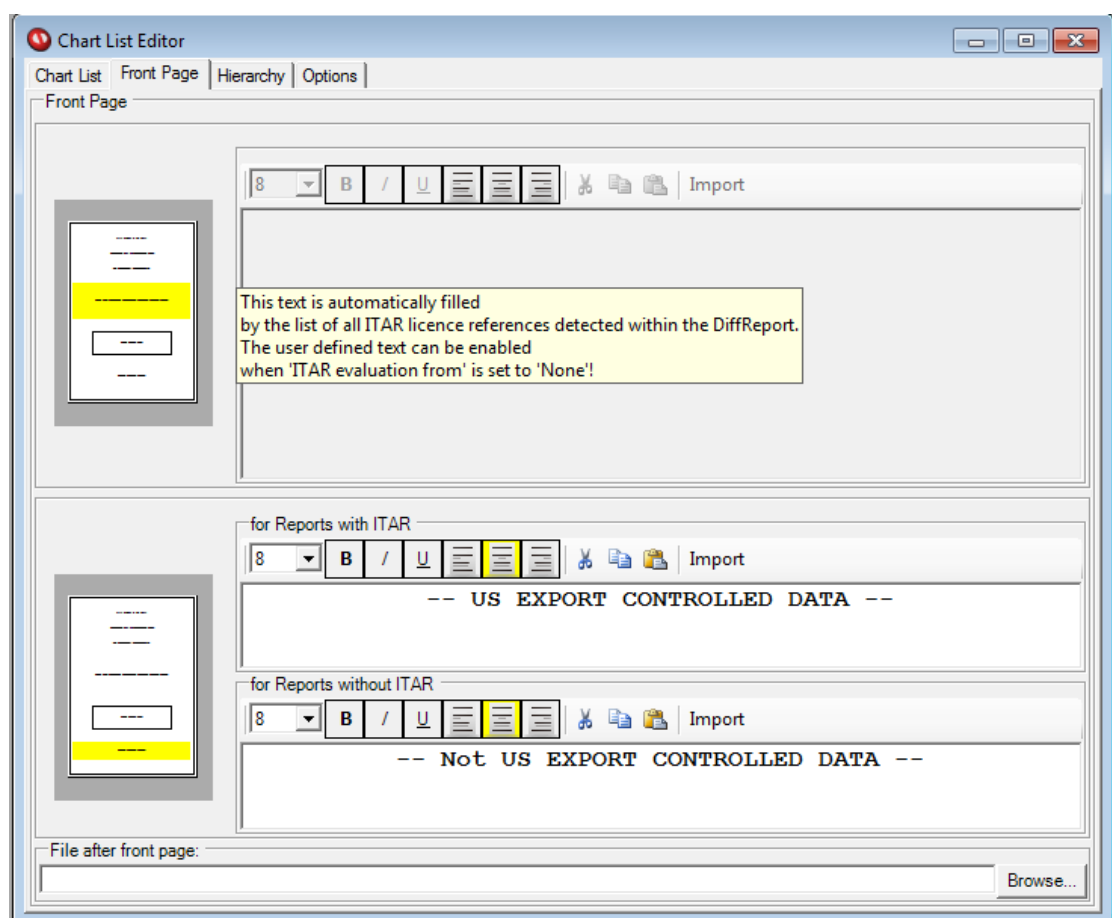




Figure 19: Front Page Editor with classification licence, "ITAR evaluation from" set to other value than "None" and "ITAR Nation" set to "UK"

To copy a text passage from the textbox to the clipboard, please do select the text to copy first and afterwards click the Copy button  or press the corresponding hotkey combination "Ctrl+C". The selected text passage (including its formatting) will be copied from the textbox to the clipboard, to be pasted anywhere else.

To paste a text from the clipboard please do set the cursor in the textbox to that location where the clipboard contents should be pasted first and afterwards click the Paste button “” or press the corresponding hotkey combination “Ctrl+V”. The text passage contained in the clipboard (including its formatting) will be pasted to the textbox. As clipboard contents only plain text and rich text is supported to be pasted to the textbox. From clipboard contents in rich text format only text including the supported font sizes, as well as the formatting bold, italic and underline is pasted into the textbox.

Importing the Front Page Text from file

The “Import” button provides functionality to import text from file into the textbox. After import the contained text in the textbox is overwritten by the imported text. As files to be imported the following formats are supported:

- Files in plain text format (*.txt).
Only plain text without formatting information is imported.
- Files in rich text format (*.rtf).
Only text including the supported font sizes as well as formatting bold, italic and underline is imported.
- Files in PowerDiff Chart List format (*.pcl).
Only the contained Front Page Text including formatting is imported.
- Files in PowerDiff Customised Settings format (*.pcs).
Only the contained Front Page Text including formatting is imported.

3.4.1 File after Front Page

The Front Page Editor provides an additional textbox “File after front page” as shown at the bottom of Figure 18. The path to an external PDF document can be entered into this textbox. This file will be inserted after the front page into the difference report.

3.5 Chart Hierarchy Editor

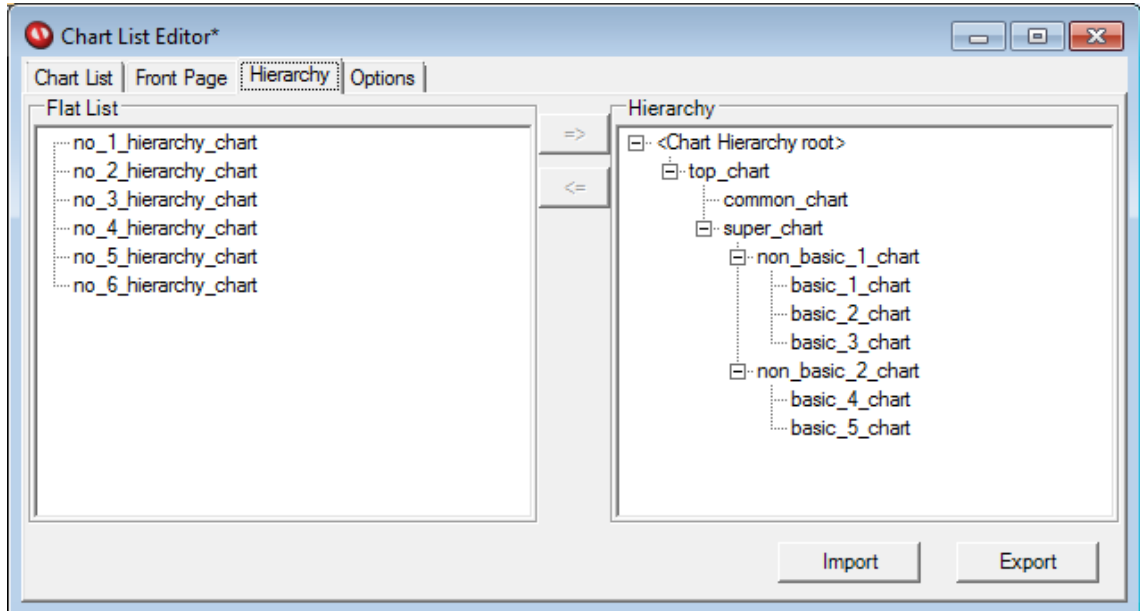


Figure 20: Layout of the Chart Hierarchy Editor

To establish a hierarchy for charts in a chart list, the “Chart Hierarchy Editor” is provided. It can be opened by choosing the “Hierarchy” tab page in the “Chart List Editor” window. The layout of the “Chart Hierarchy Editor” is shown in Figure 20:

The charts in the difference report are ordered according to the structure of the chart hierarchy stored by the chart list. You can add charts to the hierarchy by dragging a chart from the “Flat List” field onto the “Hierarchy” field. The added chart is placed as child of the chart selected in the “Hierarchy” tree view. Adding a chart to the hierarchy is also possible by selecting a chart to add in “Flat list”, selecting a parent chart in “Hierarchy” tree view and then pressing the button “=>”.

To remove a chart and its children from the “Hierarchy”, drag the chart from the “Hierarchy” tree view and drop it onto the “Flat list” field. Charts can also be removed from the chart hierarchy by selecting the chart in the “Hierarchy” tree view and clicking “<=”.

To import a chart hierarchy from a file, click “Import”.

To export a chart hierarchy to a file, click “Export”.

Please refer to the appropriate specification for the expected format of the hierarchy file to import or export.

After editing the chart hierarchy by the Chart Hierarchy Editor, the chart list has to be saved via the “Save...” button of the Chart List Editor.

3.6 Viewing Differences

After chart pairs have been successfully added to the “Chart List Editor” as described in chapter 3.2 “Chart List Editor”, a difference window (refer to Figure 21) for a chart pair can be opened by double clicking on the chart pair. Alternatively you may select multiple chart pairs and press “View Differences”. This opens a difference window for each selected chart pair.

The difference window is split into three sections:

- The “Before” view in the upper left corner contains the graphical representation of the first chart
- The “After” view in the upper right corner contains the graphical representation of the second chart
- The tree at the bottom lists all differences found for a chart element

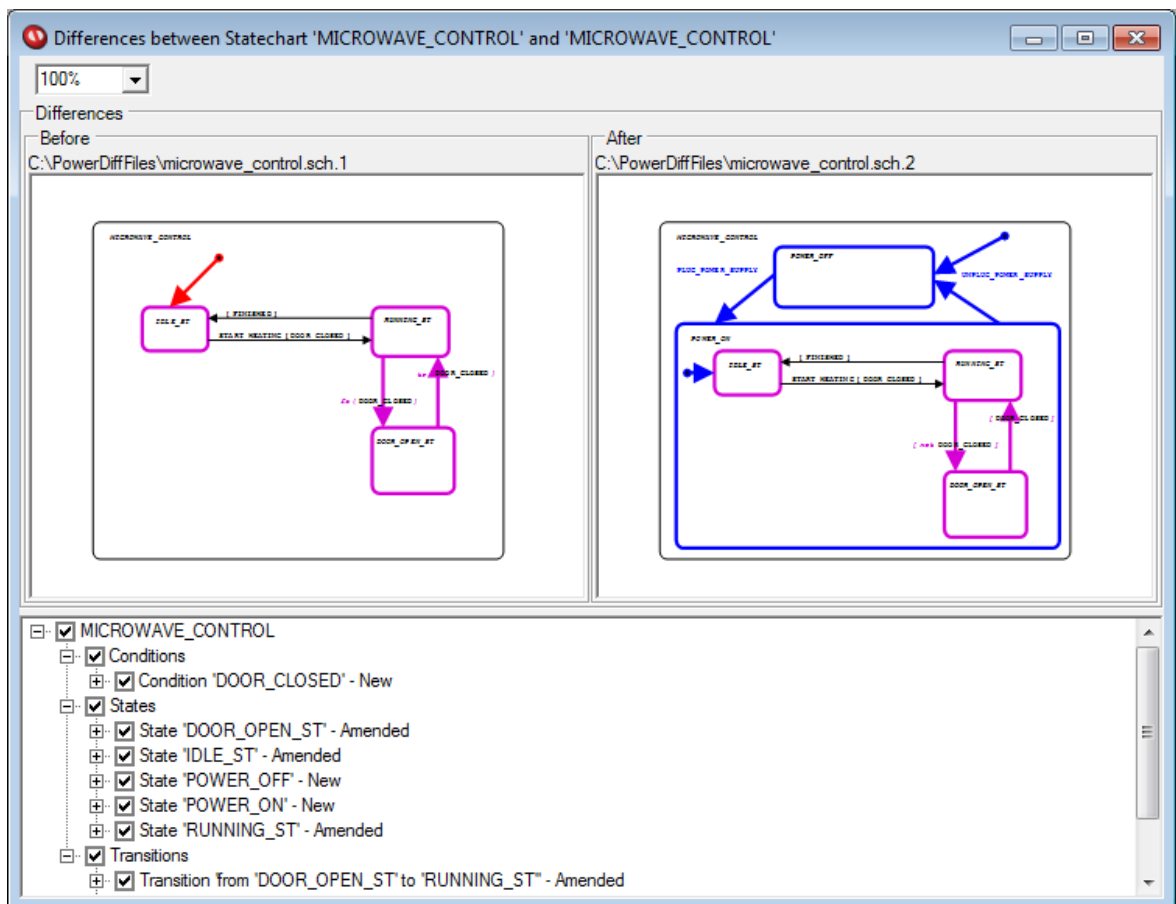


Figure 21: PowerDiff difference window

The differences are organized in a tree structure that groups the affected chart objects by their category. The following categories may apply (in Alphabetic order):

- Actions
- Conditions
- Events

- Activities
- Transitions
- Dataflows
- Connectors
- Dataitems
- Datatypes
- Notes
- States
- etc.

For each chart object, the type of difference is specified. The following types of differences are described:

- New: The chart object has been added to the chart displayed in the “After” view.
- Deleted: The chart object has been removed from the chart displayed in the “Before” view.
- Amended: The chart object or at least one of its elements differs between the “Before” view and the “After” view.

You can change the detail level of the tree structure using the actions listed in Table 2.

	Expand selected item	Collapse selected item
Left mouse click	Click “+” sign	Click “-” sign

Table 2: Expanding/Collapsing items in the difference tree

3.6.1 Highlighting of Graphical Objects

In the graphical views a colour coded highlighting scheme is used to visualise differences between the chart files.

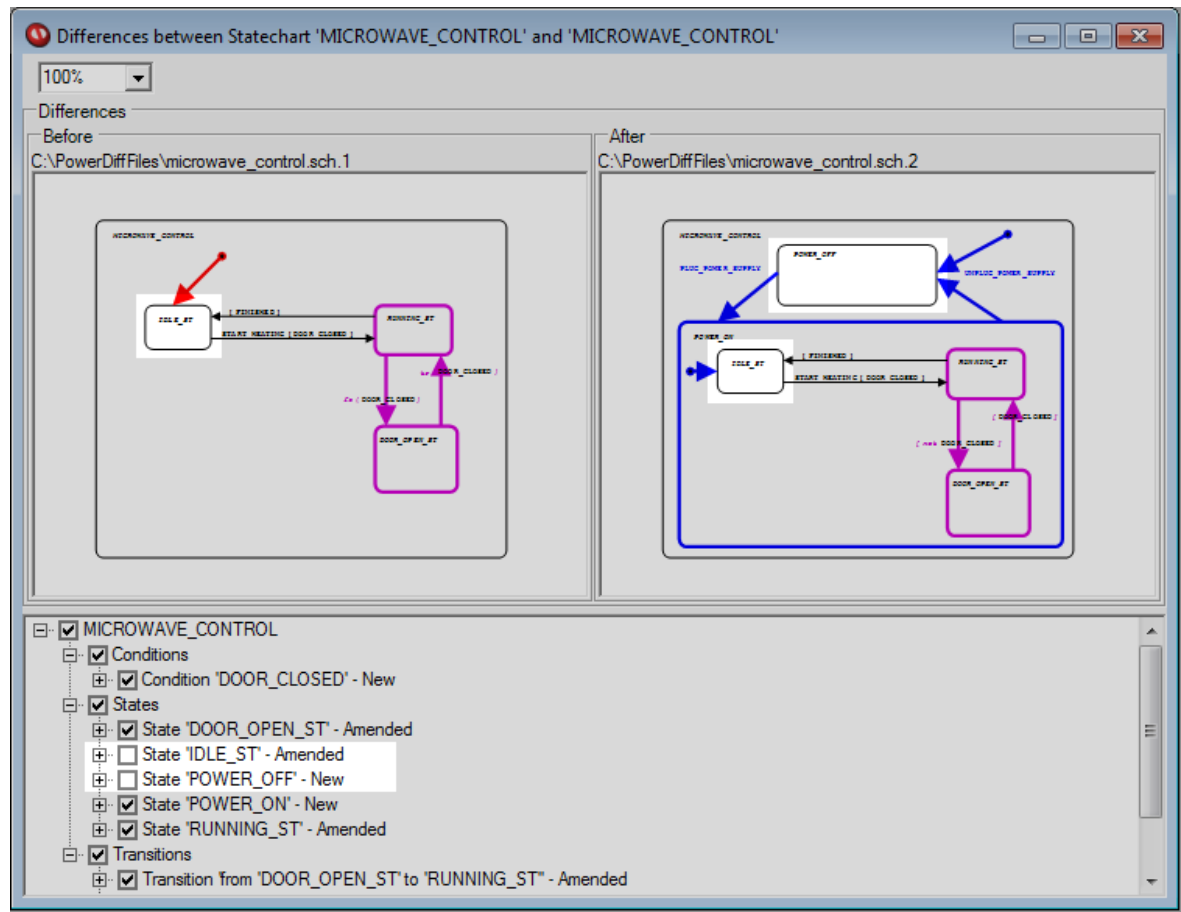


Figure 22: Enable/disable highlighting

This highlighting can be enabled or disabled for every object by activating or deactivating the check box next to the item in the difference tree by a left mouse click (See Figure 22).

If one of the elements in the difference tree associated with a graphical object is checked, the graphical object is highlighted according to the colour coding scheme shown in Table 3.

Colour	Pink	Blue	Red
Meaning	Amended object	New object	Removed object

Table 3: Colour coding for graphical objects

If an element in the difference tree contains sub elements, changes to the status of the highlighting setting will change the settings of its sub elements accordingly.

Note: Due to limitations of the Statemate® file format, some Statemate® objects (e.g. states) can only be identified reliably by their names. A change in the name cannot be distinguished from a deletion and insertion of an object with the new name and therefore the affected object is highlighted

as removed and added object. This applies to other Statemate® objects which have several identification criteria (e. g. arrows) in a similar fashion.

3.6.2 Viewing Difference Details

When you expand a branch in the difference tree, you will eventually encounter an element that does not have any sub elements (as shown in Figure 23).

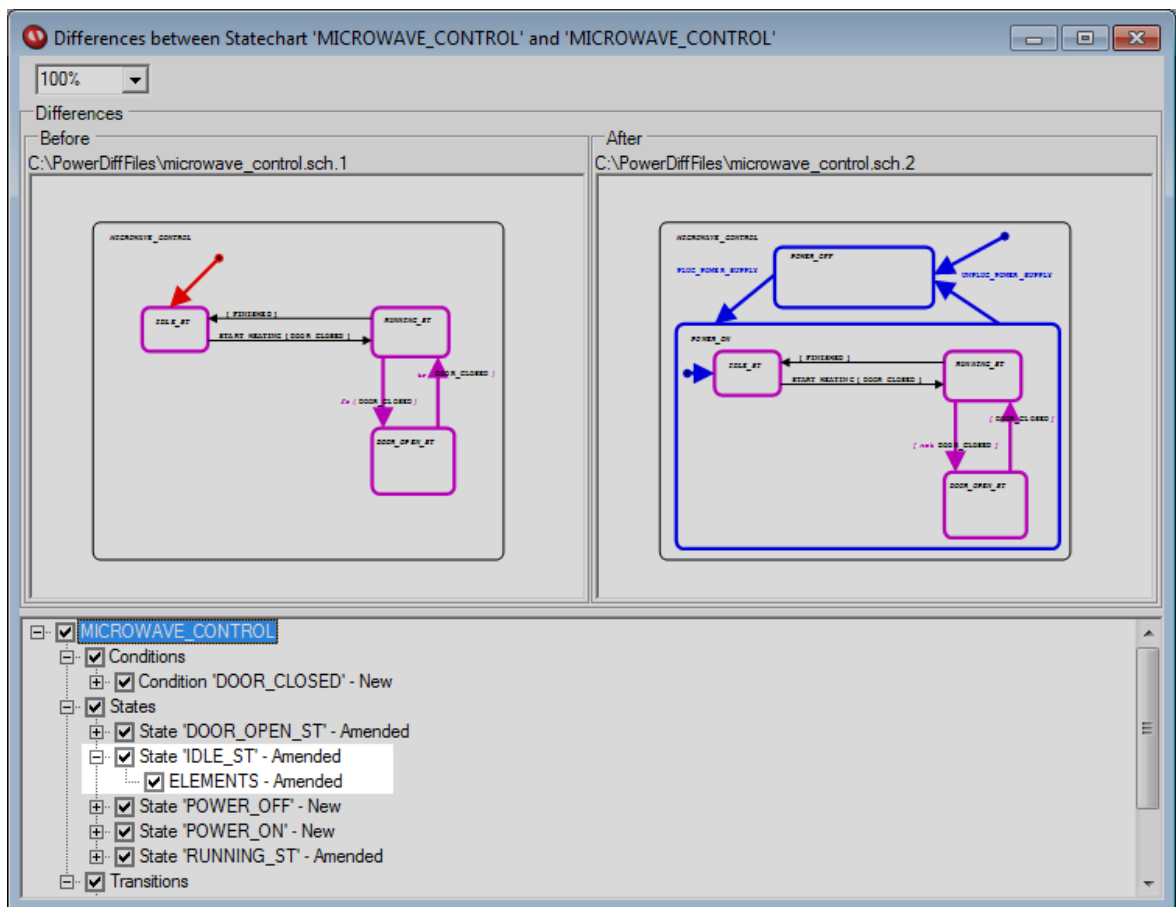


Figure 23: Elements with attributes

Usually these elements contain attributes that can be viewed by selecting the desired element. The attributes are opened in a split pane where the attributes on the left side belong to the “Before” chart and the ones on the right side belong to the “After” chart.

When an element has been added to the “After” chart, an empty field is inserted on the left side. In contrast, when an element has been removed from the “Before” chart, the corresponding field on the right side remains empty.

Depending on the type of the selected element there are different types of detail views:

- Textual differences (refer Figure 24)
- Tabular differences (refer Figure 25)

- Differences in truth tables (refer Figure 26)

Colour	Pink	Blue	Red
Meaning	Amended object	New object	Deleted object

Table 4: colour coding for textual elements

In the detail views, the same colour coding is used as in the graphical views. For the sake of better legibility, turquoise is altered to blue in the difference views. The colour coding of textual changes is given by Table 4.

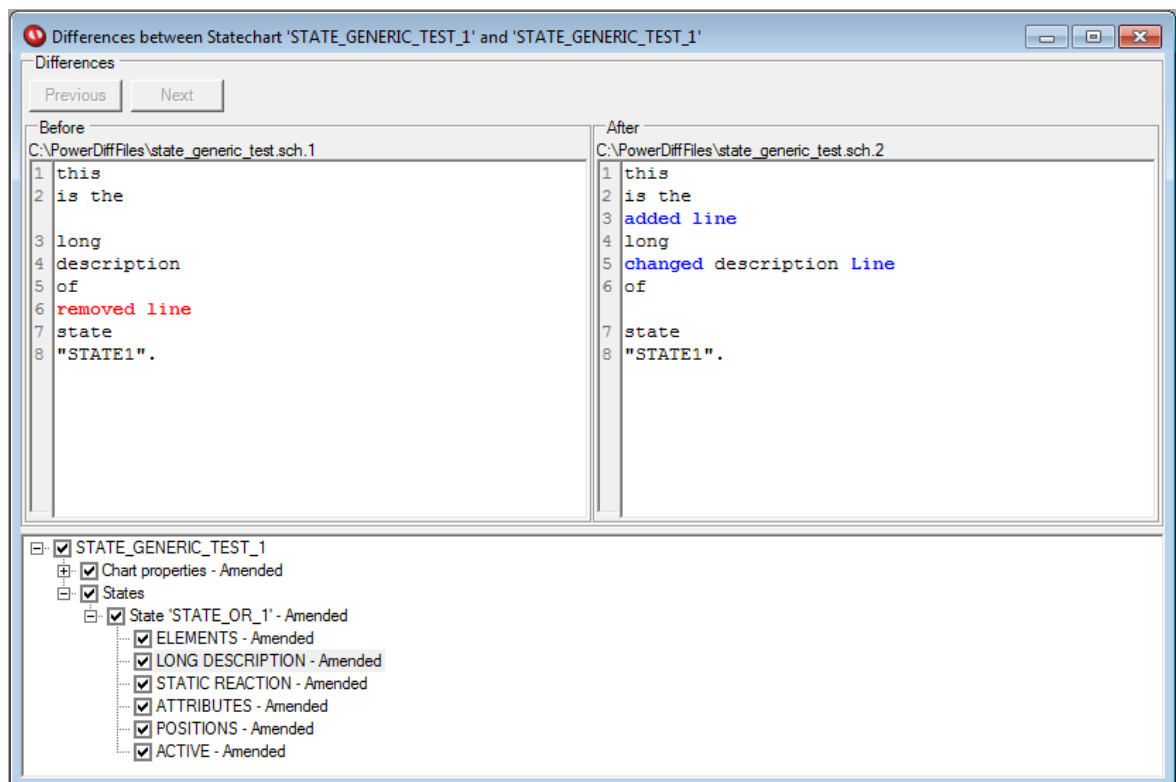


Figure 24: Detail view with textual differences

The example shown in Figure 24 indicates that the long description of a state was changed. The long description text has been selected to contain examples for changes detected by PowerDiff. There are added lines, added words within lines, changed and removed lines. All these changes can easily be navigated by using the “Next” and “Previous” button above the difference view. Pressing the “Next” button scrolls the next change into view. Pressing the “Previous” button scrolls back to the previous change. If the beginning or the end of the text is reached, the “Previous” or the “Next” button get disabled. Both buttons are also disabled if all changes are visible, thus no scroll action is needed.

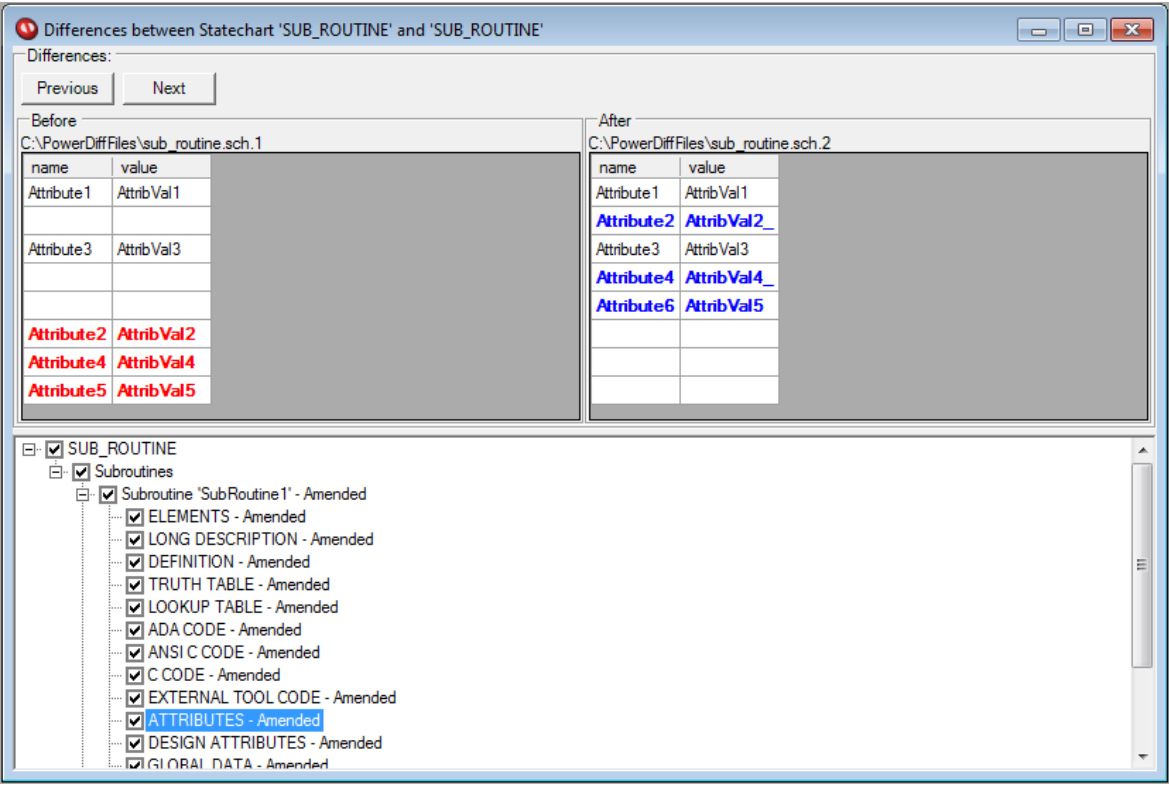
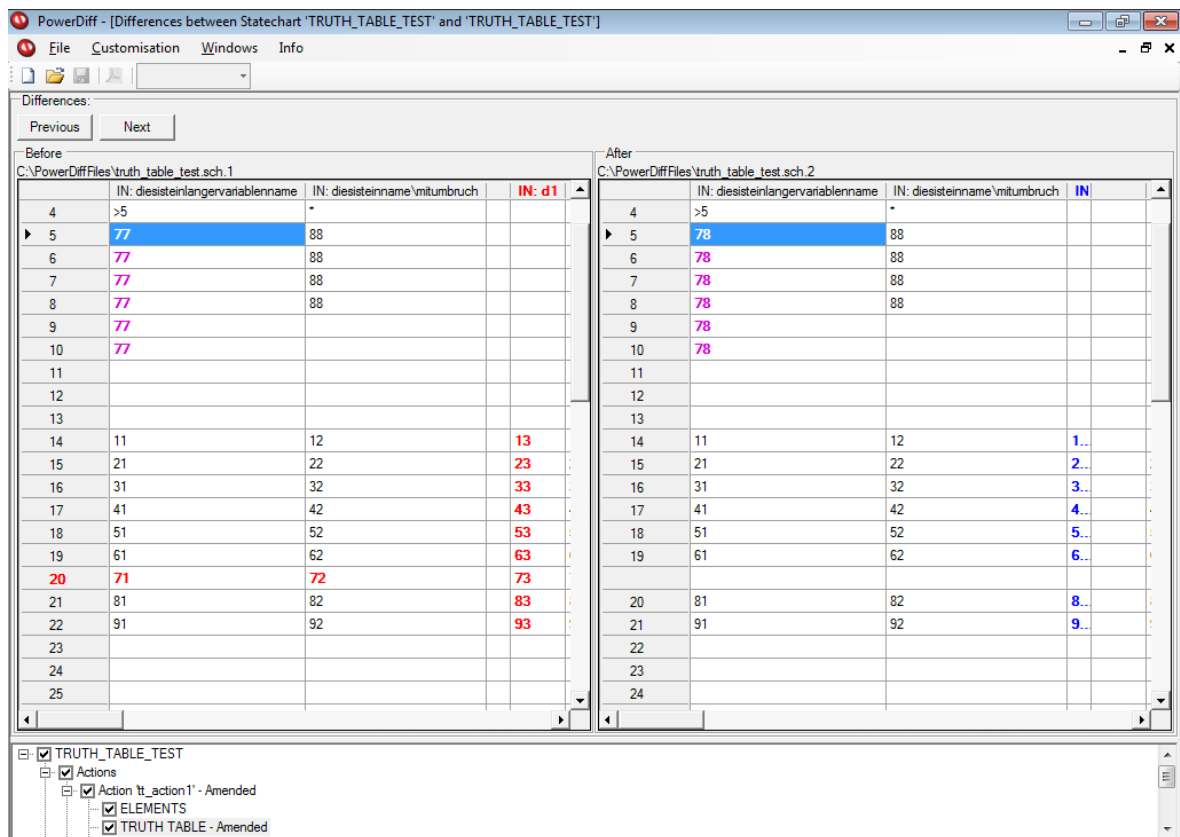


Figure 25: Detail view with tabular differences

Figure 25 shows some examples of a removed attribute (Attribute2) and an attribute that was added (Attribute4) as well as unchanged attributes (Attribute3).

Again all these changes can be navigated by using the “Next” and “Previous” button above the difference view. Pressing the “Next” button scrolls the next change into view. Pressing the “Previous” button scrolls back to the previous change. If the beginning or the end of the table is reached, the “Previous” or the “Next” button get disabled.



PowerDiff - [Differences between Statechart 'TRUTH_TABLE_TEST' and 'TRUTH_TABLE_TEST']

File Customisation Windows Info

Differences:

Previous Next

Before

C:\PowerDiffFiles\truth_table_test.sch.1

	IN: diesisteinlangervariablenname	IN: diesisteinname'mitumbruch	IN: d1
4	>5	*	
5	77	88	
6	77	88	
7	77	88	
8	77	88	
9	77		
10	77		
11			
12			
13			
14	11	12	13
15	21	22	23
16	31	32	33
17	41	42	43
18	51	52	53
19	61	62	63
20	71	72	73
21	81	82	83
22	91	92	93
23			
24			
25			

After

C:\PowerDiffFiles\truth_table_test.sch.2

	IN: diesisteinlangervariablenname	IN: diesisteinname'mitumbruch	IN
4	>5	*	
5	78	88	
6	78	88	
7	78	88	
8	78	88	
9	78		
10	78		
11			
12			
13			
14	11	12	1..
15	21	22	2..
16	31	32	3..
17	41	42	4..
18	51	52	5..
19	61	62	6..
20			
21	81	82	8..
22	91	92	9..
23			
24			

Legend:

- ☒ TRUTH_TABLE_TEST
- ☒ Actions
- ☒ Action 't_action1' - Amended
- ☒ ELEMENTS
- ☒ TRUTH TABLE - Amended

Figure 26: Detail view with differences in truth tables

The detail view in Figure 26, for example, indicates that line 20 of the truth table has been deleted. Additionally, the whole column “d1” has been removed.

The width of the displayed columns gets dynamically adjusted to the needed text width. The width may be changed manually by dragging the vertical lines in the head of the table with the left mouse button.

3.6.3 Zooming Graphical View

The user can zoom in on the graphical views to show detailed graphical information in large. The zoom is controlled through the drop down list in the left upper corner of the PowerDiff difference window (refer to Figure 27). The selected zoom factor is shared by both the “Before” and the “After” view. The synchronised scroll bars at the bottom and the right side of each view can be used to move the viewed area of both charts simultaneously.

The value of the zoom control can be set by using the drop down list or by typing a numeric value when the zoom control is currently focused (the cursor is visible in zoom control). When typing the value manually, the zooming is activated either by pressing the “Enter” or the “Tab” key.

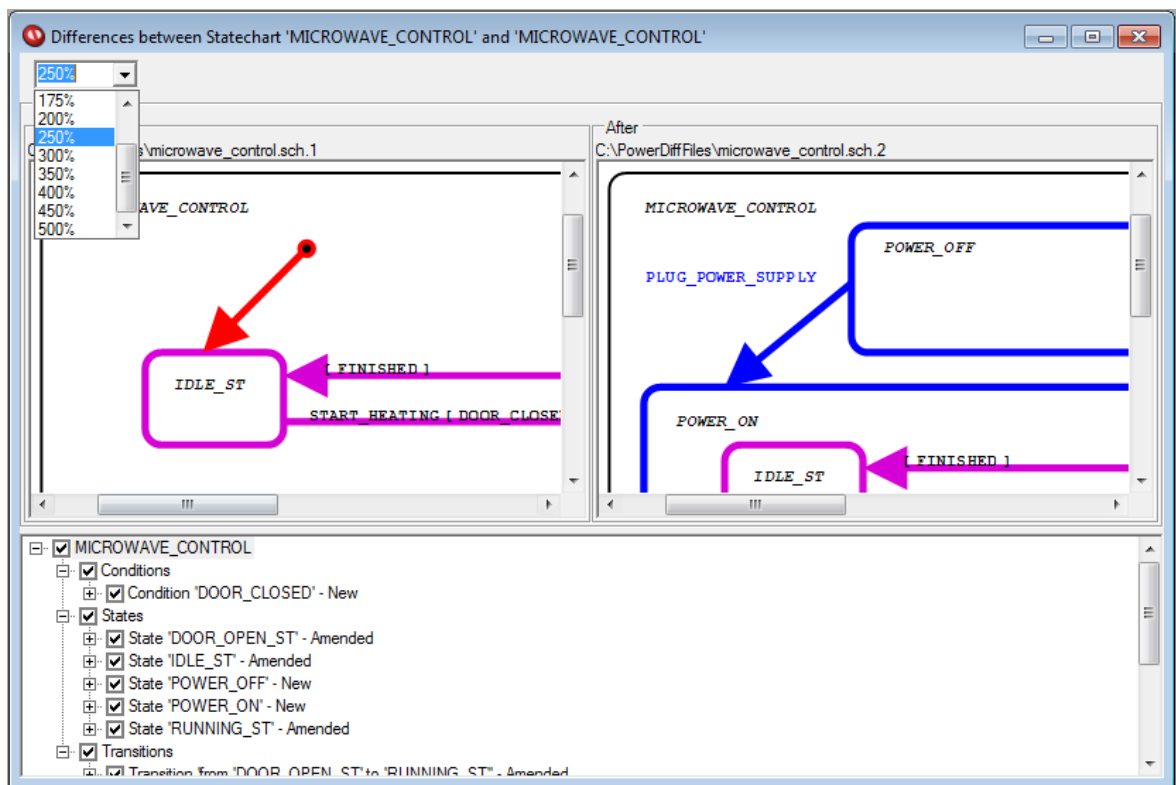


Figure 27: Zoom control in tool bar of PowerDiff main window

4 BATCH MODE

This chapter describes the functions and usage of PowerDiff in batch mode. It is recommended to read chapter 2 "Getting Started" before proceeding with this chapter.

Before starting PowerDiff in batch mode for the first time, PowerDiff needs to be started in interactive mode in order to specify a licence file (refer to chapter 3 "Interactive Mode").

4.1 Using PowerDiff in Batch Mode

The syntax of PowerDiff in batch mode is:

```
PowerDiff [-?|-help] [-nolink] [-noreport] [-noconvert] [-noflow]  
<PowerDiffPCLInputFile> [<PowerDiffPDFOutputFile>]
```

Where

<PowerDiffPCLInputFile>: PowerDiff Chart List file name, containing a list of all chart files to be compared (refer chapter 3.1, 4.2 and 7.1.1).

<PowerDiffPDFOutputFile>: PowerDiff batch output file name, containing the difference report in PDF format. This parameter is optional. If it is left out, the name of the PDF file is derived from <PowerDiffPCLInputFile> by changing the suffix to ".pdf".

[-?|-help]: Displays a PowerDiff help message declaring the syntax to start PowerDiff in Batch Mode.

[-nolink]: Disables all links and bookmarks in the PDF document. This option should be selected when the generation of large PDF documents fails and the message "TeX capacity exceeded" is displayed.

[-noreport]: Disable difference report, so only PowerDiffConvert and PowerDiffFlow are executed.

[-noconvert]: Disable PowerDiffConvert utility.

[-noflow]: Disable the Source/Sink-Analysis through PowerDiffFlow.

The example below shows how to start PowerDiff in batch mode from the command line to create the difference report "D: \Report\statecharts_diffs.pdf" from the charts listed in the input chart list file "D:\ Batch\ statecharts.pcl".

```
PowerDiff "D:\Batch\statecharts.pcl" "D:\Report\statecharts_diffs.pdf"
```

It is advised to enclose the arguments <PowerDiffPCLInputFile> and <PowerDiffPDFOutputFile> in double quotes when the path to these files include a space character.

If PowerDiff is called without any parameter from the command line, it starts in interactive mode.

4.2 Creating a Chart List

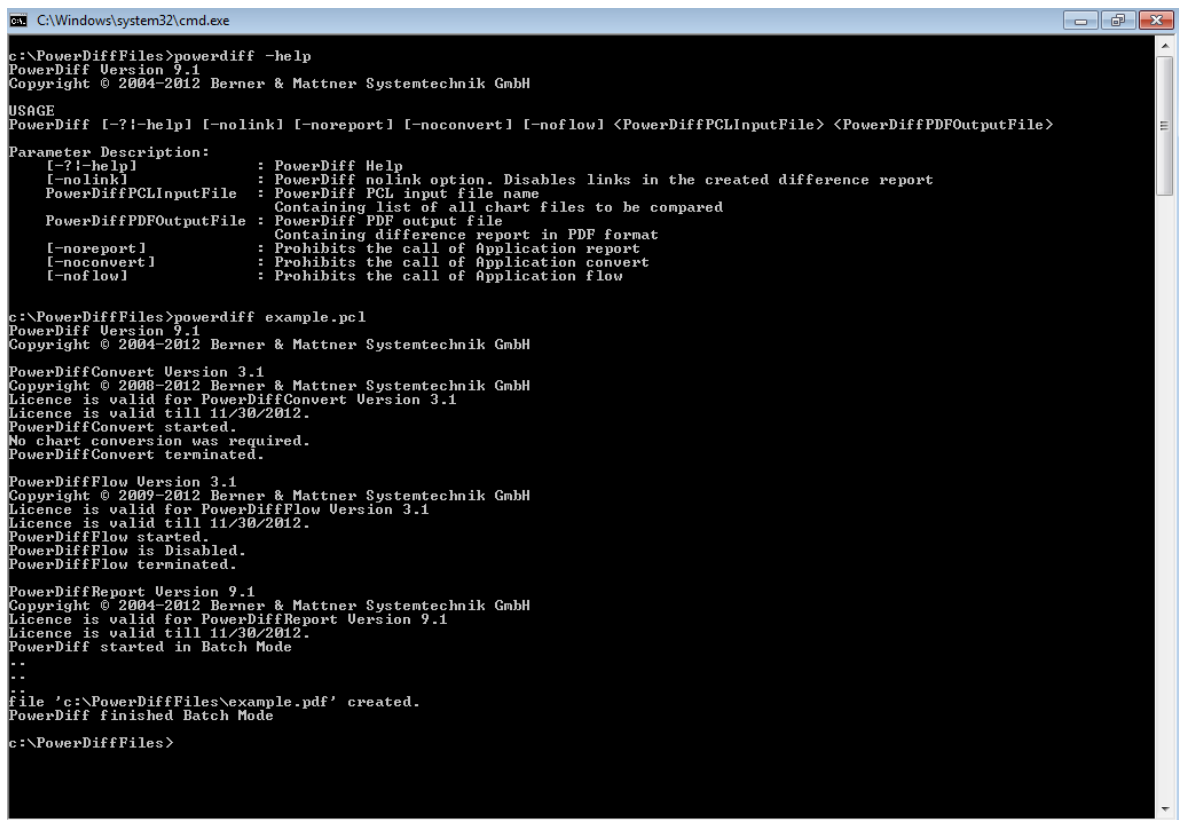
A difference report generated by PowerDiff usually contains more than one pair of Statemate® files. The names of these files are provided for PowerDiff in form of a chart list.

The recommended way to create and edit such a chart list is to use the “Chart List Editor” dialog in PowerDiff in interactive mode (refer to chapter 3.1).

When starting PowerDiff with a batch file, the console output appears as shown in Figure 28. A successful generation of the report is indicated by the expression

```
file '<pdf-outfile>' created
```

Where '<pdf-outfile>' is the full file path of the generated report file.



```

c:\Windows\system32\cmd.exe
c:\PowerDiffFiles>powerdiff -help
PowerDiff Version 9.1
Copyright © 2004-2012 Berner & Mattner Systemtechnik GmbH

USAGE
PowerDiff [-?|-help] [-nolink] [-noreport] [-noconvert] [-noflow] <PowerDiffPCLInputFile> <PowerDiffPDFOutputFile>

Parameter Description:
  [-?|-help]           : PowerDiff Help
  [-nolink]            : PowerDiff nolink option. Disables links in the created difference report
  PowerDiffPCLInputFile : PowerDiff PCL input file name
                        : Containing list of all chart files to be compared
  PowerDiffPDFOutputFile : PowerDiff PDF output file
                        : Containing difference report in PDF format
  [-noreport]          : Prohibits the call of Application report
  [-noconvert]          : Prohibits the call of Application convert
  [-noflow]             : Prohibits the call of Application flow

c:\PowerDiffFiles>powerdiff example.pcl
PowerDiff Version 9.1
Copyright © 2004-2012 Berner & Mattner Systemtechnik GmbH

PowerDiffConvert Version 3.1
Copyright © 2000-2012 Berner & Mattner Systemtechnik GmbH
Licence is valid for PowerDiffConvert Version 3.1
Licence is valid till 11/30/2012.
PowerDiffConvert started.
No chart conversion was required.
PowerDiffConvert terminated.

PowerDiffFlow Version 3.1
Copyright © 2009-2012 Berner & Mattner Systemtechnik GmbH
Licence is valid for PowerDiffFlow Version 3.1
Licence is valid till 11/30/2012.
PowerDiffFlow started.
PowerDiffFlow is Disabled.
PowerDiffFlow terminated.

PowerDiffReport Version 9.1
Copyright © 2004-2012 Berner & Mattner Systemtechnik GmbH
Licence is valid for PowerDiffReport Version 9.1
Licence is valid till 11/30/2012.
PowerDiff started in Batch Mode
--
file 'c:\PowerDiffFiles\example.pdf' created.
PowerDiff finished Batch Mode
c:\PowerDiffFiles>

```

Figure 28: Console output for batch mode

4.3 Batch Mode Warnings and Errors

When using PowerDiff in batch mode, no warning or error messages have to be interactively confirmed by the user, since the batch mode works without user interaction. For this reason all warnings and errors are printed on the console. In addition a log file is written to the same directory as the pdf-report that documents all errors and warnings for this batch run. The log file has the same name as the generated pdf-report and the file extension “*.log” instead of “*.pdf”.

The meaning of the warning and error messages that may occur in batch mode are explained within the following sections. Severe problems may result in the termination of a PowerDiff module. In this case, an exit code is written to the command-shell. These exit codes are also mentioned below.

4.3.1 Errors and warnings concerning the access to files and folders

Accessing configuration file failed (error)

The PowerDiff installation is corrupted and some vital software components are missing. Please reinstall PowerDiff. No report is generated.

PowerDiffReport Exit Code: 2

Open batch file failed (error)

This message indicates that the batch file can't be found or accessed. Please check the first command line parameter when calling PowerDiff and make sure that the batch file exists and is accessible. No report is generated.

PowerDiffReport Exit Code: 3

Accessing PDF file failed (error)

If PowerDiff reports this message on the command line, the specified report file already exists and cannot be overwritten. This may happen if the report file is write-protected or opened by another application. To avoid this problem, remove the write protection, delete the report file or use a different name for the new report. No report is generated.

PowerDiffReport Exit Code: 4

Accessing main TeX file failed (error)

The PowerDiff installation is corrupted and some vital software components are missing. Please reinstall PowerDiff. No report is generated.

PowerDiffReport Exit Code: 11

Temporary TeX files could not be created (error)

The temporary TeX file stored in the PowerDiff user directory could not be written. Please enable full access rights for the PowerDiff user to all files in the directory “%APPDATA%\Berner & Mattner\PowerDiff”. No report is generated.

PowerDiffReport Exit Code: 14

No access to temp files (error)

PowerDiff generates this message when the temporary file for the temporary storage of objects with undefined classification could not be accessed.

PowerDiffReport Exit Code: 22

Could not delete temporary pcl file (error)

PowerDiff generates this message when the temporary PCL-file used to save the results of PowerDiffFlow could not be deleted before the current execution of PowerDiffFlow. The temporary file is generated at “%APPDATA%\Berner & Mattner\PowerDiff\TempPclFile.pcl”; please ensure that the PowerDiff user has full access rights to this file and that the file is not currently opened by another application and remove any write-lock from the file. The report is not generated.

Exit Code: 1004

This Exit Code is also returned by the PowerDiff application to the user.

<infile> not found / <infile> has not been specified (error)

PowerDiff generates this message when the input PCL-file for PowerDiffFlow has not been specified, does not exist or cannot be accessed. This may happen if the input PCL-file is write-protected or opened by another application. To avoid this problem remove the write protection. The source/sink-analysis is not conducted, but the report is generated.

PowerDiffFlow Exit Code: 3004

Writing file failed / <outfile> has not been specified (error)

PowerDiff generates this message when the output PCL-file for PowerDiffFlow is not specified or cannot be accessed. The source/sink-analysis is not executed, but the report is still generated.

PowerDiffFlow Exit Code: 3006

Open import file failed (warning)

PowerDiff generates this message when the path to a Statemate® file (“Before” case or “After” case) is invalid. PowerDiff reports the path to this file and the line in the PCL file that specifies this path. If this warning appears, please check the path to the “Before” and “After” case in the given line of the PCL file and correct it if necessary. The warning will be added to appendix A of the report.

Directory access failed (warning)

PowerDiff generates this message when accessing the directory of the PCL file fails. This may be followed by generating an incomplete Diff report.

4.3.2 Errors and warnings about Statemate® chart files

Invalid chart type (warning)

At least one of the charts that should be compared contains an invalid chart type. You are probably using a Statemate® version that is not supported by your PowerDiff version. The affected charts will not be compared, but a report will be generated and a warning will be added to appendix A of the report.

Named destination already exists (warning)

This warning appears, when a name for a named destination (refer to chapter 4.5 “Links, Bookmarks and Named Destinations”) appears more than once. A report will be generated and a warning will be added to appendix A of the report.

Chart file version not supported (warning)

PowerDiff generates this message when the version number of a Statemate® chart file is not supported by the current PowerDiff version. The affected charts will be compared, but the reported differences may be incorrect or incomplete. A report will be generated and a warning will be added to appendix A of the report.

Character is not provided (warning)

Unsupported characters are detected in at least one of the compared Statemate® chart files. These characters will be replaced in the report. A report will be generated.

Chart file with invalid encoding (warning)

PowerDiff generates this message when a chart file contains text encoding information. This may be followed by generation of an improper Diff report. Please compare only chart files that have not been edited by a text editor to avoid this.

4.3.3 Errors and warnings because of wrong application arguments

Wrong use of application parameters (error)

PowerDiff generates this message when required execution parameters are missing. Assert the correctness of the call to PowerDiff. The correct use of arguments is provided in chapter 4.1. No report is generated.

Exit Code: 1003

This Exit Code is also returned by the PowerDiff application to the user.

Please specify PCL file as start argument! (error)

PowerDiff generates this message when no pcl file is passed to PowerDiffConvert. The conversion of chart-files is not executed, but the report may be generated.

PowerDiffConvert Exit Code: 2003

Insufficient number of parameters (error)

PowerDiff generates this message when the call to PowerDiffFlow contains too few parameters. If calling PowerDiffFlow directly assure the correct use of parameters. The source/sink-analysis is not conducted, but the report is still generated.

PowerDiffFlow Exit Code: 3003

4.3.4 Errors and warnings concerning licencing

Invalid software licence (error)

The licence file can't be accessed or is not valid. For further information on licencing refer to the PowerDiff "Setup and Installation Guide".

When using floating licences, all licences may currently be in use. No report is generated.

PowerDiffReport Exit Code: 8

Licence is not valid for PowerDiffConvert (error)

PowerDiff generates this message if the provided licence file could not be accessed or is not valid for the currently installed version of PowerDiff.

When using floating licences, all licences may currently be in use. No report is generated.

PowerDiffConvert Exit Code: 2001

Licence is not valid for PowerDiffFlow (error)

PowerDiff generates this message when the provided licence file could not be accessed or is not valid for executing the installed version of PowerDiffFlow.

When using floating licences, all licences may currently be in use.

A report may be created, if the licence is valid for the installed version of PowerDiffReport.

PowerDiffFlow Exit Code: 3001

Licence source not defined (error)

PowerDiff generates this message when the path of the licence file could not be found. Assert the correctness of the path to the licence file or change the path to the licence file in the Licence dialog. A report will not be generated.

PowerDiffFlow Exit Code: 3002

4.3.5 Errors and warnings about the configuration and environment

Dynamic link library could not be found (error)

A required dynamic link library can't be found. Please reinstall PowerDiff to make sure the missing dll is available. No report is generated.

PowerDiffReport Exit Code: 9

Application could not be executed (error)

PowerDiff generates this message, when a module of the application (i.e. PowerDiffConvert, PowerDiffFlow or PowerDiffReport) could not be executed. When PowerDiffReport could be executed, a report is still generated.

Exit Code: 1002

This Exit Code is also returned by the PowerDiff application to the user.

Invalid PowerDiffReport input parameters (error)

PowerDiffReport generates this message if the PowerDiffReport module is called with invalid parameters. A report will not be generated.

PowerDiffReport Exit Code: 27

PDFLaTeX call failed (warning)

The PDFLaTeX call for generating the PDF report has failed. No report is generated. Make sure that MiKTeX is installed correctly. Reinstall MiKTeX and PowerDiff to solve this problem. For information about installing MiKTeX and PowerDiff please refer to the “Setup and Installation Guide”.

MiKTeX package missing (warning)

A MiKTeX package needed by PowerDiff to generate a PDF document is missing. No report is generated. Make sure that MiKTeX is installed correctly. Reinstall MiKTeX and PowerDiff to solve this problem. For information about installing MiKTeX and PowerDiff please refer to the “Setup and Installation Guide”.

Evaluated MiKTeX version is NOT supported (warning)

This message is generated when a not supported MiKTeX version has been installed. In this case erroneous PDF reports may be generated. To solve this issue please install the required MiKTeX version. For more details about the required MiKTeX version please refer to the “Setup and Installation Guide”.

Creation of LaTeX fmt file failed (warning)

The PDFLaTeX format file ‘fmt’ can not be generated. No report is generated. Make sure that MiKTeX is installed correctly. Reinstall MiKTeX and PowerDiff to solve this problem. For information about installing MiKTeX and PowerDiff please refer to the “Setup and Installation Guide”.

Operating System '...' is not supported (warning)

This message is generated when PowerDiff is started on a not supported Windows version. To solve this issue please install the required operating system. For more details about the required operating system please refer to the “Setup and Installation Guide”.

4.3.6 Other Technical errors and warnings

Unexpected Error occurred (error)

PowerDiff generates this message when an unexpected error occurred. Try restarting PowerDiff to fix the error. If the error persists, reinstall PowerDiff. A report may not be generated.

Exit Code: 1001

This Exit Code is also returned by the PowerDiff application to the user.

Statemate 'dataport.dll' crashes in function call! (error)

PowerDiff generates this message when the conversion of chart files with PowerDiff Convert fails for technical reasons. The conversion is not executed, but a report may be generated.

PowerDiffConvert Exit Code: 2004

Loading file failed / No xml root node found (error)

PowerDiff generates this message when the input file for PowerDiffFlow could not be loaded, does not contain valid XML or has unexpected contents. The source/sink-analysis is not executed, but a report may still be generated.

PowerDiffFlow Exit Code: 3005

Page Numbers for content and Summary could not be read (warning)

PowerDiff generates this message when the destination page number of a link could not be read.

Could not read source and sink data (warning)

PowerDiff generates this message when the results of the source/sink-analysis by PowerDiffFlow could not be read into PowerDiff. The creation of the report continues, but the results of the source/sink analysis are not incorporated.

4.3.7 User information

No differences found (info)

PowerDiff generates this message when no reportable differences have been detected during comparison. No report is generated.

Settings have been created with an older version of PowerDiff (warning)

PowerDiff generates this message when a pcl-file created with an older version of PowerDiff is processed. In this case the contents of the pcl-file should be reviewed by use of the PowerDiff InteractiveMode for settings to be corrected. In newer versions of PowerDiff some settings in an older pcl-file may have become changed or obsolete and new settings may become valid. To assure that the generate difference report contains the expected result the whole settings within the pcl-file have to be reviewed and afterward saved by the user with the current version of PowerDiff.

Pages with Classification Undefined (warning) /

The file 'undefined_list.txt' is attached to the difference report (info)

For customers with classification licence this message indicates that some Statemate® elements (which are listed in file 'undefined_list.txt' attached to the difference report) are

contained within the difference report that are not assigned with a security classification or an ITAR Licence. To avoid this message the listed Statemate® elements have to be assigned with the missing Statemate® attributes (see section 5.7 Classification Settings).

The user defined front page text is overwritten by the list of all ITAR licences contained within the difference report (warning)

For customers with classification licence this message indicates that the user defined text located in the middle of the front page above the number of pages is not displayed but instead is replaced by the list of all ITAR licences detected within the difference report.

4.4 Structure of Generated Reports

The difference report generated by PowerDiff uses the following structure:

- Front page (containing the creation date and the PowerDiff version)
- Summary of changes
- Table of contents
- Colour Coding Scheme
- Graphical view of the chart hierarchy
- One chapter for each comparison of a chart pair

Each chapter describes the differences of one pair of charts and contains tables for all differences found for the structural elements. The hierarchy of these elements corresponds to the structure of the difference tree in the interactive mode (refer to chapter 3 “Interactive Mode”). In detail each chapter contains:

- A Graphical view of both charts (same colour coding as in interactive mode)
- One subchapter for each element category used in the difference tree (refer to chapter 0)

These subchapters consist of Statemate® chart elements (e. g.: states, activities, transitions ...). Additional chart elements with attributes lead to additional subchapters.

All differences are ordered in an interleaved format. This means that the version of an element from the “Before” case is placed right before the same element in the “After” case. This layout supports readability, since there is no need to browse through the document when comparing the two versions of one chart element.

4.5 Links, Bookmarks and Named Destinations

PowerDiff supports easy navigation through the generated reports by generating a link for every element in the table of contents and the summary to the corresponding chapter in the document. Adobe® Acrobat Reader navigates to the corresponding section in the document by a left mouse click on any entry in the table of contents.

Additionally, a bookmark in the outline part of the PDF document is provided for every item in the table of contents. The bookmarks are structured as a directory tree. Each node in the tree is linked to the corresponding section in the generated document.

When PowerDiff generates a report, the option “named destinations” is used. Named destinations are markers within the PDF document that can be used as reference in an external application to navigate to a section of the PDF file.

Naming of the Named Destinations

Named destinations are created for each main chapter that contains a chart comparison. The named destination has the same name as the name of the chart in the “Before” case of the comparison. Therefore, the named destination for a heading named “MICROWAVE_USAGE” - Amended” would be “MICROWAVE_USAGE”.

When a chart name appears twice in a generated document, the name of the chart can’t be used for the named destination due to the fact that a named destination must be unique in a document. In this case the first occurrence of the named destination is treated as described above. For all further occurrences an index, separated by an underscore, is added to the name of the named destination. A second occurrence of a heading would lead to a named destination that is completed with the index “1”. (in the example: “MICROWAVE_USAGE_1”).

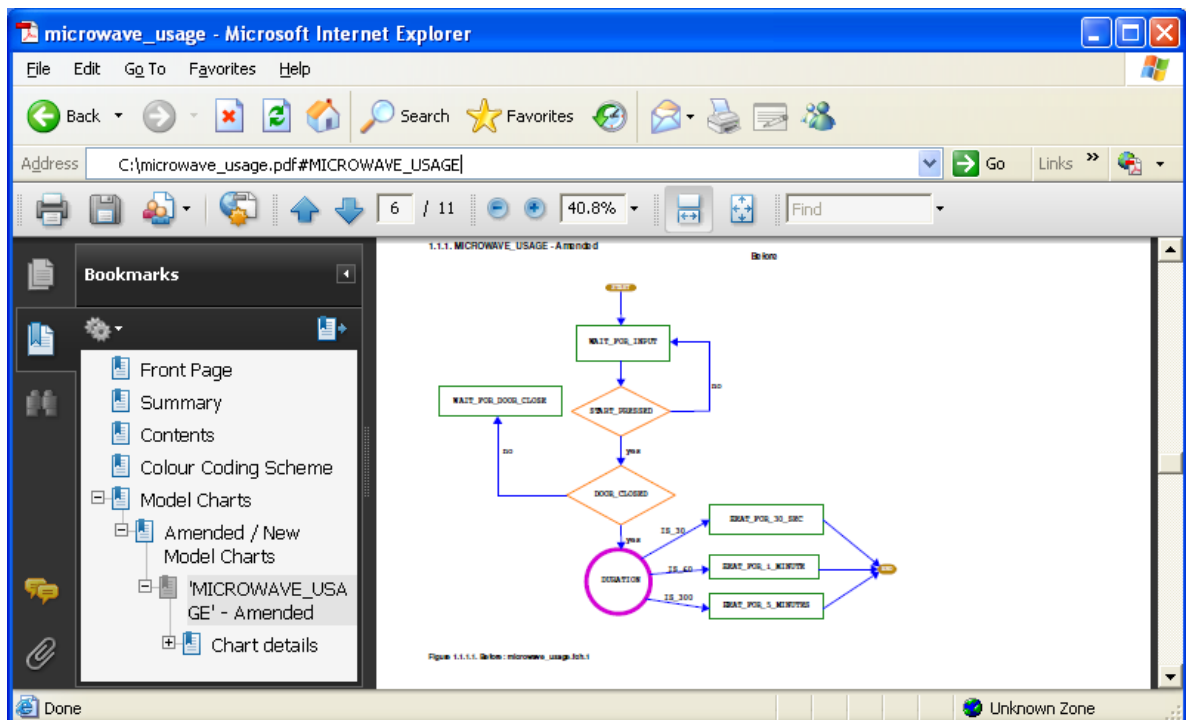


Figure 29: Named destination example

Using Named Destinations

Usually named destinations are used in HTML pages that contain links to PDF files that can be viewed by using Adobe® Acrobat 4.0 (or a later version) from within Netscape Navigator

or Microsoft® Internet Explorer. To refer to a named destination, add “#” followed by the name of the named destination to the end of the link to the PDF-document. In case of the example described above the URL could be similar to the URL in Figure 29.

5 OPTIONS

The “Options” dialog can be opened by choosing tab page “Options” in “Chart List Editor” window. The “Options” tab page provides the following subordinated tab pages.

- “Compare Filters” (Specifies the object elements to be compared.),
- “Report Filters” (Specifies the objects to be reported textually.) ,
- “Page Layout” (Specifies the page settings of the generated PDF report.),
- “Graphic” (Specifies graphical settings.),
- “Text Differences” (Specifies settings about text comparison.),
- “Highlighting” (Specifies settings for highlighting configuration.),
- “Classification” (for customers with classification licence only),
- “ITAR Layout” (for customers with classification licence only).

All these settings are stored persistently and are used in interactive and batch mode.

5.1 Compare Filter Settings

Compare filters are used to analyze only certain attributes of a Statemate® chart file in the comparison. For example it might be of no interest, whether the graphical position of a state has changed, because it has no influence on the logic of a state chart. Figure 30 shows the compare filters tab page with the default value of the options.

Compare Filter

The compare filter settings are used to ignore specific aspects, when comparing two Statemate® chart files. When an option is selected (indicated by a check mark), the related aspect is considered in the comparison. Table 5 lists all available options and their meanings.

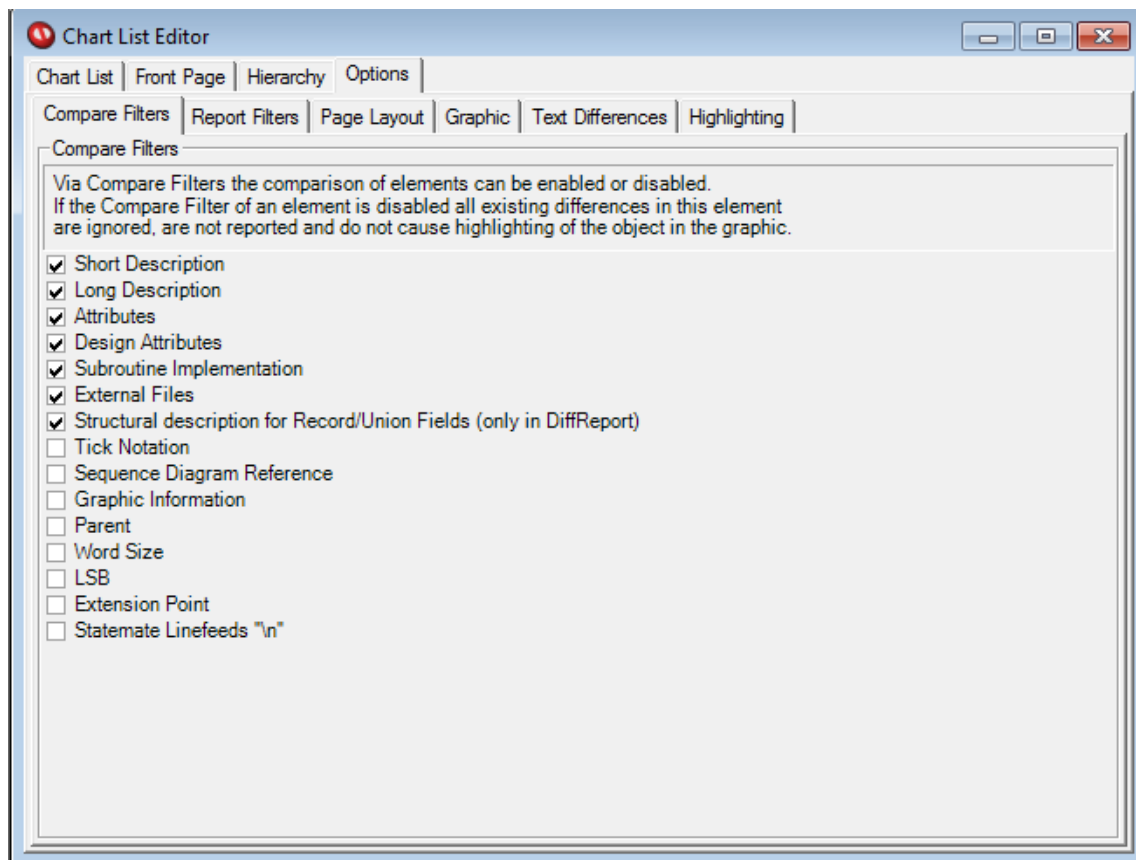


Figure 30: Compare filter settings (default values)

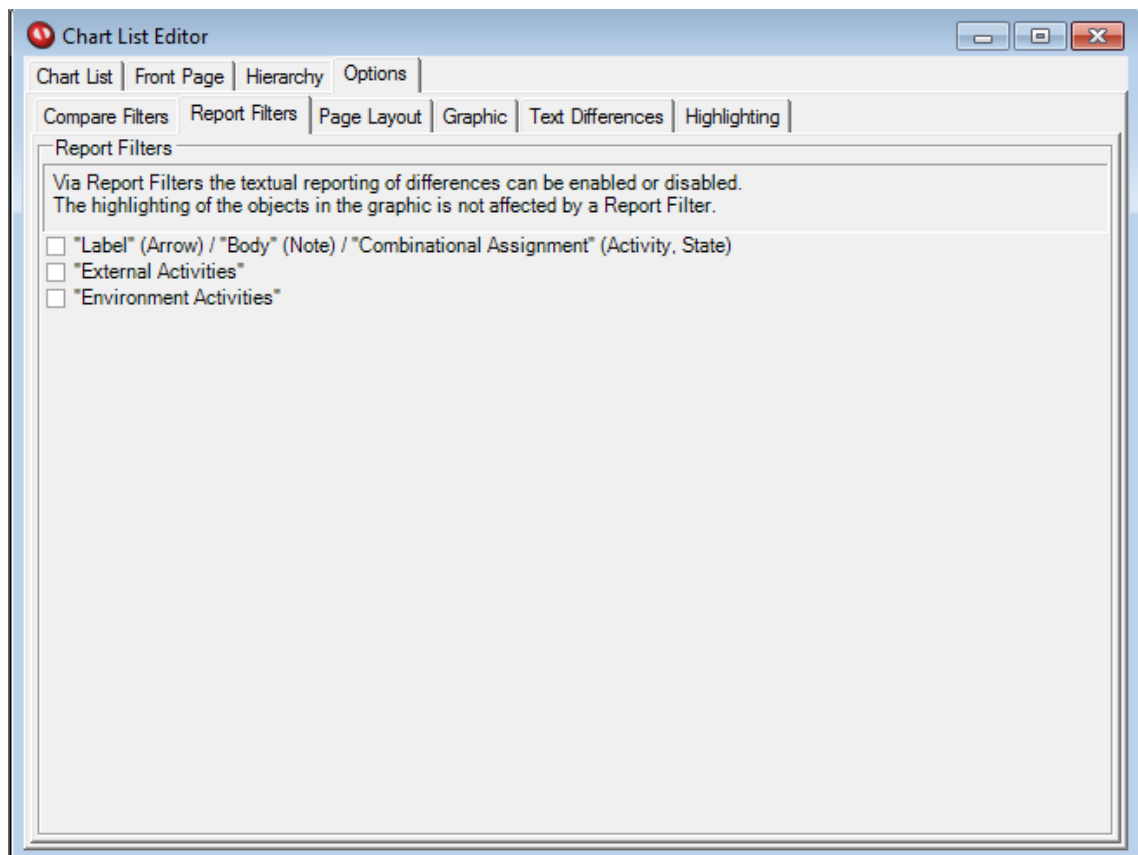
Compare option	Meaning
Short Description	Short description attribute
Long Description	Long description attribute
Attributes	User defined attributes, e.g.: security_classification
Design Attributes	Attributes used for code generation
Subroutine Implementation	Source code (e.g.: C, Ada, ...) fragments implementing subroutines
External Files	Externally linked files, e.g.: additional documentation added to a activities "external file" property.
Structural Description for Record/Union Fields	Performs a textual comparison of the Field list in Record or Union structures.
Tick Notation	Tick Notation "" used for enumerated values
Sequence Diagram Reference	Referenced Sequence Diagrams
Graphic Information	Layout information, e.g.: size, position, colour
Parent	Parent attribute (e.g. in a state)

Word Size	Word Size attributes (e.g. in a data item)
LSB	LSB attribute (e.g. in a data item)
Extension Point	Extension Point attribute (e.g. in an activity)
Statemate Linefeeds “\n”	Statemate® linefeeds in names and labels.

Table 5: PowerDiff compare options

5.2 Report Filter Settings

Report filters are used to control textual reporting of some Statemate® elements. For example the change of a textual note is displayed in the chart's graphical representation. In this case the textual reporting of the textual note might be of no interest and can be controlled by Report Option “Label’ (Arrow) / ‘Body’ (Note)”. Figure 31 shows the report filters tab page with the default value of the options.

**Figure 31: Report filter settings (default values)**

Report Filter

The report filter settings are used to control textual reporting of some Statemate® objects. When an option is selected (indicated by a check mark), the related object is reported textually. Table 6 lists all available options and their meanings.

Report option	Meaning
“Label” (Arrow) / “Body” (Note) / “Combinational Assignment” (Activity, State)	Textual reporting of arrow labels, note bodies and combinational assignment in a state or an activity.
“External Activities”	Textual reporting of external activities
“Environment Activities”	Textual reporting of environment activities

Table 6: PowerDiff report options

5.3 Page Layout Settings

The page layout settings are used to specify the page layout of the PDF report generated in batch mode. Figure 32 shows the page layout settings tab page with the default value of the options.

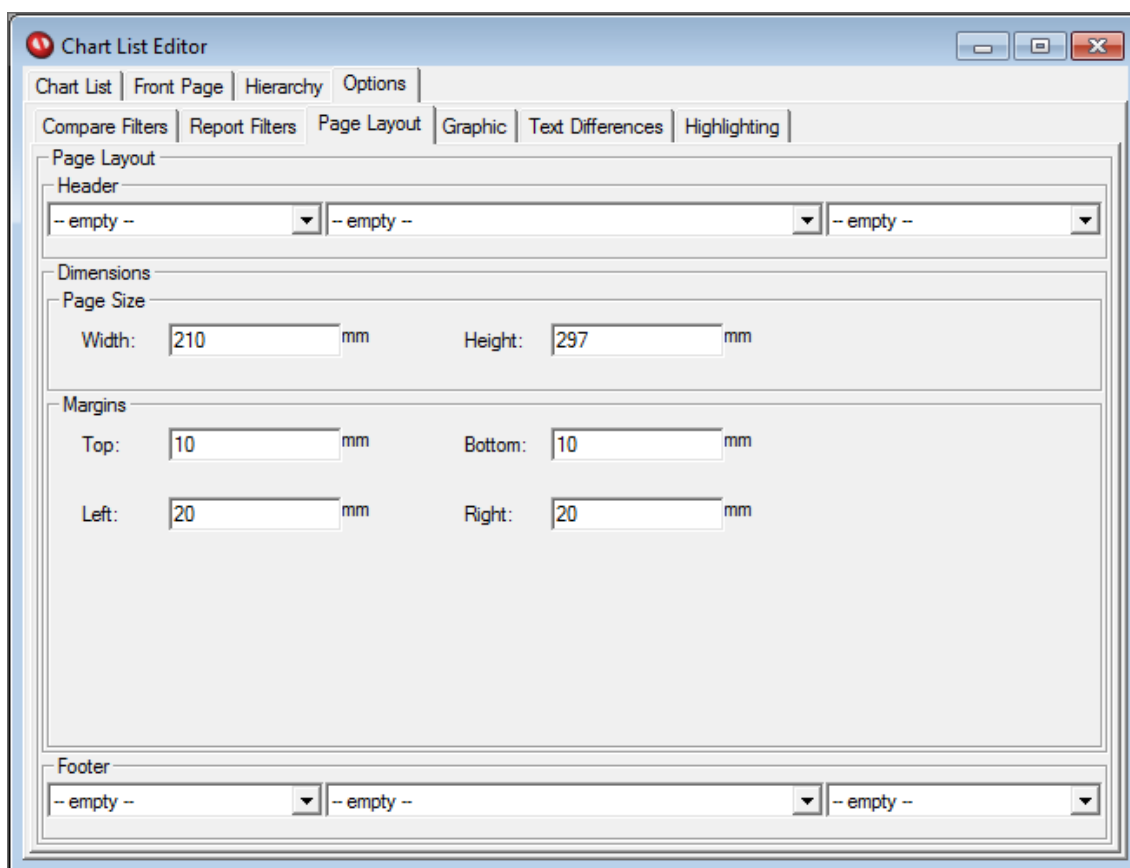


Figure 32: Page layout settings (default values)

Page Dimensions

The page dimensions consist of the page size and the margin settings (as in Figure 32). The page size specifies the size of the paper for the generated document in millimetres. The margins specify the space between the document text and the edge of the paper in

millimetres. When closing the settings dialog all entered values are checked for plausibility. For example settings of 210 millimetres for page width and 220 millimetres for the left margin would lead to an “invalid page settings” error message.

Page Footers and Headers

Page footers and headers can be changed individually to fit the user’s needs. As shown in Figure 32, there are three areas defined in the headers and footers section. The first one defines the left, the second one the middle and the third one the right area of the page header or footer. For each entry in the footer/header there is a drop down list with predefined values as shown in Table 7.

List item	Meaning
-- empty --	Space in header or footer is empty
User Defined Text	User can define a custom text
Page number	Current page number
Page # of #	“Page <n> of <m>” is added; <n> is current page; <m> number of pages in document
Classification	Highest NATO classification level contained in the report
Creation Date	Date when the report was created
Creation Time	Time when the report was created
Creation Date, Time	Date and time the report was created, separated by a colon
File Name	Name of generated report
File Path	Path and name of generated report
PowerDiff Version	PowerDiff version that was used to create the report
User Name	Name of user that created the report

Table 7: List items for customising page headers and footers

If “User Defined Text” is selected, a simple text editor appears and a text can be entered by the user. This may be used e.g. to enter the name of the project or the company name.

5.4 Graphic Settings

The graphics settings embrace miscellaneous attributes, its settings tab page with the default value of the options is shown in Figure 33.

The “Tab Size” setting affects the indented text layout. This value appoints the number of space characters that replace a tab character.

The “Line Scaling” setting can be used to modify the width of lines (highlighted or not) in the graphics. This affects lines of arrows (e.g. transitions, data flows, etc) and lines of boxes (e.g. states, activities etc.)

The “Text Scaling” setting can be used to modify the font size of text in the graphics.

The “Monochrome Graphic” checkbox restricts the graphical view of charts to the two colours black and white with exception of the colour coding for the highlighted (changed) graphical elements.

When “Automatic Zoom” checkbox is enabled a chart in which the objects do not use the hole surface of the graphic is zoomed to the maximum height and width.

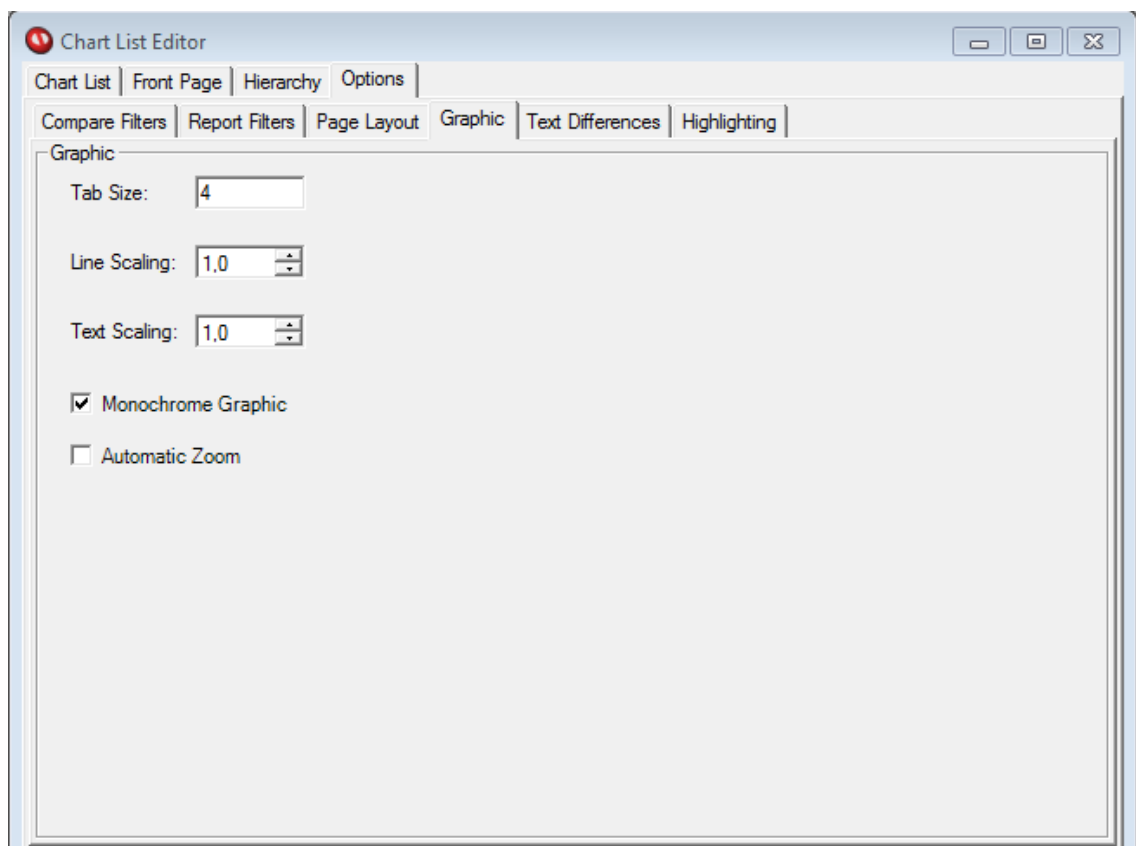


Figure 33: Graphic settings (default values)

5.5 Text Differences Settings

The text differences settings control the behaviour of the text diff algorithm. The featured attributes and their default values can be seen in Figure 34.

The “Ignore Space Characters” checkbox affects the relevance for space characters regarding the detection of differences in texts. If selected, spaces contained in texts are not considered when comparing texts.

The “Ignore Upper / Lower Case” checkbox affects the relevance of upper/lower case changes regarding the detection of differences in texts. If selected, changes in case are not considered when comparing texts.

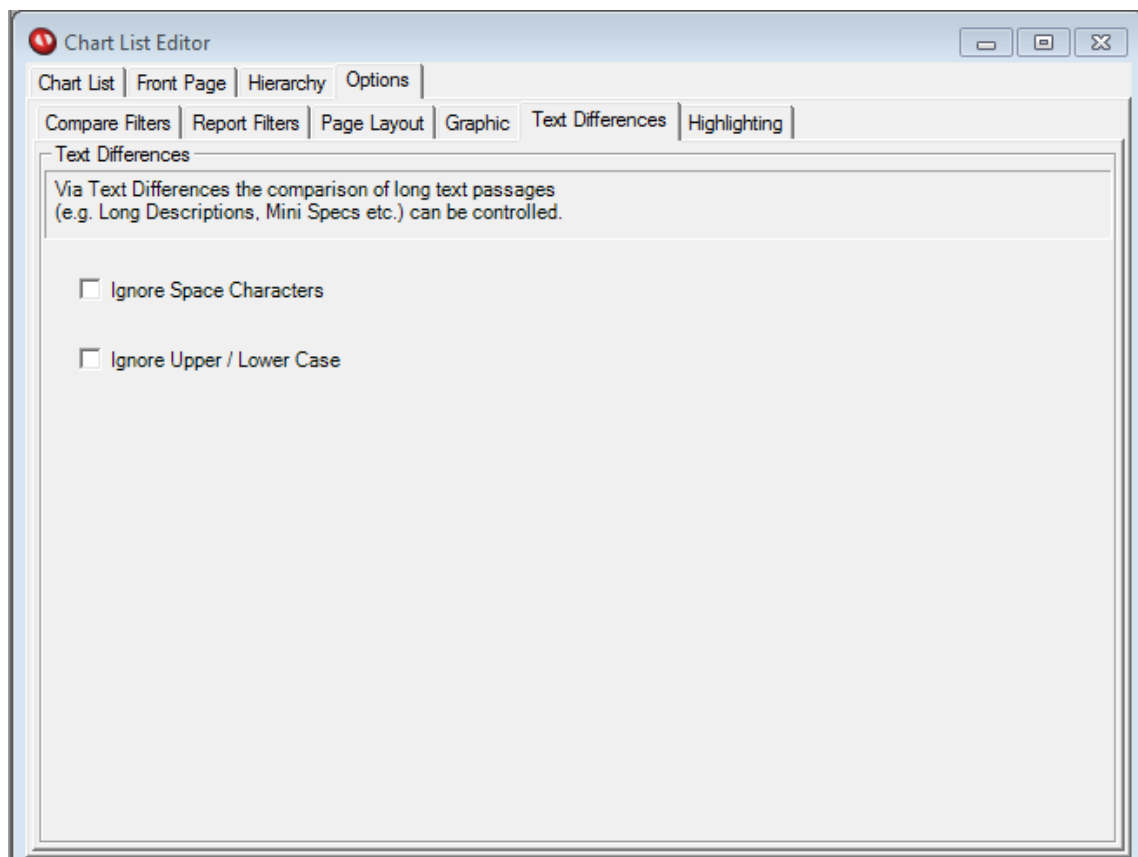


Figure 34: Text settings (default values)

5.6 Highlighting Settings

The highlighting settings provide properties to configure the highlighting of differences. The highlighting settings tab page with the default value of the options is shown in Figure 35.

Common

The “Highlighted Line Width Offset” setting can be used to modify the difference in line width between a highlighted line and a not highlighted line. This value can be used to emphasize changed elements in the graphical view. If “Highlighted Line Width Offset” is set to “0” highlighted and not highlighted lines are drawn with the same line width. In this case no accentuation is achieved by the line width. In cold prints it is advisable to set this value to its maximum since colour coding cannot contribute to the indication of changes.

Amended Text

The “Bold” check box enables bold font for changed text.

Use the “Color” button to change the highlighting colour of changed text.

Amended Items

Use the “Color” button to change the highlighting colour of changed objects in the graphics.

New Items

The “Bold” check box enables bold font for added text.

Use the “Color” button to change the highlighting colour of added text and added objects in the graphics.

Deleted Items

The “Bold” check box enables bold font for removed text.

Use the “Color” button to change the highlighting colour of removed text and removed objects in the graphics.

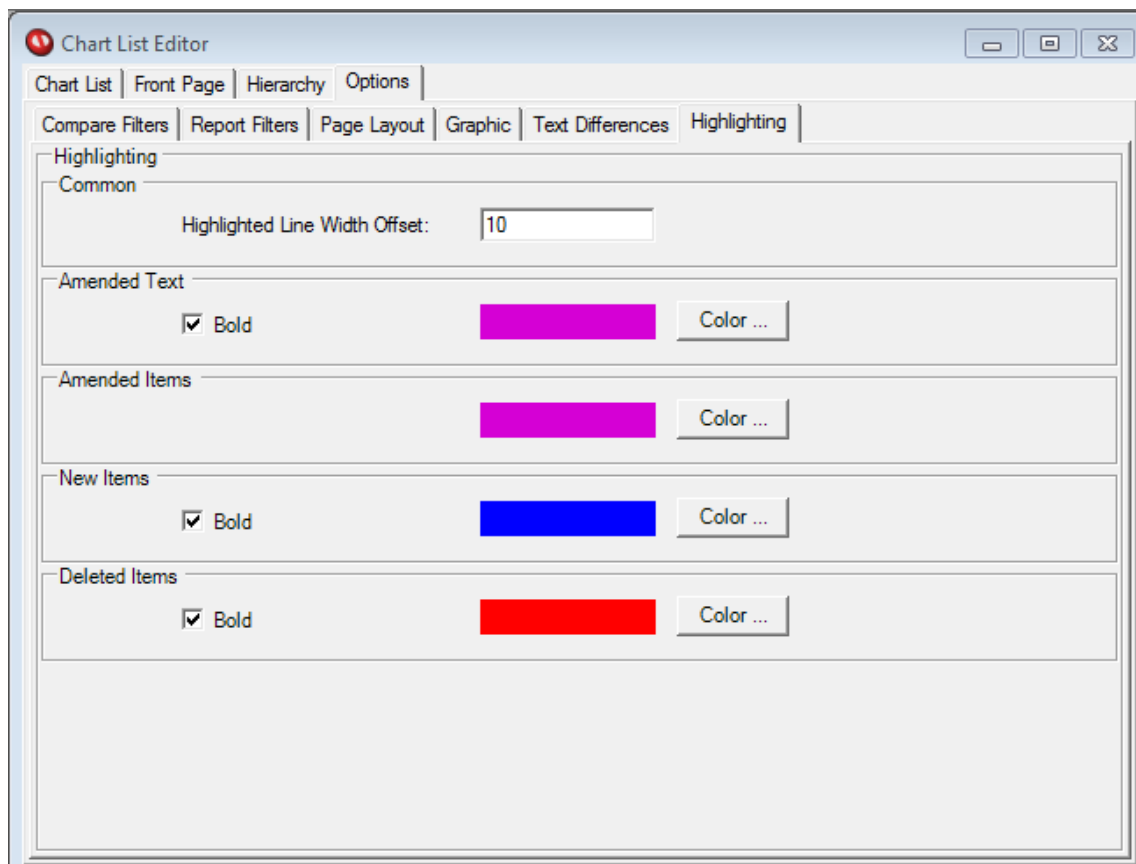


Figure 35: Highlighting settings (default values)

5.7 Classification Settings

The Options tab page provides an additional tab page “Classification” to display the classification settings (for customers with classification licences only). The layout of the “Classification” tab page as well as the default values of the contained settings are shown in Figure 36.

The Option “Nation for Classification Layout” can be used to determine the wording of the classification level in headers and footers of the PDF report. Classification Levels in headers and footers are generated according to the standards of the chosen nation.

Checking the option “Generate Classification Report on Front Page” generates a summary of security classification levels on the title page of report. If this check box is not checked, only the number of pages in the report is displayed on the title page.

The checkbox “Classification Attribute Mandatory for Offpage References” determines whether the classification attribute of an Offpage Reference (e.g. “@OFFPAGE_STATE” or “@OFFPAGE_ACTIVITY”) shall be evaluated (checked) or not (unchecked).

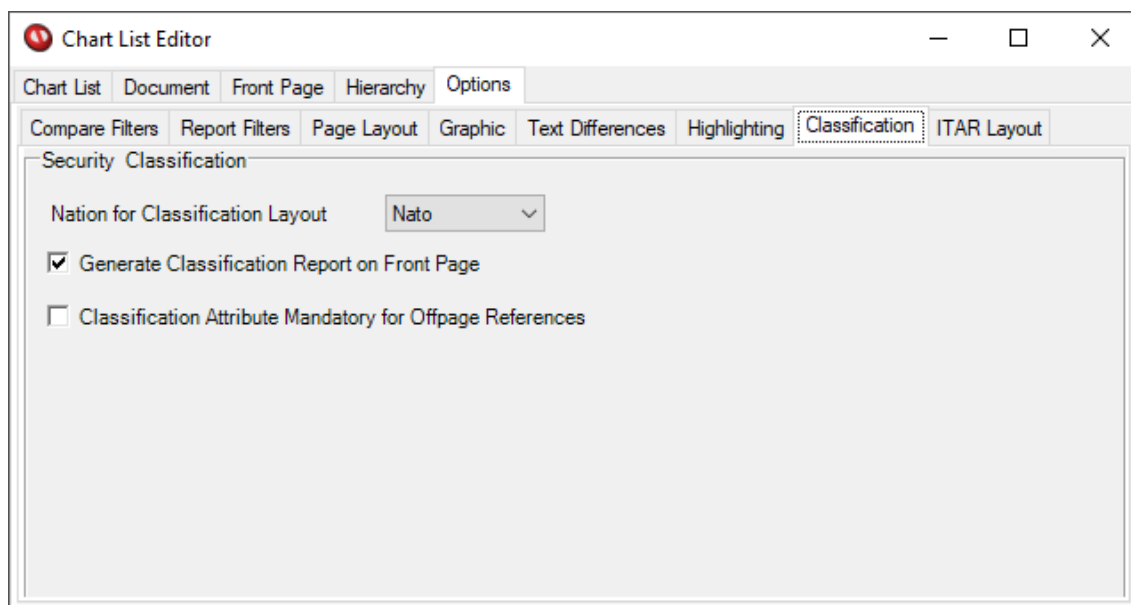


Figure 36: Classification Editor (default values)

Classification Restrictions

Security (NATO) classification levels can be assigned to Statemate® items by the Statemate® attribute, named "security_classification". The supported values of this security classification attribute are shown in Table 8.

Supported Value (security_classification)	Supported Value (external_file_security_classification)	Order significance
NATO_UNCLASSIFIED	NATO UNCLASSIFIED	0
NATO_RESTRICTED	NATO RESTRICTED	1
NATO_CONFIDENTIAL	NATO CONFIDENTIAL	2
NATO_SECRET	NATO SECRET	3

Table 8: Supported values for "security_classification" and "external_file_security_classification" attribute

The security (NATO) classification of an external file is determined by a Statemate® attribute, named "external_file_security_classification".

WARNING: When a chart or an object is classified with a higher NATO classification level than assigned to a NATO classification filter, its name may appear in a difference report with a lower NATO classification level, when a Statemate® item in the higher classified chart has differences and satisfies the settings of the NATO classification filter. PowerDiff only supports filtering of Statemate® elements according to the NATO classification attribute settings as described above. In order to ensure that the Statemate® elements displayed in the difference report comply with the selected NATO classification, it is essential that the attribute "security_classification" (specifying the correct NATO classification level) is added to at least restricted, confidential and secret elements. If the

Statemate® charts used contain sensitive information, please check the NATO classification level of the generated information before releasing the information.

For filtering security (NATO) classification levels please refer to section 3.3.2 "Document Filter Settings" too.

5.8 ITAR Layout

The Options tab page provides an additional tab page "ITAR Layout" to display the ITAR Layout (for customers with classification licences only). Via this tab page the representation of ITAR information within the difference report can be modified. The default values can be obtained from Figure 37.

ITAR evaluation from

Via control "ITAR evaluation from" the evaluation of ITAR Statemate® attributes can be specified.

Setting "Chart File Level" specifies to evaluate the ITAR information from Statemate® attributes "PCMS_ITAR_Licence_Reference" contained within the Statemate® Chart element and the Statemate® attributes "External_File_ITAR_Licence_Reference" contained in each element where needed. The collected ITAR information is displayed on the front page and is collated with the whole difference report.

Setting "Item Level" specifies to evaluate the ITAR information from Statemate® attributes "ITAR_Licence_Reference" and "External_File_ITAR_Licence_Reference" contained in each element where needed.

Setting "None" specifies to evaluate no ITAR information from any Statemate® attribute. In this case no "ITAR Nation", no "Undefined ITAR handling" and no "ITAR classification" for "ITAR Header/Footer Line 3" can be selected. If required the specific ITAR information has to be added manually to the generated difference report.

ITAR Nation

Via control "ITAR Nation" a nation specific layout can be selected in which way the ITAR information contained in the difference report is represented. This setting influences as well the representation of ITAR information on the front page as well as within the ITAR page header.

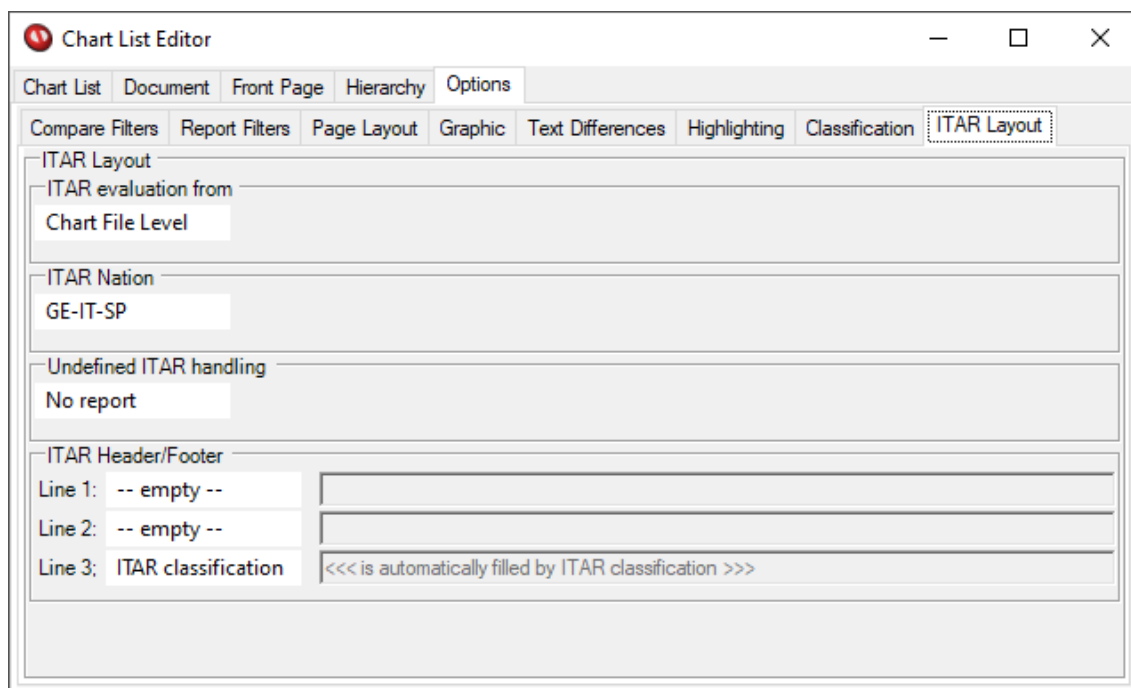


Figure 37: ITAR Layout Editor (default values)

Undefined ITAR handling

Via control “Undefined ITAR handling” the manner of handling Statemate® elements with missing ITAR attributes is specified. When differences in Statemate® elements with missing ITAR attributes are detected an appropriate message is printed to the console and to the log file and a list of those elements "undefined_ITAR.txt" is generated.

Setting “No report” specifies to generate no difference report when any Statemate® element with missing ITAR attributes would be contained within the specific difference report.

Setting “Invalid report” specifies to generate a difference report which filename is prefixed by “invalid_” when any Statemate® element with missing ITAR attributes is contained within the specific difference report.

ITAR Header/Footer

Via control “ITAR Header/Footer” three header/footer lines may be specified to be displayed on each page of the difference report except the front page. Line 1, Line 2, and Line 3 may be assigned with a user defined text. Additionally for Line 3 a page specific ITAR header/footer can be specified by selecting “ITAR classification”.

ITAR Restrictions

ITAR information can be assigned to Statemate® elements by the Statemate® attribute named "ITAR_Licence_Reference".

The ITAR information of an external file is determined by Statemate® attribute named "External_File_ITAR_Licence_Reference".

The Chart File Level ITAR information is expected to be assigned to the Statemate® Chart element by the Statemate® attribute named "PCMS_ITAR_Licence_Reference".

WARNING: When a chart or an object is classified with a higher ITAR classification level than assigned to a ITAR classification filter, its name may appear in a difference report with a lower ITAR classification level, when a Statemate® item in the higher classified chart has differences and satisfies the settings of the ITAR classification filter. PowerDiff only supports filtering of Statemate® elements according to the ITAR classification attribute settings as described above. In order to ensure that the Statemate® elements displayed in the difference report comply with the selected ITAR classification, it is essential that the attributes "ITAR_Licence_Reference" (specifying the correct ITAR classification level) is added to the elements. If the Statemate® charts used contain sensitive information, please check the ITAR classification level of the generated information before releasing the information.

For filtering ITAR classification levels please refer to section 3.3.2 "Document Filter Settings" too.

5.9 4NEO Information

For customers with classification licences an automatic functionality is provided to evaluate 4NEO information and to display an equivalent page header/footer. This functionality is executed automatically and does not need any optional settings within a specific dialogue.

4NEO Restrictions

4NEO information can be assigned to a Statemate® element by specifying Statemate® attribute "Caveats" or "4NEO_CAVEAT". If one of these attributes is present and its value is set to "GE_IT_SP_UK_Eyes_Only" a 4NEO header/footer will be created on all pages where properties of the associated Statemate® element are reported.

The 4NEO information of an external file, assigned to a Statemate® element, in addition is determined from Statemate® attribute named "External_File_Caveat". When it is set with the same value as specified before, a 4NEO header/footer will be created on all pages where the content of the assigned external file is reported.

5.10 Import Settings

With the button “Import Options ...” in the settings menu (see Figure 38) it is possible to import the settings from another PCL file. As result the settings of the currently open PCL File will be overwritten by the imported settings. Affected settings are “Compare Filters”, “Report Filters”, “Page Layout”, “Graphic”, “Text Differences”, “Highlighting”, “Classification” (“Classification” only if the user has a classification licence) and “Source/Sink-Analysis”. The “Hierarchy”, the “Front Page” and the “Assure File Format Compatibility” settings are not concerned.

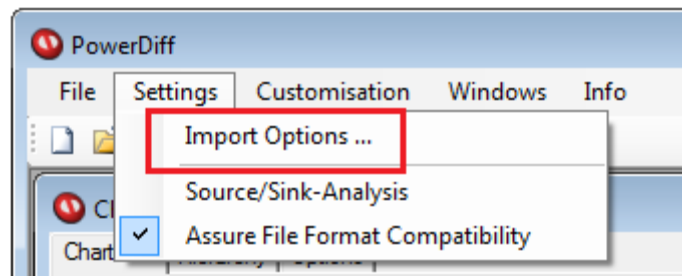


Figure 38: Import Options menu button

6 HELPFUL INFORMATION ABOUT POWERDIFF

PowerDiff gets as input a chart pair, Before Chart and After Chart. In process of comparison PowerDiff selects an object contained in the Before Chart as (BeforeCase) and searches in the After Chart for a comparison partner (AfterCase).

If no comparison partner has been identified, the BeforeCase is declared to be Deleted.

If no comparison partner has been identified for an object contained in the After Chart (AfterCase), the AfterCase is declared to be New.

If an object has been identified in the After Chart to be a comparison partner for the object in the Before Chart, both objects are compared and the detected differences are displayed in the InteractiveMode or are written to the DiffReport in PDF format.

6.1 Highlighting of renamed objects as New and Deleted

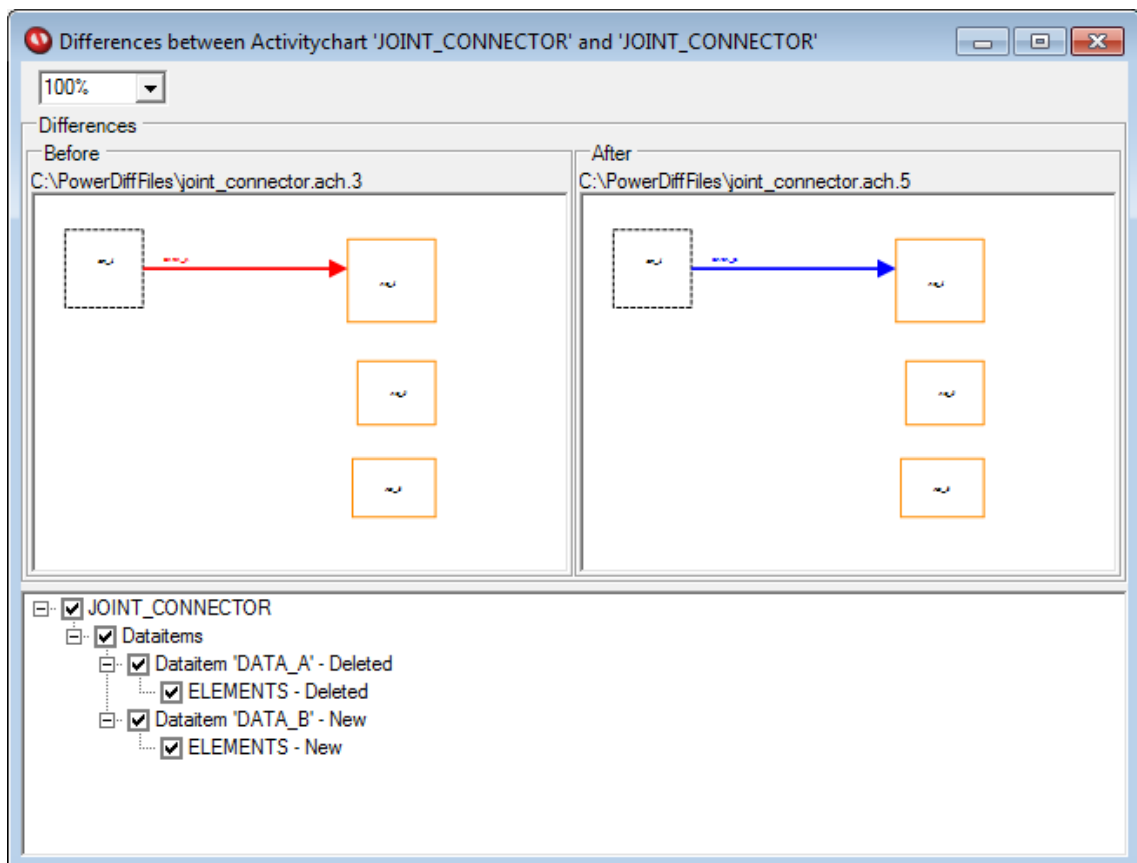


Figure 39: Renamed Data-Item

The identification of a comparison partner for an object is predominantly based on having the same value of the name element. If an object has been renamed, its comparison partner cannot be found. In this case the BeforeCase object is highlighted as Deleted and the AfterCase object is highlighted as New as shown in Figure 39. In this case “DATA_A –

Deleted” and “DATA_B – New” is reported in detailed textual description (refer to the Diff-Tree in Figure 39).

6.2 Highlighting of Transitions

Two Transitions are detected as comparison partner by means of their Source (e.g. a State) and by means of their Target (e.g. another State) as shown in Figure 40 with the Transition from State “IDLE_ST” to State “LOADING_ST”. By this, a verbatim TextDiff can be provided for the whole Transitions Label including Trigger and Guard.

Additionally, if more than one Transition has the same Source and Target, the Trigger in combination with the Guard that fires the Transition is used for identification of comparison partners, as shown in Figure 40 with the two Transitions from State “IDLE_ST” to State “RUNNING_ST”. In this case the Trigger and Guard cannot be included in a verbatim TextDiff. That’s the reason why Transitions are highlighted as New and Deleted if the Trigger or the Guard has changed as displayed in Figure 40 with Transitions “STOP_EV” from State “IDLE_ST” to State “RUNNING_ST” in which a Guard has been added.

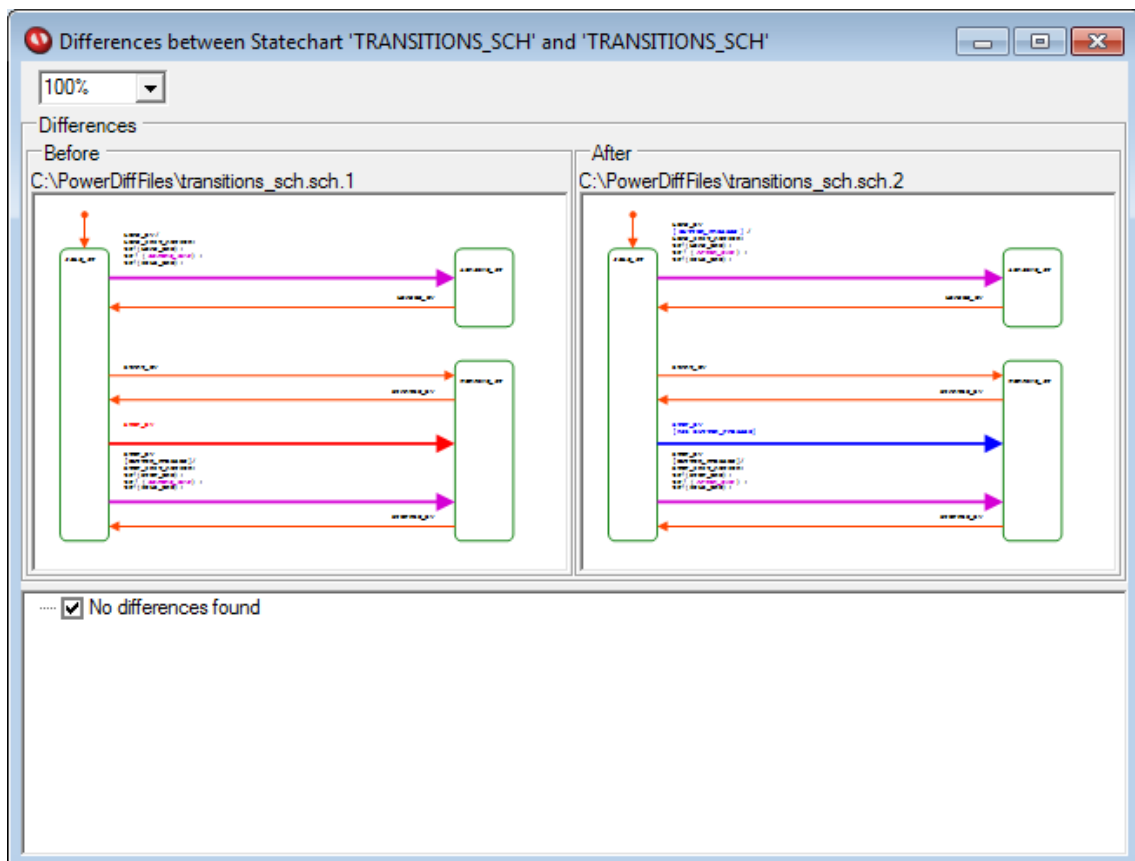


Figure 40: Highlighting of Transitions

6.3 Highlighting of Data-Flows and Control-Flows

Highlighting of Control-Flows is implemented according to the highlighting of Data-Flows.

Two Data-Flows are detected as comparison partner by means of their Source (e.g. an Activity), by means of their Target (e.g. another Activity) and their whole Labels (e.g. the name of a Condition, Event, Data-Item or Information-Flow). If the Source or the Target or the Label of a Data-Flow has changed (e.g. because of the renaming of a Data-Item) the whole Data-Flow is detected to be Deleted as BeforeCase and New as AfterCase, as shown in Figure 41.

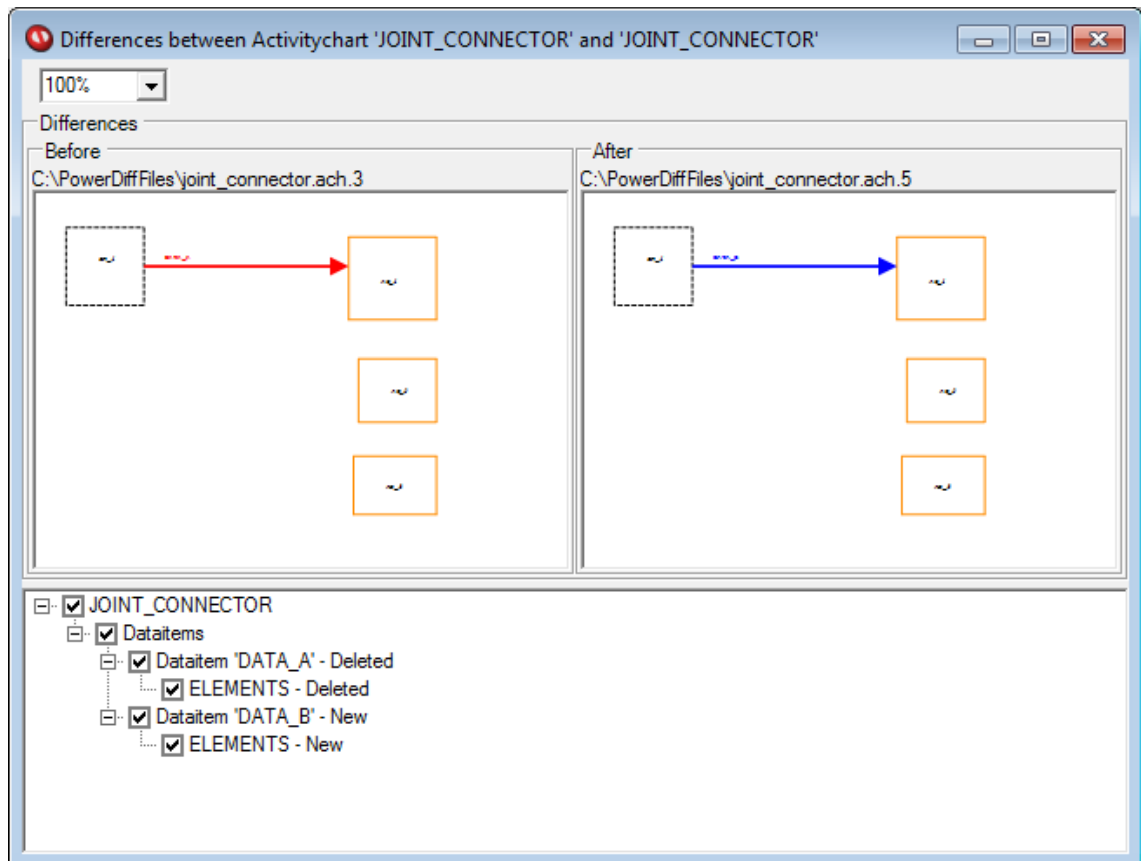


Figure 41: Renamed Data-Item

For Data-Flows flowing over Junction or Joint Connectors, the highlighting New and Deleted is implemented for parts of the whole Data-Flow. This means that only the New or Deleted sections of a Data-Flow are highlighted instead of the whole Data-Flow, which is shown in Figure 42.

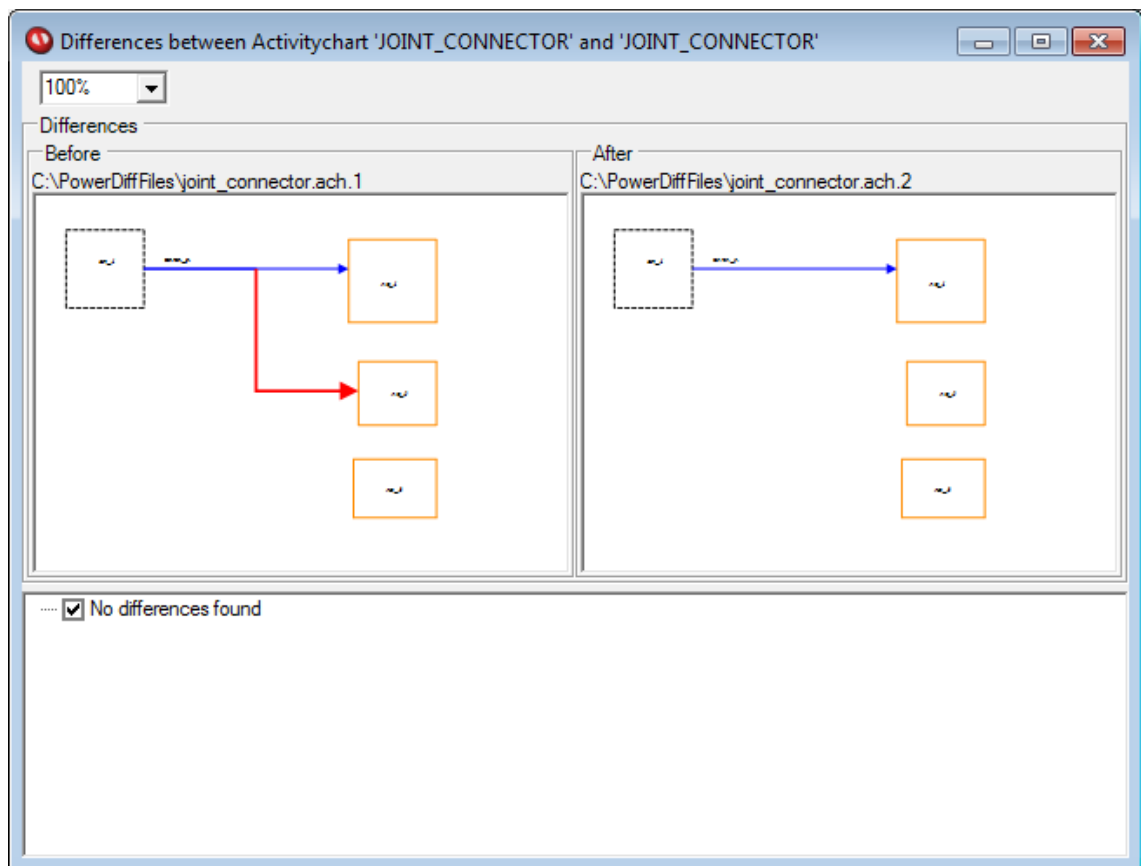


Figure 42: Deleted Data-Flow over Joint a Connector

The highlighting of a Data-Flow complies with the change status of the corresponding Data Object (Event, Condition, Data-Item or Information-Flow). When the Label is highlighted as Amended the reason may be a change in the corresponding Data as shown in Figure 43. Details for the changes in Data-Item "DATA_A" are displayed in the detailed view shown in the DiffTree.

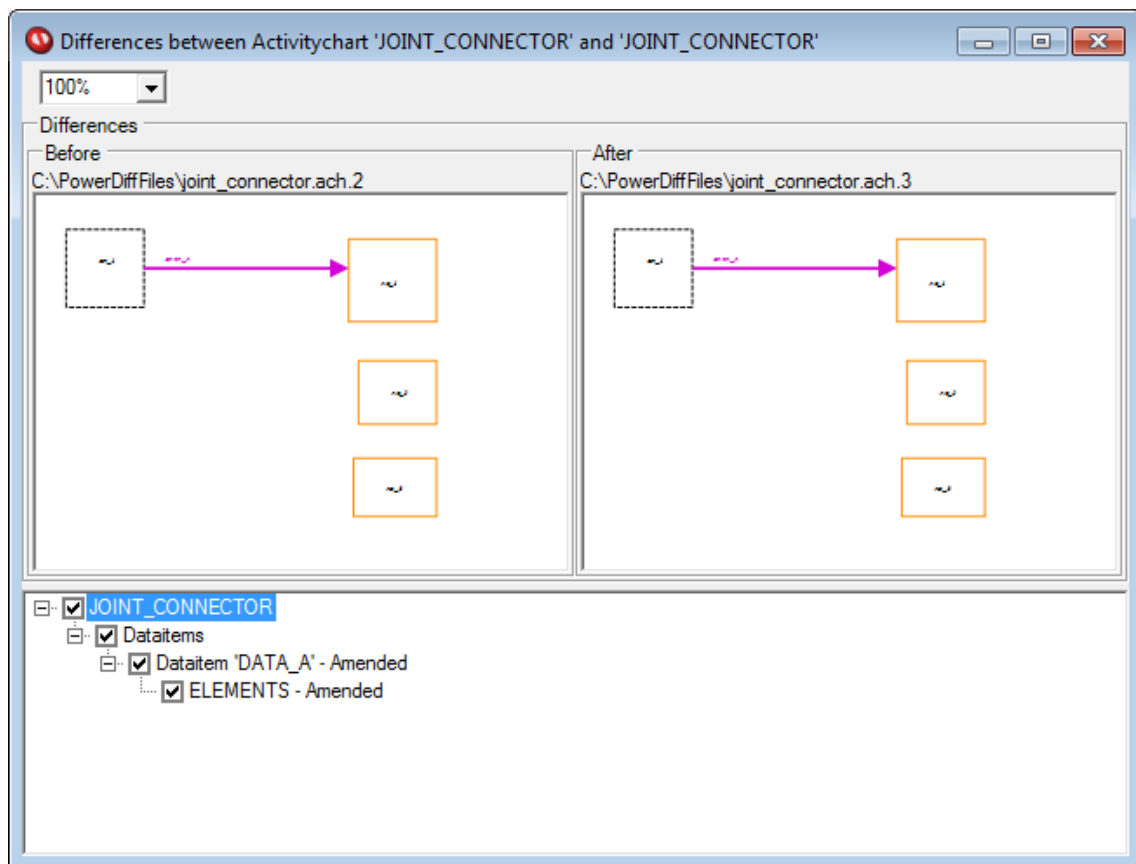


Figure 43: Changed Data-Item highlighting on Data-Flow

When the scope of an object (e.g. Event, Condition, Data-Item, Information-Flow, Data-Type, Subroutine, Action, etc.) has changed in two compared versions of chart files, the definition of the object has been moved from one chart to another. In this case PowerDiff detects this object as Deleted from the chart it has been defined as BeforeCase and as New in the chart the object is defined as AfterCase. The reason is that PowerDiff performs comparison on a chart basis.

For a Data-Flow referencing a Data (Event, Condition, Data-Item, Information-Flow) with a changed scope the graphic displays the Name of the Data as New in AfterCase and as Deleted in BeforCase as shown in Figure 44. In this case the detailed difference only displays the information of the BeforeCase or the AfterCase as shown in the DiffTree.

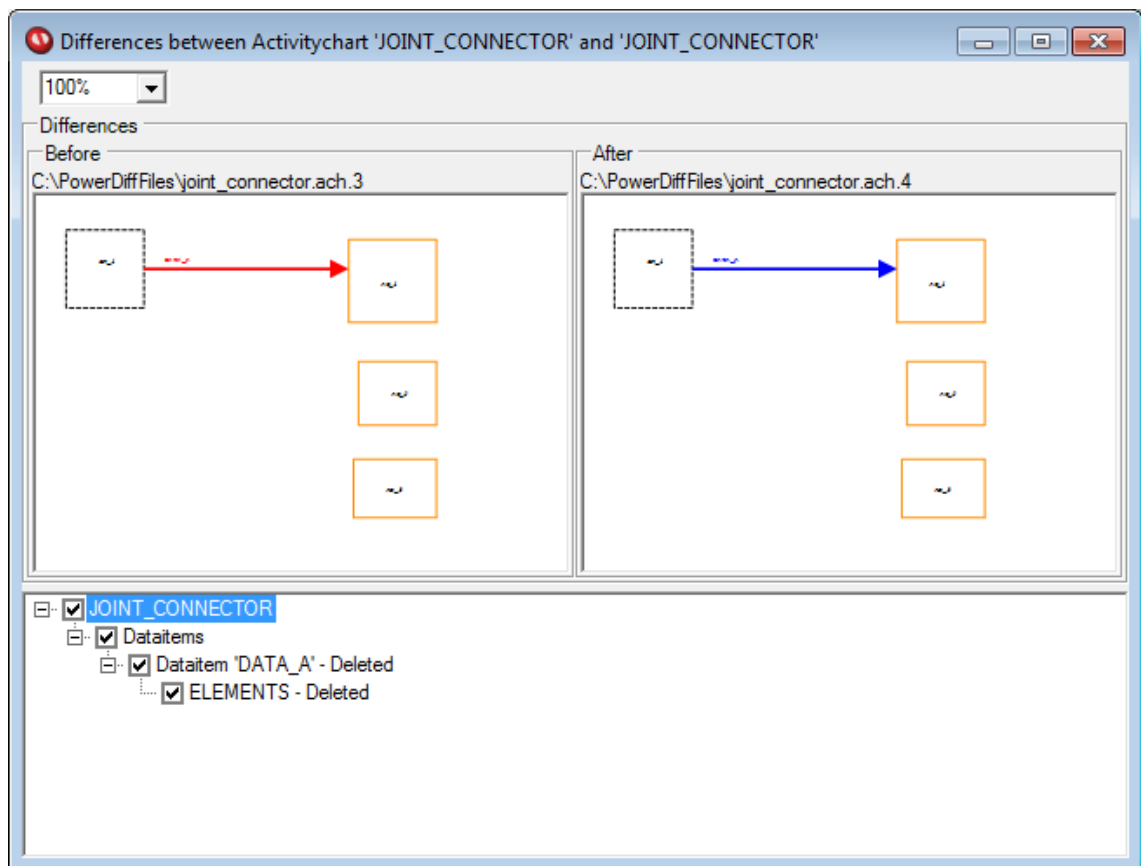


Figure 44: Highlighting of Data-Item with changed scope

7 POWERDIFFCONVERT

7.1 Overview

Different versions of Statemate® generate chart files using different formats for numerical and conditional values as well as for enumerations. These differences affect only the representation of these values but not the semantics. Chart files have to be preprocessed by the PowerDiffConvert utility to ignore this kind of differences.

The PowerDiffConvert utility checks the version of the chart files format in the BeforeCase and in the AfterCase. If the version number is different, a file conversion is performed: PowerDiffConvert executes the Statemate® application, loads both chart files into a Statemate® work area and exports the charts one at a time.

7.1.1 Input File Format

PowerDiffConvert uses the Statemate® Dataport Interface to convert chart files. Consequently, PowerDiffConvert works for all chart files that can be used by the installed Statemate® version except for Module-Charts. For the supported Statemate® versions please refer to 7.2.1 “Preconditions”.

The chart files must be listed in a PowerDiff pcl-file (see 3.1).

Note: A chart name and the name of its corresponding chart file (except for the file ending) must be identical.

7.1.2 Output Files

PowerDiffConvert will convert Statemate® chart files. As a consequence, the input chart files will be overwritten.

Note: Even write protected chart files will be overwritten by PowerDiffConvert!

7.1.3 Installation and Registration

PowerDiffConvert will be installed with PowerDiff. For information about installing and registering PowerDiff please refer to the “Setup and Installation Guide”.

7.2 Getting started

7.2.1 Preconditions

PowerDiffConvert uses the Statemate® Dataport Interface to convert chart files. Consequently the following preconditions must be fulfilled:

- Statemate® must be installed. Supported versions are 4.6.1.3, 4.6.1.4, 4.6.1.5, 4.6.1.6, 4.6.1.7, 4.6.1.8, 4.6.1.9, 4.6.1.10, 4.6.1.11.
- A valid licence for the installed Statemate® version is available.

7.2.2 Settings

Before PowerDiffConvert can be used for the first time, a few settings have to be made:

- Dependent on the installation of Statemate®, PowerDiffConvert sets environment variables during its execution. For this reason, the environment variables which have to be set must be defined in the Settings Dialog of the PowerDiffConvert utility. For more information see chapter 7.4 "Convert Settings Dialog".

7.3 Executing PowerDiffConvert

If PowerDiff is started in batch mode as described in 4.1 Using PowerDiff in Batch Mode the PowerDiffConvert utility will also be started if the option "-noconvert" is not set.

The following example shows a command that starts PowerDiff with implicit execution of PowerDiffConvert:

```
PowerDiff "D:\Batch\statecharts.pcl" "D:\Report\statecharts_diffs.pdf"
```

7.4 Convert Settings Dialog

PowerDiff Interactive Mode provides the Convert Settings dialog to configure the settings, which are required to use PowerDiffConvert.

The Convert Settings dialog can be opened by clicking menu item "Convert Settings..." located in menu "Customisation" (please refer to section 3.1.4 "The "Customisation" menu").

Via the Convert Settings dialog (see Figure 45) the environment variables which are required to execute the Statemate® Dataport Interface can be defined and adapted. A list of these environment variables can be found in file "run_stmm.bat" located in the Statemate® directory %STM_ROOT%\bin. When one required environment variable is missing the execution of the Statemate® Dataport Interface may fail, which will cause in failing execution of PowerDiffConvert.

In most executing systems the specified default values for the listed environment variables do not have to be adapted. In some cases environment variable "USER" has to be specified with value "%USERNAME%".

Note: For environment variable "STM_ROOT" no default value is provided. This variable has to be set to the path in which the Statemate® bin directory is located (see the example in Figure 45).

The "DATAPORT_DLL_PATH" environment variable is used to extend the "PATH" environment variable with the path to file dataport.dll and all additionally needed files. File dataport.dll should be located in folder %STM_ROOT%\bin, which is specified as default value.

The folder referenced by environment variable "STM_PREFERENCES_DIR" is temporarily copied to a location below folder "%APPDATA%". The reason is that the Statemate® Dataport Interface writes preferences files located in this folder and in some environments

no write access is provided for the “%STM_ROOT%\preferences” directory. Due to this fact please assure that write permission is given to folder “%APPDATA%” and all its subfolders.

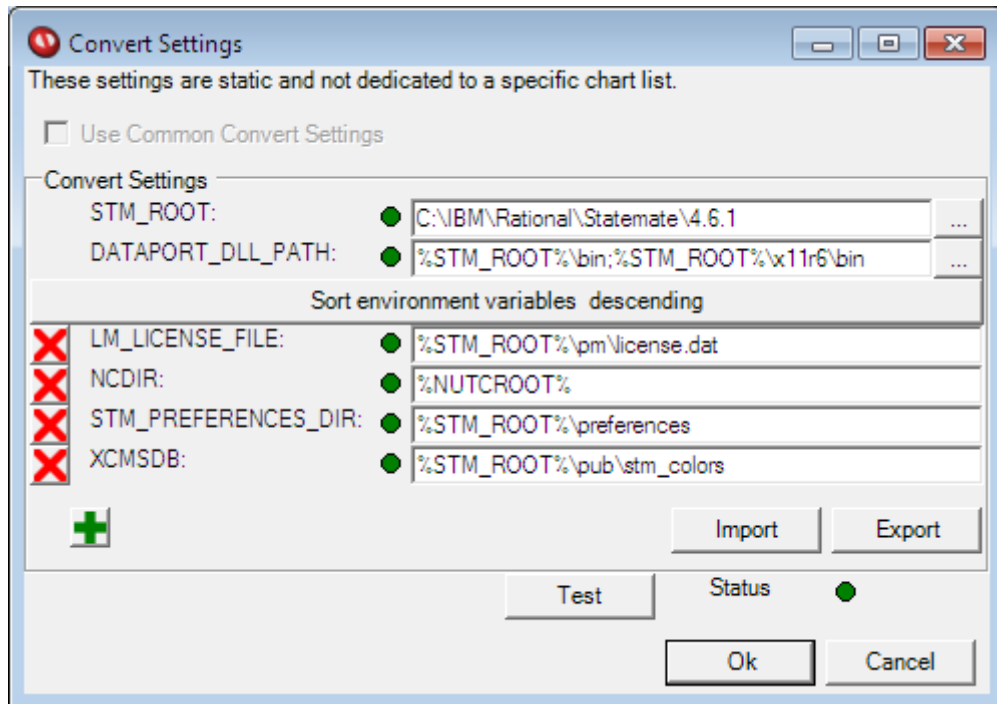




Figure 45: Convert Settings Dialog (with default values and an example for value STM_ROOT)

To export the specified Convert Settings to a “PowerDiff Customised Settings” file (*.pcs) please click button “Export”.

To import the required environment variables from a “PowerDiff Customised Settings” file (*.pcs) please click button “Import and select the PCS-file to import in the Open File Dialog. Click “OK” and the environment variables contained in the PCS-file are listed in the Convert Settings Dialog. By importing the already specified Convert Settings are overwritten.

To add a new environment variable please click button  and fill in the Environment Variable Name Editor (see Figure 46). The name can be specified by editing the textbox or by selecting an already defined environment variable from the list. By clicking button “OK” the new environment variable is added to the list in the Convert Settings dialog. If the environment variable is already contained in the Convert Settings the “OK” button stays disabled.

To delete an environment variable please click button  of the appropriate environment variable in the list.

Editing the value of an environment variable can be performed by changing the contents of the appropriate textbox. The accuracy of an environment variables value is estimated while editing. The estimated accuracy is highlighted by an associated lamp (a kind of traffic light). Green light indicates that the specified value seems to be accurate. Yellow or red light indicates that the specified value is estimated to be incorrect. Detailed information is displayed as tooltip on the appropriate lamp.

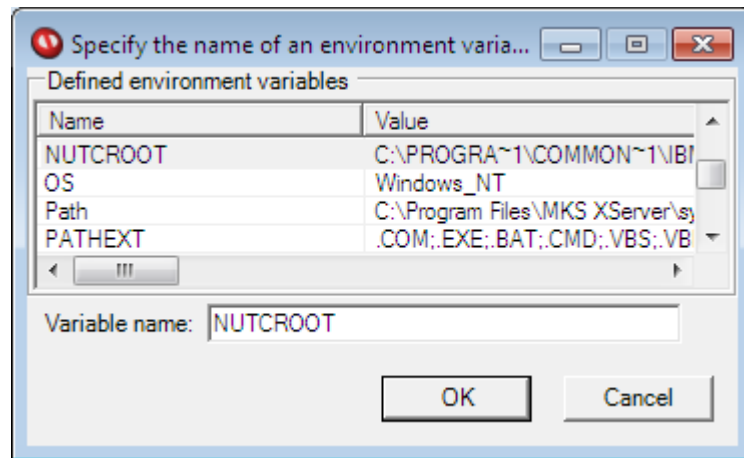


Figure 46: Environment Variable Name Editor

Testing the specified Convert Settings can be initiated by clicking button “Test”. The status of the test is displayed in the associated lamp (a kind of traffic light). Green light indicates that the specified Convert Settings are correct. Yellow (blinking) light indicates that testing the Convert Settings is recommended. Red light indicates that the specified Convert Settings are incorrect. Detailed information is displayed in the textbox of the test dialog and as tooltip on the appropriate test status lamp in the Convert Settings dialog.

After editing, the Convert Settings are stored by clicking button “OK” in a user specific file.

Via menu “Customisation” this user specific file can be imported, exported or reset (please refer to chapter 3.1.4 “The “Customisation” menu”).

7.4.1 Common Convert Settings

When Common Convert Settings shall be provided (read only) for a user instead of user specific Convert Settings a Registry Key “CommonConvertSettingsFile” has to be defined in Registry below “HKEY_CURRENT_USER\Software\Expleo-Germany\PowerDiff\X.Y” (where ‘X’ is the major version number and ‘Y’ is the minor version number of the current PowerDiff version). The value of this Registry Key has to be the path to a “PowerDiff Customised Settings” file (*.pcs) with correct (tested) Convert Settings. In this case the Convert Settings dialog is displayed as shown in Figure 47.

When checkbox “Use Common Convert Settings” is checked the Convert Settings stored in the Common Convert Settings file are displayed read only. When this checkbox is unchecked the user specific Convert Settings are displayed and may be modified. When closing this dialog by clicking button “OK” the check status of this checkbox is saved.

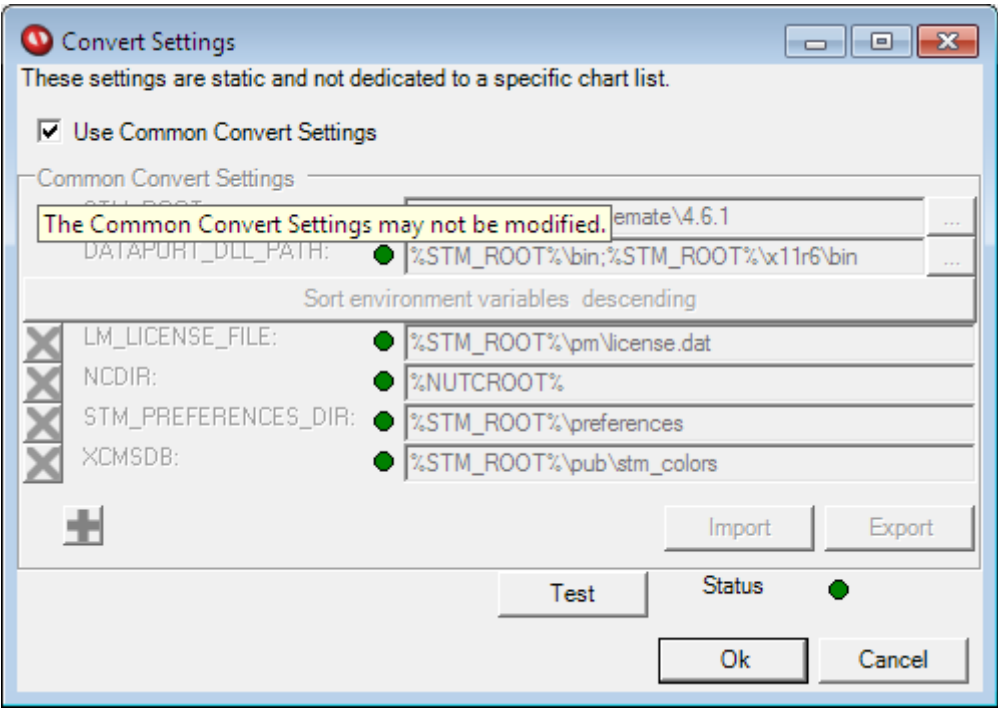


Figure 47: Common Convert Settings Dialog (with correct Convert Settings)

8 POWERDIFFFLOW

8.1 Overview

In order to see, where a data object is used or modified, a source/sink-analysis can be conducted. This analysis is executed by PowerDiffFlow.

PowerDiffFlow finds the places, where the value of a data object is evaluated or possibly changed and allows for listing the sources/sinks in the correct section of the resulting PDF-file. PowerDiffFlow is started after the chart-files are converted by PowerDiffConvert and before the report is generated.

8.1.1 Outline of the Source/Sink-Analysis

The source/sink-analysis conducted by PowerDiffFlow lists the activities, states and state charts, within which a data object (i.e. a data item, condition or event) is evaluated (as sinks) or possibly modified (as sources).

PowerDiffFlow uses the data given in Truthtables as well as information from Lookuptables or implementations using the Statemate® Action Language. Other implementation languages such as ADA or C are not supported.

8.1.2 Installation and Registration

PowerDiffFlow is installed as part of PowerDiff. For information about installing and registering PowerDiff please refer to the "Setup and Installation Guide".

8.2 Getting started

8.2.1 Preconditions

PowerDiffFlow uses Statemate® chart files as input. These chart files must fulfil the following preconditions:

- Evaluated Chart files must be created by Statemate® of version 4.6, 4.6.0.1, 4.6.0.2, 4.6.0.3 or 4.6.1
- All chart files to examine must be either Activity charts or State charts
- The complete model must be evaluated at once and therefore be completely passed to PowerDiffFlow

8.2.2 Contribution to the PowerDiff PDF-report

The results from the source/sink-analysis conducted by PowerDiffFlow are written to the resulting PDF report. Within the report, the sections concerning data items, conditions and events also contain a summary of their sources and/or sinks. Figure 48 shows extracts of a report that contain source and sink information for one data item (other information such as name and data type have been omitted in this case for the sake of brevity).



1.1.1.2.2. Dataitem '*ST_ANA_DI_IN_OUT*' - Amended

Before

Sources - Amended

INSTANCE_ST<*GENERIC_SCH*
<*GENERIC_SCH*
SUB_INSTANCE_ST<*GENERIC_SCH*
<*GENERIC_SCH*

Sinks - Amended

INSTANCE_ST<*GENERIC_SCH*
<*GENERIC_SCH*
SUB_INSTANCE_ST<*GENERIC_SCH*
<*GENERIC_SCH*

After

Sources - Amended

<*GENERIC_SCH*
SUB_INSTANCE_ST<*GENERIC_SCH*
<*GENERIC_SCH*

Sinks - Amended

<*GENERIC_SCH*
SUB_INSTANCE_ST<*GENERIC_SCH*
<*GENERIC_SCH*

Figure 48: Extracts of PowerDiff report containing Source/Sink-Information

9 SUPPORT

For updates and additional information about PowerDiff check our web page www.expleogroup.com and browse to the PowerDiff section.

On the web site you can also get access to the “Change & Defect Area”, where you can report recommendation, requests and observations. Our change process keeps you informed per E-mail. In addition you can check the current status of your entries.

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