Bartels AutoEngineer®
Version 6.8
Release Notes

This documentation contains information about the new features introduced with **Bartels AutoEngineer Version 6.8**. Forward compatibility from earlier versions to **Bartels AutoEngineer Version 6.8** is ensured, but not backward compatibility.

Bartels AutoEngineer Version 6.8 Release Notes
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Contents

1   General

1.1   Installation

Installation Guide

The Bartels AutoEngineer® Installation Guide (file `inst_en.htm` from the `baedoc` directory of the BAE-CD-ROM) provides detailed **Bartels AutoEngineer** installation instructions for all supported hardware and software platforms.

ULC Program Library

The precompiled **User Language** programs of the BAE software are now provided in the `ulcnew.vdb` file, and the BAE system copies these programs to the `ulcprog.vdb` file when first started after installation. This means that user-specific **User Language** programs are now kept in `ulcprog.vdb` and don't have to be recompiled after installing intermediate BAE versions which don't require **User Language** program recompilation. The `ulcnew.vdb` file is automatically deleted once the programs have been succesfully copied from `ulcnew.vdb` to `ulcprog.vdb`.

1.2   User Interface and General Functions

Element Edit Lock

The `LOCKMODE_STD` parameter for controlling DDB element access in multi-user environments has been added to the `bae.ini` file. This parameter can be configured through the Element Double Usage option of the Settings / Settings bae.ini function.

The Issue Warning Query on Save default mode issues a warning message with a verification prompt when trying to save an element which has been modified in the mean time and/or by somebody else. The Issue Warnings on Load & Save mode also causes a warning to be displayed to anyone who is loading an element which is currently loaded and/or manipulated by someone else. The Issue Warning on Load, Disable Save mode takes this a bit further in that it disables any save operations on elements which are already loaded by a different user. Finally, the Disable Load mode prevents elements from being loaded by different users at the same time.

The information about currently processed DDB file elements is kept in a `.lck` files associated with the project `.ddb` file. The lock file is automatically deleted when the last element of the associated DDB file is closed.

In networks of BAE installations with different `.ddb` file access configurations, the most restrictive applicable `.ddb` file access control configuration is used.

Project File Cleanup

The Copy Project and SQL Database functions have been added to the File / Library Utilities / Copy Elements submenu. Copy Project copies all SCM sheets and layouts inclusive of any project-specific parameter settings and SQL databases to a new DDB file. The new DDB file is usually smaller than the original DDB file and contains only those symbol/macro definitions which are used in the project's SCM sheets and layouts.

Symbol Preview

A symbol preview pane has been added to the file and element selection dialogs. The preview is activated by selecting an element with a single mouse-click. The **Layout Editor** preview also shows the smallest drilling diameter and the smallest (horizontal or vertical) pin grid of the selected element.

The three-column library element dialog has been modified. When selecting a library from the right column, the elements of this library are now listed in the center column (previously only the elements from the standard/default library were listed in the center column). The Search button for scanning the libraries of the library directory for elements with name patterns has been added. Only files containing elements matching the specified element name pattern are displayed once the search has finished.

Name/Text Patterns

Numerous functions allow for the specification accept wildcards such as `*` and `?` for the specification of element names and/or texts. It is now also possible to include `#startnumber-endnumber#` number ranges in such name patterns. I.e., a name pattern such as `r#100-199#` can be specified to select all names from `r100` to `r199`. Only digits are allowed for start and end number specifications. I.e., the `#` character sequence is treated like a normal character sequence if it doesn't adhere to the above syntax.

Grid Settings

The behaviour of the F toolbar button has been modified to distinct between right and left mouse button clicks. Clicking the F button with the left mouse button activates the favorites funtion menu. Clicking the F button with the right mouse button provides a menu for configuring and/or accessing user-specific grid settings. Up to 28 named database entries with grid settings can be configured per module.

The key programming sequence for activating the grid menu is `favorite:"!"`.

Command History

The H toolbar button has been changed to differ between left and right mouse clicks. Clicking H with the left mouse button provides access to previously processed DDB files/elements (DDB element history). Clicking H with the right mouse button lists the last 16 menu functions activated during the current BAE session (BAE command history). Any of the commands from the BAE command history can be reactivated by simply clicking on it.

Element Load History

A menu for accessing the elements loaded during the current session has been added to the arrow buttons of the toolbar. This menu can be activated by right-clicking the element history arrow buttons, and it allows to access and/or re-load any element from the element load history directly without the need to step through element load history and/or hierarchy.

File Name Specification

The special variables `$projectfile` (project file path name without `.ddb` extension), `$projectbase` (project file name without path/directory and without `.ddb` extension) and `$projectdir` (project file directory path name) are now supported in file name parameter specifications. This allows, e.g., for the specification of project-specific output file names such as `$projectdir/schematics.pdf` and/or `$projectdir/layout.pdf` to ensure that the output files are always written to the project file directory.

Design View Window Info

Design view info queries with the i toolbar buttons are now displaying a yellow frame in the toolbar overview window to indicate the design view position for the currently loaded element.

Mouse Position Change

The `MOUSEWARP_STD` parameter for setting specific mouse pointer positioning modes has been added to the `bae.ini` file. The Settings / Settings bae.ini function can be used to change these settings. On default, mouse pointer repositioning is deactivated because it is an extension to common user interface implementations.

The Mouse Warp option configures the mouse pointer positioning for popup menu activation through mouse clicks. The No menu mouse warp leaves the current mouse pointer position unchanged. The Warp to 1st item positions the mouse pointer to the first popup menu item. The Warp to selected item mode positions the mouse pointer to the currently selected popup menu item (or to the first menu item if nothing is selected). The Restore position setting moves the mouse pointer back to the position from before the menu call once the selection has been made.

The Warp to Element Pick Position setting positions the mouse pointer to the origin of the symbol, part or text selected for placement. I.e., this mode prevents the selected element from jumping to the selection coordinates if these are different from the element origin coordinates. The Zoom All has been adapted accordingly to keep the mouse position on the currently loaded element. This mode also causes the mouse pointer in the Change Colors dialog to jump to the color button of the selected layer and back to the layer button after selecting the color.

Mouse Rectangle

The `MOUSERECT_STD` parameter for setting a minimum horizontal and/or vertical distance beyond which the feature for defining a mouse rectangle (e.g., for Zoom Window) with pressed left mouse button has been added to the `bae.ini` file. Previously, this minimum distance was set to 5 pixels. Any value larger than the current screen dimensions virtually deactivates the mouse rectangle function.

Drawing Rectangles

A function for drawing rectangles can now be activated by pressing the r key during the definition of polygons, either before or after setting the first polygon point. The function then only requires the selection/setting of the opposite corner point and automatically creates the missing two corner points.

Key Programming

The `Key Programming` functions have been modified to support the programming of letter keys in combination with the `Shift` and `Ctrl` keys. In **bae.ini**, codes 257 (A) to 282 (Z) are used to refer to those key combinations.

Screen Aspect Ratio Correction

A series of alternative/modern display devices don't store accurate screen aspect ratio values in the operating system. This can cause a distorted display of circles and other geometric objects. Input fields for entering scaling factors for the X and Y screen dimensions have been added to the BAE main menu to correct this problem. The main menu also displays the current operating system screen dimension settings for reference. The environment variables **BAE_SCRXSCALE** and **BAE_SCRYSCALE** have priority over main menu screen dimension settings to allow for user-specific screen aspect ratio settings in network installations.

1.3   Symbol and Part Libraries

ROUTE - Router Control, Rule System

The tag_pin_heattrap tag symbol for assigning copper fill heat trap connections to pins has been added to the ROUTE library.

2   Schematic Editor

2.1   General

Element Query

The Query Element function (as known from the **Layout Editor**) has been added to the View menu and to the menu which is available through the middle mouse button clicks. Label and connection element queries provide the list of sheets with reference to the selected net in the status line in addition to the element data display.

An element query function/dialog for displaying information about the elements placed at the current mouse position has been added to the placement and selection functions. This query can be activated by pressing the Ctrl key, and it is permanently active in the Query Element function and the Add Connection function (before setting the first connection corner point). The Info Text option for deactivating the permanent element query has been added to View / Settings.

Report

Additional information such as data about the last **Packager** run and the last name update for the project (by **Packager** or Backannotation), Backannotation requests due to layout changes, and the list of schematic sheets changes since the last **Packager** run has been added to the output produced by Utilities / Report.

Plan Size Change

The New Sheet Size function for changing the size of the currently loaded SCM sheet has been added to the Settings / Element Size submenu. The new sheet size can be selected from a list of predefined standard sheet dimensions. If automatic frame group loading is activated through the **SCMHEADLIB_SCM** parameter in **bae.ini**, then New Sheet Size automatically deletes elements with **header** group names, loads a frame group for the new sheet size and transfers header symbol attributes to replaced symbol macros.

Settings in bae.ini

The Settings / Settings bae.ini function for editing **Schematic Editor** specific BAE system parameters from the **bae.ini** file has been added. These changes are immediately activated for the current **Schematic Editor** session. Settings bae.ini creates a **bae.ini** backup with the file name **bae.bak** before updating **bae.ini**.

Mouse Button Context Functions

The Ctrl Function, Shift-Ctrl Function, Alt-Left Function and Alt-Right Function functions for assigning context functions to the right mouse button/keypress combinations have been added to the mouse button/menu from the toolbar. On default, the Delete, Select, Rotate Left and Rotate Right functions are assigned to these keys.

Origin Pick

The system now automatically snaps to the element origin when pressing the p key during element placement operations with the mouse pointer outside the element boundaries. This simplifies the placement of frame groups and/or symbols which have to be placed at the origin.

Grid Selection

The 0.1 mm grid option has been added to the Display Grid and Input Grid settings in View / Settings.

File/Element Favorites

The behaviour of the open button in the toolbar has been modified to distinct between left and right mouse button clicks. The left mouse click activates the Open menu. The right mouse click activates a new menu for managing and accessing file and element name favorites. Up to 28 favorites can be defined for quick access, each with options for predefined or selectable file name, database class and element name and element or group load mode. This allows for the definition of additonal menu functions, such as loading standard library labels which only prompt for label names, or loading standard SCM groups.

The key programming sequence for activating the file/element favorites menu is **favorite:"!":"f"**.

File Save As

The behaviour of the save button in the toolbar has been modified to distinct between left and right mouse button clicks. The left mouse click activates the Save function. The right mouse click activates Save As function.

BAE Window Hopping (BAE HighEnd)

The View / Other Functions / Activate Neighbour Window function for switching to the next SCM and/or layout window has been added to the **BAE HighEnd** version. The mouse is automatically positioned in the center of the activated window. This function has also been assigned to the Tab key to simplify BAE window access in multi-screen and/or multi-monitor environments.

Spice Netlist Output

The `SPICEHEAD_SCM` parameter for defining a header for inclusion in the output file created by File / Import/Export / Spice Data Output has been added to the `bae.ini` file. This header can be a single command, a file with a predefined name, or a file with a project-specific name and a predefined file name extension. This allows for the inclusion of general control parameters for the Spice simulation and eliminates the need for manually adding control parameters which cannot be provided through SCM symbol definitions.

2.2   Symbols, Labels

Symbol Name Specification

The NAMEPROMPT_SCM parameter for deactivating the symbol name query in the Symbols / Add Symbol function on SCM plan level has been added to the bae.ini file. Add Symbol automatically creates a symbol name according to the name pattern defined on symbol macro level if the symbol name query is deactivated.

Symbol/Label Pick

Symbols and labels can now also be selected by picking their names and/or attribute texts, even if these texts are positioned beyond the symbol boundaries. This simplifies the selection of, e.g., standard labels with long net names. The Move Name and Move Attribute context menu functions have been adapted accordingly.

Part List Cleanup

The Part List Cleanup function didn't delete unused symbol name list entries if the project contains labels with matching names. This problem has been fixed.

Label Placement

The Place Pin Texts function which can also be activated by pressing the e key from within Symbol Edit Functions has been renamed to Place Texts/Labels and can be used on SCM sheet level for placing label lists and label rows.

Part Name Pattern

The Set Part Name Pattern and Replace Number Part options have been added to the Part Name Pattern batch step of the File / Library Utilities / Symbol Edit Batch function. Set Part Name Pattern is the default option for specifying complete part name patterns to be substituted. The new Replace Number Part option can be used to substitute only the numeric part (matched by the * character) of the part name pattern. This allows for fixed width numeric parts to be substituted by variable width numeric parts in part name patterns with different name prefices. I.e., only a single batch step is necessary to replace, e.g., r??? and c??? part name patterns with r* and c*.

Symbol Location Search

The Symbol Name and Symbol Macro buttons featuring sorting the symbol/part selection list by symbol/part name or macro name have been added to the dialog of the View / Find Part / Search in list function.

Tag Symbol Display

The connection line between tag symbol pin and tag destination is now also displayed if the tag symbol is placed outside the current zoom window.

Symbol Database Generation

The new **DEF2CSV User Language** program can be used to create .csv and .map files for building symbol selection databases from logical library definition (.def) files. **DEF2CSV** is capable of retrieving database fields from newattr commands or comments. The library name for each symbol is derived from the .def file name. I.e., **def2csv.ulc** should only be used for definition file names matching the corresponding SCM symbol library file name.

Part ID Replacement

New options for replacing part numbers/ids for all group-selected symbols, for all symbols of the currently loaded SCM sheet, or for all symbols on all project SCM sheets have been added to the ID Replacement function from Symbol Database.

Symbol Renaming

The Renumber Manually and Swap Names functions have been added to the Symbols / Other Functions / Renumber Parts submenu. Renumber Manually prompts for a name pattern and a start number and activates a loop for renaming and/or renumbering mouse-selectable symbols according to these settings. A symbol name swap is performed if the new name of a selected symbol is already used by another symbol. Swap Names swaps the names of two selectable symbols.

The new Replace Pattern function for changing symbol name patterns (prefix/suffix replacement) has also been added. Buttons are provided for applying Replace Pattern also to labels and texts.

The Update Names from $ function for correlating symbol and layout part name lists by renaming group-selected symbols according to layout part names has also been added. A name extension (`_2`, `_3`, etc.) is appended to the second and successive symbol names of multi-symbol parts. A message is displayed to warn about the potential loss of pin/gate swaps and symbol assignments to multi-symbol parts. It is strongly recommended to refrain from applying the Update Names from $ function to symbols for which this is the case.

Symbol Logic Templates

When applied to a single-pin SCM symbol without logical library definition and with `$gp` attribute text, the Edit Symbol Logic function now automatically creates an `xlat` command which assigns the SCM symbol pin to all pins of the selected layout part macro. This simplifies the definition of special part types (e.g., connector symbols), where the symbol logic definition only needs to be confirmed.

Symbol Logic Check

The list of symbol macros without logical library definition is now included at the end of the symbol list created with Symbols / Other Functions / SCM Cross Reference.

Pin Name Resize

The Pin Text Size batch function for changing the size of pin names and/or pin attribute texts which have been modified with the Move Name and Move Attribute functions has been added to the File / Library Utilities / Symbol Edit Batch setup.

Attribute Assignment

The Assign Value(s) button for symbol attribute editing has been added to the p context dialog for symbols.

V buttons for editing variant-specific attribute values in projects with variants have been added to the dialog of the Assign Value(s).

When picking symbols with multi-page attribute lists, the attribute assignment dialog automatically jumps to the page which contains the attribute at the symbol pick position.

Attribute Default Values

Add List and Edit List buttons for assigning lists of default values to attributes have been added to the Symbols / Other Functions / Set Attributes / Attributes Default Values function. The Browse button for selecting values from these default lists has been added to the Assign Value(s) function. The selected default value is copied into the attribute value input field for further editing and assignement. The attribute value edit box is not activated if the Lock option is set for the attribute. This allows for the save setting of attributes with fixed value ranges.

The new Base Variant Only option can be used to restrict attribute changes to the base variant only, and have other variants display the attribute assignment in read-only mode. This feature is useful for special attributes such as `$plname` which the **Packager** only evaluates for the base variant. New options for automatically setting and resetting the base variant mode for all symbols of a selectable library have been been added to File / Library Utilities / Symbol Edit Batch.

The `$rpname` attribute is now supporting the `$` and `$n` default values. `$` is automatically substituted by the symbol name. `$n` is automatically substituted by the symbol name without the letter suffix after the last numeric part of the symbol name. I.e., the system automatically assigns the value `ic15` to the `$rpname` attribute of the symbols/parts named `ic15a` and `ic15b` if `$n` is set as default `$rpname` value for the corresponding symbol.

Variant Specific Header Symbol Attributes

The dialog of the Set Frame Attributes function for assigning variant-specific header symbol attributes always loaded the base variant attributes. This problem has been fixed. The Set Frame Attributes dialog can now also be used to modify and/or edit existing variant-specific header symbol attributes.

Layout Part Placement (BAE HighEnd)

The Symbols / Other Functions / Place Layout Part function for activating the part placement function in the center of the project layout window has been added to the SCM symbol context menu.

Single Label Report

The `scm_name_label` rule has been added for deactivating single label warnings issued by the Symbols / Other Functions / Check Labels function. The Settings / Rule Attachment functions can be used to assign this rule either to selectable labels on SCM plan level or to label macros types on label level.

Library Documentation

The Files / Library Utilities / Library Documentation function for generating symbol and label library documentation has been extended to allow for the automated processing of complete library directories. It is now also possible to create library documentation for symbols and labels in one go. The library documentation output can optionally be directed to a file and/or directory different from the original library file.

The Folder Files with Extension mode provided with the EPS/PDF Output output batch facilities can be used together with the Library Documentation function to create PDF library documentation for all symbol/label library files of a library directory.

Symbol placement errors could occur in special cases when updating library documentation sheets after changing library symbols. This problem has been fixed.

2.3   Connections

Automatic Corner Insertion

The Automatic Connection Corners option for activating an automatic corner insertion mode for the editing of connections has been added to the View / Settings menu. With Automatic Connection Corners, the system automatically inserts a horizontal and a vertical connection segment to connect the last connection corner point to the current mouse position. The horizontal segment connects to the destination point if the current mouse position is off-grid between the last connection point and the destination point. Otherwise, the horizontal segment connects to the last connection corner point. The Automatic Connection Corners option has also been added to the connection context menu available through the right mouse button. This allows for the activation and/or deactivation of this mode whilst editing connection.

Symbol/Group Connections Rerouting

The routing algorithm for re-routing group connections does not consider preplaced connection segments of the connections to be rerouted as obstacles anymore. This prevents the system from creating multiple connections when compacting circuit modules.

Connections to multiple pins of the same moved symbol were not correctly re-routed in special cases. This problem has been fixed.

The re-routing procedure sometimes created short-circuits when rerouting connections to different symbol pins at the same height and ditrection. This problem has been fixed.

The symbol router has been modified to avoid routing over symbol level standard texts.

Net Selection

Scrollbars have been added to the net name dialogs.

Bus Tap Ranges

The Tap Bus functions has been changed to support downward counting name range specifications.

Cross Reference List

The `$pagecref` system attribute for displaying SCM sheet comment lists for labels has been added.

2.4   Graphics

DXF Ouput with Filled Areas

The `DXF14OPT_SCM` parameter for activating Autocad 14 commands for fill area presentations in DXF outputs has been added to the `bae.ini` file. Previously, the DXF export function always created outlines for fill areas.

DXF Import

The `Transfer all DXF Layers` option for importing all DXF layers of multi-layer DXF files has been added to the layer assignement facility of the `AutoCAD/DXF Import` function.

The `AutoCAD/DXF Import` for importing DXF files into the **Schematic Editor** has been modified to support `INSERT` and `DIMENSION` DXF block definitions and DXF block references.

Polygon Sketching

Pressing the `Shift` and `Ctrl` keys during the placement of polygon corner points causes the system to set polygon points automatically whenever the mouse moves. This feature considers angle lock and input grid settings. I.e., angle lock and input grid should be deactivatad for freehand polygon drawing. Freehand drawing mode can save numerous mouseclicks when using the `Edit` / `Group Polygon` submenu functions for sketching polygons.

Polygon Point Edit

Buttons for scrolling in the polygon point list of the picked polygon have been added to the dialog which is activated by pressing the `p` key when modifying polygon corner points. The index and type of the selected polygon point is now also displayed in this dialog.

2.5   Text, Attributes

Load Text Sheet

The Load Text Sheet context function has been changed to consider SCM sheet specific comments when selecting plans to be loaded. Once the SCM sheet is loaded, it is scanned for part/symbol names matched by the comment text, and a Zoom Window operation is triggered to zoom to the matched symbol/part. This allows for the definition of a text such as `see Power Supply IC10` referring/linking to the part/symbol `IC10` on the sheet with the comment text `Power Supply`.

Multi Line Text

On default, the reference point for processing multiline texts is in the bottom left corner of the rectangle surrounding the text. The `MTEXTORG_STD` parameter for setting this reference point to the top left corner has been added to the `bae.ini` file. The multiline text reference point is dynamically calculated. I.e., changing the reference point position also applies to multiline texts created in previous BAE versiosn.

Text Table Import

The Import Table for importing text table files has been added to the Texts / Other Functions / Multi Line Text submenu. Import Table converts each table column into a multiline text object. On default, Import Table expects input files with up to 20 semicolon-separated input fields per line. `bae.ini` parameters can be used to specify non-default table definitions. This allows for sorting, reformating of table columns, and automatic table content substitutions.

Variant Name Display

The variant name is now automatically assigned to the `variant_name` plan predicate if an SCM plan variant is activated. This means that the name of the currently selected variant can be displayed anywhere on the schematic plan simply by placing a `$?s:variant_name` text at the desired position.

BAE Version Display

The system attributes `$pltbaeversion`, `$pltbaebuild` for displaying and/or plotting the **Bartels AutoEngineer** software version and build numbers have been added. This allows for the inclusion of software version information on SCM documentation as required for ISO certification.

Name Update Data Display Attributes

The `$pltcname`, `$pltcdatede`, `$pltcdate2de`, `$pltcdateus`, `$pltcdate2us` and `$pltctime` attributes for displaying the layout element name and the date and time of the last name update have been added to the system.

Variant Data

The (Sheet Variant Data Scan) and (Sheet Deletion of Plot Visibilities and Variant Attributes) buttons have been added to the Settings / Variants dialog for variant selections.

(Sheet Variant Data Scan) creates a listing of all variants with variant-specific attributes and/or plot visibility modes. The listing may also include data from group-loaded variant numbers for which a name has yet to be assigned in the current project.

(Sheet Deletion of Plot Visibilities and Variant Attributes) can be used to delete all variant-specific attibutes and plot visibility modes from the current project. This feature can be used for cleaning up circuit data before transfering it to a new project.

2.6   Group Functions

Group Polygon Toggle

Toggle options for toggling the group selection status of the elements inside the current group polygon have been added to the Edit / Group Polygon functions.

Attribute Selection

The Attributes option for selecting or deselecting symbols according to their attribute settings has been added to the Select and Deselect submenus from the Edit / Other Funktions which can also be activated through the F9 key.

Reset Group

Pressing the Ctrl-A keys together with the Shift key causes the system to deselect all group elements.

Zoom All

During group placement operations, the Zoom All function is now taking the currently picked group elements into account when calculating the new zoom window.

2.7   Plot Output

Plot Visibility

The Generic Output function has been changed to plot inactive elements using the variant color when producing coloured output with the Generic Output Color option from Plot Output / Settings. The variant color must be set to the background color to prevent invisible elements from being included with color outputs.

Plot Pen Width Scaling

The Plotter Pen Width function for setting plotter pen widths for line and text output has been changed to accept negative input as scaling factor for the current pen width specification.

Plot Preview

The Lines Plot Preview has been added to the View / Settings menu. Lines Plot Preview assigns the current Plotter Pen Width setting from Plotausgabe / Settings to the screen display of lines and texts without pen width assignment, thus providing a plot preview for standard lines and vectorized texts. In certain monitor and/or screen resolution configurations, this feature also increases the onscreen legibility of the currently loaded element.

Print Output Cancellation

Multi-page print outputs with Generic Output can now be cancelled at any time by pressing a key and confirming the cancellation.

EPS/PDF Output

Output batch support has been added to EPS/PDF Output with page output options for element type specific color assignments, variant attribute and text class output control, and plot visibility color assignments.

The `$pdfpage` system attribute text for displaying the current page number in PDF outputs has been added. The `$pdfpage` text attribute definition can be placed on any element hierarchy level.

The `scm_text_font_bae`, `scm_text_font_ps1` and `scm_text_font_ps2` rules for assigning non default EPS/PDF Output character fonts to texts and/or symbols have been added.

PDF output is now generated in compressed format.

The selected output font `Courier`, `Times-Roman` and/or `Arial` text size rather than the BAE vector font text size is now used for negation lines and alignment offsets for negated and/or centered texts.

The Postscript 1:1 and PDF functions have been changed to Postscript n:1 and PDF n:1 with scaled output support.

The new All variant sheets of file option for Output Element(s) creates a PDF file with a separate page and a table of contents for each variant and SCM sheet combination.

The output offset defined with the `bae.ini` parameters `PSXOFF_SCM` and `PSYOFF_SCM` can now be edited in the parameter dialog and will be used for all EPS and PDF output formats.

The p key can be used to assign element-specific colours for the EPS/PDF Output function. These settings have priority over standard color setups and can be used to, e.g., emphasize important comment texts.

HPGL Output

The wide option has been added to the Fill Mode HP-GL plot parameter setting. With this option activated, the plot output functions perform filling/hatching not only on closed polygons and/or areas but also on texts and lines with width specifications.

2.9   Backannotation

Layout Part Name Lookup Table

The Backannotation function and the **Packager** are now saving the part names from the layout netlist in the project file. The symbol name assignment functions avail of this layout part name lookup table when creating new symbol names based on Part Name Pattern. This prevents the **Schematic Editor** from creating name conflicts by assigning part names which have already been assigned by renaming parts on the layout.

Warning

Either a Backannotation or a **Packager** run is required to activate the layout part name lookup in project files which have been created with BAE versions prior to BAE V6.6.031.

Pin Attributes

Backannotation has been changed to transfer layout pin attributes back to the SCM. Thus it is possible to, e.g., display layout net names on SCM sheets through `$net` attribute text defintions on SCM marker level.

3 Packager

3.1 Error Messages

Net Attribute Warnings

A warning message is now issued if different non-empty net attribute values are assigned to the same net. This feature can be used to activate specific DRC checks. E.g., a `$suptype` net attribute with different values for positive and negative power supply could be assigned to power supply pins in logical library definitions, and the **Packager** would then issue warnings if such power supply pins are accidentially connected.

Redundant Error Messages

Symbol-related error messages caused by missing layout parts (symbol pin assignment failures, missing swap pins, etc.) are not issued anymore because such error messages don't provide any useful information and only distract from the actual cause of the problem, i.e., the missing layout part.

Pin Net Changes

The Error Report parameter for suppressing warning messages about `$net` pin attribute value assignments has been added to the Settings menu. The default setting Ignore $net change deactivates warning messages for changed net name assignments after net list changes. The Display $net change mode for activating these warning messages can be used to monitor how the system assigns synthetically generated net names to unnamed nets.

Unused Gates

The **Packager** didn't set the `$net` attribute for all part pins when issuing warnings about unused gates. This problem has been fixed.

Placement Status Multi-Symbols

It wasn't possible to use the `$noplc` attribute for multi-symbols because this caused part overload errors in the **Packager**. This problem has been fixed. Please note, however, that the placement is prioritized in cases where the sub-symbols of a layout part have variant-specific placement settings. Warnings are issued in cases where sub-symbols which are marked to be unplaced will be included in insertion data output.

3.2 Attribute Assignments

Part Macro Information

`$ulname` (Used Library Name) attribute value assignments for backannotating layout part macro names to the schematic plan are now carried out by the **Packager** rather than the Backannotation.

Pin Attribute Backannotation

The **Packager** has been changed to backannotate pin attributes to the schematic plan. This allows for layout pin attributes to be visualized in the schematic plan by placing the desired pin attribute name such as `$net` (layout net name) on SCM marker level.

Attribute Length Units

The prompts for DRC, autorouting and copper fill clearance and width attributes have been changed to allow for length unit specifications by appending `mil` (for thousands of an Inch), `Inch` or single or double quotes (for Inch), or `um` or `µm` (for micro metre). These specifications are not case-sensitive. Input values are interpreted in millimetre units if the length unit specification is omitted, and the use of the comma instead of the decimal point is now also supported.

4   Layout Editor

4.1   General

Element Query

An element query function/dialog for displaying information about the elements placed at the current mouse position has been added to the placement and selection functions. This query can be activated by pressing the `Ctrl` key, and it is permanently active in the Query Element function, the Add Trace function (before setting the first trace corner point) and during net selections through element pick. The Info Text option for deactivating the permanent element query has been added to View / Settings.

Pressing the `Shift` instead of the `Ctrl` key displays the current distance to the placement start point or the length of the current trace.

Report

Additional information such as data about the last **Packager** run and the last name update for the project (by **Packager** or Backannotation), Backannotation requests due to layout changes, and the list of schematic sheets changes since the last **Packager** run has been added to the output produced by Utilities / Report.

Airline Display

Pressing the `Ctrl` key whilst placing netlist parts or editing netlist traces causes the dynamic airline display to extend its search for the nearest netlist point to be extended from pins to traces. Pressing the `Ctrl` key again restores the pin search mode.

Mouse Button Context Functions

The Ctrl Function, Shift-Ctrl Function, Alt-Left Function and Alt-Right Function functions for assigning context functions to the right mouse button/keypress combinations have been added to the mouse button/menu from the toolbar. On default, the Delete, Select, Rotate Left and Rotate Right functions are assigned to these keys.

Origin Pick

The system now automatically snaps to the element origin when pressing the `p` key during element placement operations with the mouse pointer outside the element boundaries. This simplifies the placement of frame groups and/or documentation parts which have to be placed at the origin.

Origin

The Origin parameter with the left bottom and centered options for setting the element origin of new layout elements to the left bottom or to the center has been added to the element size dialog box of the functions from the File / New submenu. Previously, left bottom was automatically applied to layouts and parts, and centered was automatically applied to padstacks and pads. Now it is possible to, e.g., center the origin of new constructive parts such as test pads and/or drill holes.

File/Element Favorites

The behaviour of the open button in the toolbar has been modified to distinct between left and right mouse button clicks. The left mouse click activates the Open menu. The right mouse click activates a new menu for managing and accessing file and element name favorites. Up to 28 favorites can be defined for quick access, each with options for predefined or selectable file name, database class and element name and element or group load mode. This allows for the definition of additonal menu functions, such as loading standard library parts which only prompt for part names, or loading standard groups for specific PCB layout formats.

The key programming sequence for activating the file/element favorites menu is `favorite:"!":"f"`.

File Save As

The behaviour of the save button in the toolbar has been modified to distinct between left and right mouse button clicks. The left mouse click activates the Save function. The right mouse click activates Save As function.

BAE Window Hopping (BAE HighEnd)

The `View` / `Other Functions` / `Activate Neighbour Window` function for switching to the next SCM and/or layout window has been added to the **BAE HighEnd** version. The mouse is automatically positioned in the center of the activated window. This function has also been assigned to the `Tab` key to simplify BAE window access in multi-screen and/or multi-monitor environments.

Color Definitions

The `p` key can be used to assign element-specific colours for the `EPS/PDF Output` and `WRL Data Output` functions. These settings have priority over standard color setups and can be used to, e.g., emphasize important comment texts or to synchronize part level keepout areas with layout level color settings.

4.2   Display, Design Rule Check

Color Settings

The Top Layer entry has been added to the special layers set of the layout color table. Elements on the top layer are displayed using the Top Layer color rather than the corresponding signal layer color if a non-black color is assigned to the Top Layer. This allows for the definition of color tables were the part and solder side color assignments are independent from the project's and/or elements current signal layer count.

New entries for the different drill classes have been added to the special layer set to allow for drill class specific color and display mode (line draw or fill area) settings. The otherwise obsolete Drill Holes entry can now be used to assign a color and display mode setting to all drill classes. When reading old color tables, the existing drill hole color assignment (and line draw display mode) is automatically assigned to all drill classes.

The View / Change Colors dialog has been changed to display both the signal and documentary layer selection menus simultaneously if the BAE window is large enough (e.g., in fullscreen mode on 1024x768 display configurations).

The (Scan) button for marking layers used by the currently loaded element has been added to the View / Change Colors dialog. Used layers and drill classes are indicated through asterisks at the color selection boxes. The layer usage scan also activates the display of (numbered) documentary layers which are not declared in the currently active BAE setup. This allows for the display of data from other (third-party) BAE installations with different documentary layer configurations.

The color and pattern selection dialog allows for the layer selection to be changed. This allows for the correcting of wrong layer selections and also provides a feature for controlling layer-specific color and pattern assignments.

Color buttons for assigning the same color to multiple layers have been added at the bottom of the View / Change Colors dialog. The (Color Assignment Done) button is displayed for finishing the multi-layer color assigment.

Layer Browse

The new View / Other Functions / Layer Browse function activates a dialog for stepping through the layers. Only the selected layer is displayed. This allows for a quick visual layer checks, e.g., to find documentary layer structures.

Pick Marker Display

The clipped option for activating the 3.0 mm pick position marker display according to the current Clipping has been added to the Pick Marker Display option from View / Settings. With clipped selected for Pick Marker Display, pick position markers are only displayed if the current display zoom factor exceeds a certain limit.

Plot Preview

The Lines Plot Preview has been added to the View / Settings menu. Lines Plot Preview assigns the current Gerber Default Line Width setting for Gerber plots to the screen display of lines and texts without pen width assignment, thus providing a plot preview for standard lines and vectorized texts. In certain monitor and/or screen resolution configurations, this feature also increases the onscreen legibility of the currently loaded element.

The Settings / CAM Settings dialog from the **CAM Processor** has been added to the **Layout Editor** to allow for the Gerber line width and heat trap parameters which are relevant to the Default Line Width setting.

When displaying power layers, the Lines Plot Preview mode shows the board outline using the relevant power layer plot parameters and draws heat traps without thermal aperture assignment using 4 quarter circles with default plot line width. The heat trap to drill hole and isolation distances are set to the current minimum distance plus half of the plot tolerance. This allows for visual power layer plot output checks to be carried out in the **Layout Editor**. Note however, that, depending on the tolerance settings, the actual Gerber plot output might differ from this preview if special heat trap apertures are used.

DRC Distance Display

The DRC Distance Display parameter for activating a minimum distance line display for copper areas and traces has been added to View / Settings. This display uses the colors assigned to the layers of the affected copper structures and considers net-specific and element-specific minimum distances. Clearances to Traces are different from clearances to Areas. For Areas, global copper fill parameters for increased isolation distances are prioritized if necessary. The Pattern can be used to display a pattern between the distance line and the copper. This simplifies the distinction between free and occupied areas, however, at the cost of a possible slow down of display/screen refresh operations.

These options make it easier to locate DRC errors caused by net-specific minmium clearance settings, allow for nets with non-default clearance settings to be recognized "in advance" during manual routing, and provide a facility for visually checking bottlenecks for copper fill feasability.

The Clipping parameter controls whether the distance line display is suppressed according to the current window zoom factor selection.

DRC 3D Height Model Export

The File / Import/Export / WRL/VRML Data Output function for exporting height DRC data to a `.wrl` file in format `VRML V1.0` has been added. A series of freely available viewers and/or web browser plug-ins are available for visualizing such data.

Settings in bae.ini

The Settings / Settings bae.ini function for editing **Layout Editor** specific BAE system parameters from the `bae.ini` file has been added. These changes are immediately activated for the current **Layout Editor** session. Settings bae.ini creates a `bae.ini` backup with the file name `bae.bak` before updating `bae.ini`.

Connectivity Generation (BAE HighEnd)

The algorithms for the connectivity generation and for the dynamic airline calculation during part placement in **BAE HighEnd** have been redesigned and optimized. This results in a significantly increased performance when processing parts high pin counts.

Batch DRC

The number of errors is now displayed with the continuously updated status message of the Batch DRC. The Batch DRC can be stopped at any time by pressing a key and confirming the cancellation. The confirmation prompt for starting the Batch DRC has therefore become obsolete and has been removed.

DRC Update

The Utilities / DRC Error List function has been converted to a submenu with the DRC Error List, DRC Update Single Elements, DRC Update Group Elements and DRC Deactivation functions. The DRC Error List function provides the original feature for displaying the current list of DRC errors with error type and error location information. The DRC Update Single Elements and DRC Update Group Elements functions apply the design rule check to mouse-selectable and/or group-selected elements. These functions can be used instead of Batch DRC to save some time if only certain parts of a layout have to be checked for further processing after loading the layout.

The Library Element DRC function can be used to deactivate the design rule check between elements which are placed on subordinate macro levels. This increases the performance for the manual placement of parts with high pin and/or fanout counts dramatically. It is recommended to activate appropriate DRC parameters during the design of part macros to avoid any accidental DRC violation when subsequently placing parts on the layout with macro level DRC disabled.

The DRC Deactivation function deactivates the design rule check, e.g. to speed up interactions during part placement procedures. After reactivating the design rule check, it is strongly recommended to run a Batch DRC to update the DRC results for the current design.

Inside Layers DRC

Structures assigned to Middle Layers are now excluded from the design rule check if the Top Layer is set to signal layer 2. In 2-layer layouts, this allows for pins with increased inside layer pad dimensions to be placed closer to each without causing redundant distance violation errors.

Via Distance Check

The `lay_via_trcdist` layout/plan DRC rule for treating copper areas on vias like traces has been added. I.e., with this rule assigned to the layout, the design rule check applies the Trace/Trace rather than the Trace/Copper DRC parameter when checking via to trace distances. This allows for a higher routing density on PCBs where lacquer coating is used for the vias.

Pad Layer Usage Check

The File / Library Utilities / Check Drill Padstacks function for checking the layer assignments of padstacks with drill holes in a selectable DDB file has been added. The result of this function is a listing which includes all padstacks which lack both areas and pads on at least one signal layer, with signal layer 1 through to a selectable top signal layer being checked.

DRC Error Report

The Utilities / Report function has been changed to display the number of net-internal distance violations together with the number of copper distance violations. This is helpful in cases where net-internal distance violation can be ignored (e.g., if copper fill operations are still to be carried out).

DRC Block Naming (BAE HighEnd)

The Settings / Advanced DRC function has been converted to a submenu and provides the DRC Block Definitions function for layer-specific trace width specifications (for automatic trace width adjustments when changing layers) and DRC block name assignments. Accordingly, DRC block names rather than DRC block numbers can now be assigned to `$drcblk` net attributes. The Net Group DRC function which has also been moved to the Settings / Advanced DRC submenu has been extended to allow for DRC block name specification (with a block name list box for easy selection).

The DRC Block Import, DRC Block Export and Delete DRC Block functions have been added to transfer parameter settings for named DRC blocks between different project files and a central database file named `drcparam.dat`.

Element specific distance check (BAE HighEnd)

The Settings / Advanced DRC / Element DRC Block submenu with functions for assigning DRC blocks with non-default clearance parameters to single and/or group-selected elements has been added. These DRC parameters have priority over the default general and net-specific DRC clearance parameters. This feature allows for the assignment of DRC parameter blocks, e.g. for non-default pin and fanout clearance checking of certain BGAs.

Height DRC (BAE HighEnd)

The Subtract PCB Thickness button for subtracting the PCB thickness has been added to the Areas / Other Functions / Height DRC / Height Specification function for specifying the height for the height DRC.

The thickness of the PCB can be specified through a new input field in Settings / Rule Attachment / Layer Stackup. The metal and isolation layers thicknesses are automatically added if the PCB thickness is not specifically set. The Settings / Rule Attachment / Layer Stackup must be ended with the OK to activate this setting.

This option is useful for shielding pin ends which stick out on the opposite PCB side.

Net Highlight (BAE HighEnd)

BAE HighEnd net highlight settings activated during the manipulation of traces and areas are now automatically transferred to the SCM.

4.3   Parts, Placement

Part Pick

Parts can now also be selected by picking their names and/or attribute texts, even if these texts are positioned beyond the part symbol boundaries. The Move Name and Move Attribute context menu functions have been adapted accordingly.

Part Pin Data Display

Information about the selected pin such as pin name, pin macro, net name and pin state (normal pin, short-circuit pin, or free pin with or without net connection) has been added to the part data dialog which is activated when pressing the p key on a part pin.

Part Pin Movement

The Move Pin function for moving part pin positions has been added to the Parts menu and to the context menu for part pins. This function can be used on layout level. However, it can only be applied to part pins for which this feature has been activated with the Permit Pin Movement option. The Permit Pin Movement option is available on part macro level through the p key dialog for pin data.

The Move Pin function is useful for parts with flexible leads, such as transformers and/or upright electrolytical capacitors which allow for variable selections of the PCB connection pad positions.

Pad Generation

The Corner Radius option for creating rectangular and square pads with rounded corners has been added to the Pad[stack] Generator of File / Library Utilities / Macro Generator. On default, the Corner Radius value is 0.0 for creating rectangular pads with 90-degree corners.

Part Numbering

The Next free Number for Name button for automatically retrieving the next free part name for constructive parts has been added to the name selection dialog of the Add Part function. For part name specifications without numeric pattern, the system starts the free part name/number search at 1. I.e., for **drl**, the system searches **drl1**, **drl2** etc. for a new/unused part name. For **drl100**, the system searches **drl100**, **drl101** etc. for a new/unused part name.

When activated on part level or on a layout without a net list, Next free Number for Name also provides the list of already placed pins/parts in a selection menu with an option for automatic part numbering with name prefix.

Semi-Automatic Part Renaming/Renumbering

The Renumber Manually and Swap Names functions have been added to the Parts / Other Functions / Autoname Parts submenu. Renumber Manually prompts for a name pattern and a start number and activates a loop for renaming and/or renumbering mouse-selectable parts according to these settings. A part name swap is performed if the new name of a selected part is already used by another part. Swap Names swaps the names of two selectable symbols.

Part Rotation

The &Pin Rectangle 180 Degrees function has been added to the Parts / Other Functions / Rotate Parts submenu. &Pin Rectangle 180 Degrees uses the center point of the rectangle surrounding the part pins (rather than the part origin/placement coordinate) as rotation reference point. This allows for parts with symmetrically placed pins to be rotated at their insertion poisition even if the part macro origin is not in the center of the part.

A button for activating the &Pin Rectangle 180 Degrees function has also been added to the part data modification dialog which can be activated by pressing the p key.

Part Mirroring

The Default Placement option has been added to the Alternate Part function for changing the package type of layout parts with different mirroring preferences for part and/or solder side. I.e., Default Placement automatically mirrors the part as required by the new package type's mirroring preference. This safeguards against possible package type assignment errors and simplifies the processing of package types with different definitions for part and solder side.

Part Macro Update

The Parts / Other Functions / Update Macros for correlating layout part packages with changed net list package assignents has been added. Depending on whether a package selection has to be corrected due to SCM **$plname** updates and logical library definition changes or whether an alternate package type assignment is incorrect due to a Save as operation, Update Macros automatically applies either a layout part macro change or an alternate package type (re-)assignment. All changes carried out by Update Macros are listed at the end of the procedure.

The Load Group has been changed to transfer alternative part package assignments from the loaded group to the current layout netlist so that these settings can be backannotated to the schematics.

Placement Status Dependent Elements

The **vardocvisplc** and **vardocvisuplc** rules can now also be assigned to documentary layer polygons and texts on padstack and pad level. This allows for pin names, graphic and keepout areas on padstacks and pads to be displayed and/or faded out depending on variant-specific **$noplc** part attribute settings.

Part Placement Matrix

The Edit Dimensions dialog has been added to the right mouse button context menu of the Parts / Matrix Placement / Define Matrix function. Edit Dimensions prompts for the matrix cell size and the number of matrix columns and rows and calculates the matrix end point automatically (unlike the conventional method which requires the user to select the matrix end point through mouse-click).

Autoplacement

Due to a bug, one dimension of pre-placed parts placed at non-orthogonal angles was incorrectly calculated. This bug has been fixed.

The Part Outline Layer parameter for selecting the documentary layer for part macro size calculations has been added to the Parts / Autoplacement / Settings function. On default, and if the selected layer doesn't contain any documentary or keepout areas, the system uses the None (i.e. element boundaries) mode which calculates the part macro dimensions from its element boundaries (inclusive of any documentary text or graphic placed outside the physical part body).

The Part Outline Offset parameter for adding a fixed part size expansion value has also been added. Unlike the Part Expansion parameter, the Part Outline Offset parameter is not automatically reduced if the system doesn't find enough space to place the parts.

Layout Part Attributes

The Settings / Rule Attachment / Part Attributes function has been changed to allow for default and locked attribute values to be assigned through **$?s:predicate** part macro texts on layout level.

4.4   Traces, Routing

Trace Route Functions

The Move Trace and Copy Trace functions for moving and copying not just single-layer traces but multi-layer groups of traces inclusive of vias have been added to the Traces menu. The placement operations implemented in these functions are identical to the group placement functions, and there is also an option for selecting the currently processed traces to the group.

The Traces / Other Functions / Trace Split function has been changed to support not only trace segment selections but also via selections. If a manually routed trace segment crosses the selected via, then this trace segment is split at the via position, and the via and both newly created trace segments can be processed by other functions such as teardop generation and Move/Delete Corner.

Net Selection

Scrollbars have been added to the net name dialogs.

Layer Selection

If a signal layer is specifically selected prior to the first trace corner point, then the Add Trace function is now always placing the first trace segment onto that signal layer, even all traces and/or pins at the pick position are on different signal layers.

Gridless Object Border Snap

The DRC Snap mode has been added to the trace Edit Display option. This mode checks for DRC errors at the current mouse and/or grid position and moves automatically away from obstacles. The system switches into off-grid mode if necessary and indicates this by changing the trace distance line to a white dotted line. This mode can be used together with Octagon Mode to route through off-grid pins, even if an input grid is activated. The relative mouse position between obstacles controls whether the trace is centered between the obstacles or whether it is routed alongside one of the obstacle edges.

With DRC Snap activated, the Move Segment function can be used to maximize the density of trace bunches without violating DRC clearance parameter settings.

Trace Width Change

The automatic DRC-controlled B key trace necking function was erroneously applied to a trace segment between the last trace corner point and the current grid-free mouse position rather than the displayed grid-aligned trace segment. I.e., dependening on the distance between the mouse pointer and the next grid point, the necking was carried out incorrectly or not at all. This bug has been fixed.

The `PATHWIDTHL_GED` parameter for specifying a list of necking/bending step values has been added to the `bae.ini` file. Options for configuring and/or activating these necking/bending step value lists have been added to the b and B key functions. It makes sense to populate the necking/bending step lists with the diameters of the round line draw apertures which are being used for CAM/Gerber outputs.

The Edit / Other Functions / Change Path Widths / Incremental with DRC has been added for increasing the widths of group-selected traces step by step without violating DRC settings until a maximum trace width is reached. This feature can be used to distribute the available space evenly between selected traces. The system prompts for a trace width increment value unless a valid trace widths list is defined in `bae.ini`.

Via Size Change

The Group with DRC option has been added to the Via Functions|Change Vias function which can also be activated through the v key. Group with DRC only changes vias for which the placement of the new via padstack doesn't cause any DRC errors. for modifying only vias. This feature is useful for maximizing the via sizes throughout the layout without causing DRC errors.

Corner Move

A screen redraw was necessary to reset the net highlight activated by the Move/Delete Corner context function for traces. This problem has been fixed. The modified net/trace is now immediately dehighlighted when the Move/Delete Corner is finished.

Pin Contact

The `TRCMODE_GED` parameter in `bae.ini` supports the new mode `2` for pin connections created through the ⍿ key. On default, the diagonal segment is inserted at the far end of the pin center point connection. Mode `2` ensures that the diagonal segment is inserted according to the currently selected Angle Direction setting. This corresponds with the Traces Octagon Mode preview which is displayed prior to the activation of the ⍿ key.

Routing Grid Query

The Traces / Other Functions / Grid Query function for querying **Autorouter** routing grids for selectable traces has been added. Since trace start and end points might be offgrid pin connection points, the routing grid query only works for traces with five or more corner points.

Teardrop Generation

The Max. Trace Width option for specifying a maximum trace width for teardop generation has been added to the parameter dialog of Traces / Other Functions / Teardrop Utilities / Create Teardrops.

The Snow Man Teardrops function with the Pad Diameter parameter setting has been added to the teardrop generation functions. With this option, the `TDRADFAC_GED` parameter from the `bae.ini` file relates to the position of the teardrop pad relative to the pin/via exit position of the trace segment rather than to the sum of via/pin size and trace widths, and a dialog for setting this parameter is provided. The circular teardop pads created with the Snow Man Teardrops can be plotted with round flash Gerber apertures and are therefore likely to simplify the manufacturing process.

The Single Nets teardop generation option, when applied to non-netlist traces, has been modified to process not just single-layer traces, but multi-layer trace groups inclusive of vias.

New Trace Mode options have been added for manually extending the teardrop generation to via and pin center points.

Trace Shield

The Create Trace Shield function for placing via rows alongside selectable traces has been added to the Via Functions menu which can be activated through the ⍁ key. Create Trace Shield also provides a via net assignment option to allow, e.g., for copper fill connectivity.

Net Status

New Load Highlight/Colors, Save Highlight/Colors, Delete Highlight/Colors and Load Visibility, Save Visibility, Delete Visibility SQL database function groups for storing and/or re-loading net highlights/coloring configurations and net/airline visibility settings have been added to the Traces / Net List Utilities / Highlight Nets submenu. Highlight/airline configurations for standard nets can be re-used througout different projects.

When loading a layout, any layout-specific highlight, color and visibility settings saved with the name of the layout are automatically loaded and activated.

4.5   Graphic, Copper Areas

DXF Output with Filled Areas

The `DXF14OPT_LAY` parameter for activating Autocad 14 commands for fill area presentations in DXF outputs has been added to the `bae.ini` file. Previously, the DXF export function always created outlines for fill areas.

DXF Import Layer Selection

The Assign all DXF Layers to one BAE Layer option for importing all DXF layers of multi-layer DXF files to a selectable BAE layer has been added to the layer assignement facility of the AutoCAD/DXF Input function.

Distance Measurement

The Areas / Other Functions / Drawing Utilities / Distance Measure function has been changed to support the creation of additional arrow tips as specified through the new `DENDMODE_GED` and `DENDARATIO_GED` parameters from the `bae.ini` file.

Negative field length settings for the `DDECDIG_GED`, `ADECDIG_GED` and `WDECDIG_GED` parameters in `bae.ini` can be used to remove trailing zeros from Distance Measure texts, causing the system to display, e.g., 1.0 mm instead of 1.000 mm.

The Delete Measurement/Ruler function for deleting measurement and ruler graphic sets created with Areas / Other Functions / Drawing Utilities. Please note that Delete Measurement/Ruler can only be applied to measurement/ruler graphics created with **BAE Version 6.6.008** or higher.

Polygon Point Edit

Buttons for scrolling in the polygon point list of the picked polygon have been added to the dialog which is activated by pressing the p key when modifying polygon corner points. The index and type of the selected polygon point is now also displayed in this dialog.

Polygon Placement

The Pick Center and Set Pick Origin options have been added to the context menu which can be activated through the right mouse button whilst moving and/or copying polygons. These options set the reference point for the polygon positioning and rotation to the polygon center point (e.g., for centric placement of square polygons) or to a polygon corner point next to the current polygon pick point (e.g., for placing structures with symmetric rotation).

Polygon Sketching

Pressing the Shift and Ctrl keys during the placement of polygon corner points causes the system to set polygon points automatically whenever the mouse moves. This feature considers angle lock and input grid settings. I.e., angle lock and input grid should be deactivatad for freehand polygon drawing. Freehand drawing mode can save numerous mouseclicks when using the Edit / Group Polygon submenu functions for sketching polygons.

Polygon Batch Edit

The polygon functions of File / Library Utilities / Layout Library Edit Batch have been modified to allow for polygon type selections for each batch step. This feature can be used to, e.g., transfer keepout areas from one layer to another.

Documentary Layer Keepout Polygons

The p and/or the Areas / Other Functions / Set Polygon Type/Net can be used to assign documentary layer keepout areas to up to four classes. Keepout areas without class assignment are checked against any other keepout areas. Keepout areas with class assignments only trigger DRC errors if they intersect keepout areas of the same class. Keepout area classes are user-definable. This allows for different clearance checks to be defined and carried out on the same documentary layer (e.g., between parts and between padstacks).

New entries (`DOCFCLASS1_GED`, etc.) for the assignment of short keepout area class names have been added to `bae.ini`

4.6   Text, Drill

Text Selection

The `DEFTEXTLST_GED` entry for populating a list of predefined texts for the create text menu and toolbar functions has been added to the `bae.ini` file. On default, `DEFTEXTLST_GED` contains the names of the **AutoEngineer** system attributes. Entries starting with `$` are truncated at the first blank character when being placed. This allows for comments to be added to attributes selectors.

Text Center Alignment

Text center alignment support has been extended to signal layers and `PHYSICAL` documentary layers.

Text Placement

The Place Pin List and Place Pin Row/Matrix functions which can also be activated by pressing the e key from within the Part Edit Functions have been renamed to Place Pin/Text List and Pin-/Textliste platzieren and can now also be used to place text lists and/or text rows/matrices accroding to the specified name pattern.

Multi Line Text

On default, the reference point for processing multiline texts is in the bottom left corner of the rectangle surrounding the text. The `MTEXTORG_STD` parameter for setting this reference point to the top left corner has been added to the `bae.ini` file. The multiline text reference point is dynamically calculated. I.e., changing the reference point position also applies to multiline texts created in previous BAE versiosn.

Text Table Import

The Import Table for importing text table files has been added to the Texts / Other Functions / Multi Line Text submenu. Import Table converts each table column into a multiline text object. On default, Import Table expects input files with up to 20 semicolon-separated input fields per line. `bae.ini` parameters can be used to specify non-default table definitions. This allows for sorting, reformating of table columns, and automatic table content substitutions.

Variant Name Display

The variant name is now automatically assigned to the `variant_name` plan predicate if a layout variant is activated. This means that the name of the currently selected variant can be displayed anywhere on the layout simply by placing a `$?s:variant_name` text at the desired position.

BAE Version Display

The system attributes `$pltbaeversion`, `$pltbaebuild` for displaying and/or plotting the **Bartels AutoEngineer** software version and build numbers have been added. This allows for the inclusion of software version information on layout documentation as required for ISO certification.

Name Update Data Display Attributes

The `$pltcname`, `$pltcdatede`, `$pltcdate2de`, `$pltcdateus`, `$pltcdate2us` and `$pltctime` attributes for displaying the layout element name and the date and time of the last name update have been added to the system.

Text String Change

An option has been added to the File / Library Utilities / Layout Library Edit Batch to allow for the processing of text on the special layer All Layers only (previous default) or of text on any layer when setting up Change Text String batch parameters.

Drill Pick

Drill holes can now be selected by clicking anywhere within the drill diameter. Previously, drill holes had to be selected by clicking the drill hole center point.

Parts and vias can now also be selected by clicking their drill hole(s) if the drill holes are visualized through the current color setup. Previously, parts and vias could only be selected by clicking their copper pads and/or macro origins. I.e., the drill pick facility simplifies the selection of constructive (drill hole) parts which don't have any copper pads.

4.7 Group Functions

Group Polygon

Toggle options for toggling the group selection status of the elements inside the current group polygon have been added to the Edit / Group Polygon functions.

The option All is also provided as Select/Deselect Content function in the context menu for polygons. This allows for the selection and/or deselection of all elements inside certain polygons such as the board outline or a fill area.

The functions from the Edit / Group Polygon submenu only used to consider parts, vias and texts with their origin inside the group polygon and traces and polygons with all points inside the group polygon. The Select Touching option available from the context menu when setting the first group polygon point changes this behaviour to allow for traces and polygons with at least one point inside the group polygon and parts, vias and texts with an outline intersection the group polygon to be selected and/or deselected. This simplifies the selection of parts with connected traces significantly.

Trace Selection

The Trace Routes function for selecting and/or deselecting multi-layer trace segment sets/routes inclusive of vias has been added to the Edit / Group Elements submenu. This function has also been added as Select/Deselect whole Route to the trace context menu.

Reset Group

Pressing the Ctrl-A keys together with the Shift key causes the system to deselect all group elements.

Group Functions

The Change Text Layers, Change Polygon Layers and Change Path Layers function from the Edit / Other Functions submenu have been integrated to the Change Layers function which provides a dialog for selecting the desired layer change operations.

The Resize Areas function for applying the Areas / Resize Area function to all group-selected elements and the Change Polygon/Text Pen Width function for setting the pen width for all group-selected texts, documentary lines and split power planes have also been added to Edit / Other Functions.

Zoom All

During group placement operations, the Zoom All function is now taking the currently picked group elements into account when calculating the new zoom window.

4.8   Automatic Copper Fill

Copper Fill Area Context Dialog

The Fill Settings button for checking and/or setting fill parameters has been added to the p context dialog for copper fill workareas.

Range Fill

The Fill pick range , Fill pick layer , Clear pick range , Clear pick layer , Hatch pick range and Hatch pick layer functions have been added to the Areas / Copper Fill submenu. These functions operate on all fill areas on either all visible layers or a selectable layer at a mouse-selectable position and are useful on layouts with fill areas on different layers.

Warning

The call sequences for functions from the Areas / Copper Fill submenu have been change due to the addition of the above functions. This means that customer-specific key and macro programming sequences have to be adapted accordingly.

Copper Fill Parameters

The No Neighbour Pin Connection option for suppressing the creation of heat-traps for adjacent part pins of the same net as been added to the copper fill functions.

New parameters for controlling the way the copper fill functions create pad heat trap connections have been added to the dialog for p key dialog for pads on padstack level. The default setting creates pad connections according to the current copper fill parameter settings. The always direct connection and always heat trap modes force the system to create direct connections or heat traps for the pad, irrespectively of the curent copper fill parameter settings. The `lay_pad_directconnect` has become redundant and is automatically removed when using the p key application.

Copper Fill Area Processing

Net-specific copper fill area outlines are now considered and/or included in net highlight and net selection functions.

Copper Fill Area List

The Areas / Other Functions / Fill Area List function for displaying a list of all layout copper fill areas with assigned net names, fill area layers, occupied layout coordinate ranges, fill area priorities and copper fill clearance settings has been added to the **Layout Editor**. Copper fill clearance settings assignment information (fill area, fill net, default copper fill clearance) is also provided. Selecting a fill area list entry zooms to the fill area and provides access to a menu with specific copper fill functions.

5   Autorouter

5.1   General

Settings in bae.ini

The Settings / Settings bae.ini function for saving the current **Autorouter** control and strategy parameters to the `bae.ini` file has been added. These settings are automatically activated when the **Autorouter** is (re-)started. Settings bae.ini creates a `bae.ini` backup with the file name `bae.bak` before updating `bae.ini`.

Standard Trace Setting

Max. buttons for setting the Minimum Distance and Trace Width to their respective maximums (minus 1/1000 mm tolerance) in relation to the current routing grid have been added to the Autorouter / Options dialog.

Net Visibility

The Settings / Net Status submenu with functions for saving and re-activating net and airline display and visibility configurations has been added to the **Autorouter**.

5.2   Autorouter Algorithms

Power Layer Vias

Power Layer Vias parameter has been added to the Autorouter / Control dialog. Power Layer Vias controls via type selections for power layer connections. With the All Layer Via default option, the **Autorouter** uses the all signal layer standard via. With the Marked Vias Minimum and Marked Vias Maximum options, the **Autorouter** can optionally use blind and/or buried vias if the drill hole on the via padstack is marked for connection to the destination power layer. Minimum and maximum relate to the layer stack. Maximum prioritizes the selection of all layer vias, while minimum selects vias with minimum layer occupation.

On default, the **Layout Editor** creates drill holes which can be connected to all power layers. Please make sure that the selected via padstack drill hole definitions are suitable for power connections in the current layer stack configuration before activating the Marked Vias options.

6   CAM Processor

6.1   General

Batch Output

The Output Order Index option has been added to the CAM-Batch Output function. This option can be used to control the sequence of the batch steps. Output elements are still primarily ordered by output type and, secondarily, by output layers. The default output index 0 is assigned to batch output steps which have been created with earlier BAE versions, except for report outputs which are assigned a default index of 999. This feature can be used to create batches with batch steps for loading a DDB element.

The batch output has been changed to check for used drilling classes. This check prevents from the creation of empty drilling data files and provides warnings about used drilling classes which are not configured in the batch.

The Generic Insertion Output process with preselected format specifications has been added to the batch output options.

Highlight Focus

The Highlight Focus On/Off functions for activating and/or deactivating exclusive highlight element display has been added to the View menu. Switching into highlight focus makes it easier to locate overdraw errors after plot output operations.

6.2   Control Plot

EPS/PDF Output

Support for page background color assignments has been added to the EPS/PDF batch output procedures. This feature allows for screen-oriented outputs and can be facilitated to create positive plots from negative power layer structure outputs (e.g., through white structures on black background).

The new PDF n:1 A4 Mosaic format diverts outputs in mosaic fashion onto different pages if the output element doesn't fit onto a single A4 sheet.

An option for substituting page names with element comments rather than element names has been added to the PDF batch output configurations.

The documentary layer parameters have been extended to allow for inverted plot visibility specifications. This allows for outputs where, e.g., inserted and uninserted parts are output in different colors.

The `$pdfpage` system attribute text for displaying the current page number in PDF outputs has been added. The `$pdfpage` text attribute definition can be placed on any element hierarchy level.

The `lay_text_font_bae`, `lay_text_font_ps1` and `lay_text_font_ps2` rules for assigning non default EPS/PDF Output character fonts to texts and/or parts have been added.

PDF output is now generated in compressed format.

Output to DDB Element

Activating All Layers in Output to DDB File causes the system to create padstacks with the name pattern `layoutname_drill_n` and to place vias for all drill holes on the output layout. This allows for the subsequent panelization of drilling data.

The Output to DDB File function was restricted to one active power layer. This restriction has been removed.

Bitmap Creation (Windows)

The Output to Clipboard function has been changed to create monochrome instead of coloured bitmaps for single-layer outputs. This allows for a higher maximum bitmap resolution for single-layer outputs because Windows imposes a system-dependent bitmap size/memory limit.

6.3   Gerber Photo Plot

Gerber Output Precision

The predefined `2.5` (1/100 mil resolution) and `2.6` (1/1000 mil resolution) `Gerber Format` options have been added to the `Gerber Photoplot` / `Settings`.

Heat Trap Generation

For heat traps without matching thermal aperture, the heat trap arcs were calculated using the smallest round line aperture instead of the standard line width which was used for plotting. In special cases, this caused overlapping heat trap isolation structures in Gerber plots for layouts with very small drill holes and a large difference between standard line width and smallest round line aperture size. This problem has been fixed.

6.4   Drilling Data Output

Double Drill Check

New `bae.ini` parameters have been added for activating a scan for overlapping drill holes in the `File` / `Export` / `Drill Data Output` / `Drill Statistics`. The coordinates and drill classes of overlapping drill holes are listed in the header of the drill data statistics output. Redundant drill hole padstacks are marked in the layout. Marked padstacks are not included in `File` / `Export` / `Drill Data Output` or Gerber documentary layer (e.g., drill plan) plots.

If drill holes with different diameters are placed at the same position, then only the larger drill hole is kept. For drill holes of different classes, `bae.ini` provides a matrix for activating and/or deactivating checks for each drill class combination specifiying drill class output priorities.

DXF Data Output

The `AutoCAD/DXF Output` function has been updated to support drill hole output. Drill holes are created as circles with the drill hole diameter on the `DRILLS` output layer.

6.5   Insertion Data Output

Insertion Data Output

The output control/script file specification for the `Generic Insertion Output` function has been extended to allow for the keyword `ORIGIN` (for the layout origin) or a double-quoted name of an origin macro to be added to the end of layer entry lines to specify an insertion data output origin different from the currently selected CAM/plot origin.

The `ANGLEOFF180` or `ANGLEMIRR180` keyword can now be used between the layer definition and the output type of the `OUTLAYER` output configuration command. `ANGLEOFF180` adds 180 degrees to the output angle. `ANGLEMIRR180` mirrors output angles at 180 degrees. These options can be used for parts placed on the solder side if the automatic insertion equipment doesn't interpret part placement angles from the part side view.

New system attributes have been introduced for retrieving and/or displaying the name of the currently active variant, the values of attributes assigned to specific part macro types, the current date, the project file name and the layout element name.

7   CAM View

7.1   General

Settings in bae.ini

The Settings / Settings bae.ini function for editing **CAM View** specific BAE system parameters from the `bae.ini` file has been added. These changes are immediately activated for the current **CAM View** session. Settings bae.ini creates a `bae.ini` backup with the file name `bae.bak` before updating `bae.ini`.

Color Settings

New entries for the different drill classes have been added to the special layer set of the View / Change Colors function to allow for drill class specific color settings. The otherwise obsolete Drill Holes entry can now be used to assign a color setting to all drill classes. When reading old color tables, the existing drill hole color assignment is automatically assigned to all drill classes.

Color buttons for assigning the same color to multiple layers have been added at the bottom of the View / Change Colors dialog. When changing aperture colors, the (flash), (line) and (border) buttons are provided for assigning the selected color to all apertures with the selected mode. The (Color Assignment Done) button is displayed for finishing the multi-layer color assigment.

Workspace Boundaries

The Zoom All function has been changed to recalculate the workspace outline for the currently loaded elements. This prevents from zooming to a too large workspace after data sets have been deleted and/or moved.

File Type Associations (Windows)

The `excdrl_e.reg` and `gerber_e.reg` files have been added to the BAE Windows versions. These files contain example associations for the file name extensions `.exc` (load Excellon drilling data to **CAM View**) and `.gbr` (load Gerber data to **CAM View**). Once the `.reg` files are installed to the Windows registry (by double-clicking them), Windows automatically starts the **CAM View** module when `.exc` and/or `.gbr` files are double-clicked.

The `.reg` files can and should be customized if BAE is not installed to its default directory and/or if different extensions are used for Excellon and Gerber files.

7.2   Data Import

Layout Creation

The Documentary Layer Mode parameter has been added to the Settings / Settings dialog. Documentary Layer Mode controls whether flashed structures on documentary layers are saved to the layout as outline polygons (default) or as documentary layers.

For Gerber data with `Special` aperture types, the Create Layout function sometimes created invalid area polygons and rendered the layout unloadable. This problem has been fixed.

8   Utilities

8.1   LISTDDB

Screen Listing

The output of **LISTDDB** is now directed to standard output (screen) if no output file name is specified.

Class Names

DDB class names without elements in the project/DDB file are not listed anymore by **LISTDDB**.

8.2   LOGLIB

Attribute Names

Attribute name specifications are now generally considered to be case-sensitive. Previously, **LOGLIB** converted all attribute name specifications in logical library definition files to lowercase. The `attrlowercase=on;` command can be inserted before the first `part` command to force lowercase attribute names in old logical library definition files for backward compatibility.

9   Bartels User Language

9.1   General

This section describes general changes to the **User Language** specification. See Bartels User Language Programmer's Guide - Chapter 2 for a detailed description of the **User Language** specification.

Internal User Language Version

The internal **User Language** version has been changed. **User Language** programs compiled under earlier BAE versions won't execute in the **User Language Interpreter** environment of the new **Bartels AutoEngineer** version (error message `User Language program version incompatible!`). This means that each **User Language** program compiled under earlier BAE Versions must be recompiled under the new **BAE** version to regain compatibility.

9.2   User Language Compiler

This section describes the news and changes introduced to the **User Language Compiler**. See Bartels User Language Programmer's Guide - Chapter 3 for detailed information on how to operate the **User Language Compiler**.

File Type Associations

The `ulcreg_e.reg` file has been added to the BAE Windows versions. This file contains an example association for the file name extension `.ulc`. Once the `.reg` file is installed to the Windows registry (by double-clicking it), Windows automatically starts the **User Language Compiler** to compile double-clicked `.ulc` with specific options (such as include file path). This allows for **User Language** program files to be compiled by double-click from virtually anywhere.

The `.reg` file can and should be customized if BAE is not installed to its default directory and/or if different **User Language Compiler** options are required.

9.3   User Language Interpreter

This section describes the news and changes introduced to the **User Language Interpreter**. See Bartels User Language Programmer's Guide - Chapter 3 for detailed information on how to operate the **User Language Interpreter**.

Implicit Program Call

A new implicit program call facility for automatically activating the **BAE_EXIT** **User Language** program when exiting/closing the curently active BAE program module has been added to the **User Language Interpreter**.

9.4   System Functions

This section lists new and changed **User Language** system functions. See Bartels User Language Programmer's Guide - Appendix C for a detailed description of all system functions.

New System Functions

The following **User Language** system functions have been implemented:

IP	System Function	Short Description
GED	**ged_getstrpar**	Get GED string parameter
	ged_setstrpar	Set GED string parameter
AR	**ar_getintpar**	Get Autorouter integer parameter
	ar_setintpar	Set Autorouter integer parameter
CAM	**cam_getintpar**	Get CAM integer parameter
	cam_setintpar	Set CAM integer parameter

Changed System Functions

Support for parameter queries/settings has been added to the **bae_getintpar**, **bae_setintpar**, **bae_getstrpar** and **bae_setstrpar** functions.

A new mode/parameter for rubberband distance display activation has been added to the **bae_inpoint** and **bae_inpointmenu** functions.

The bit values **4** for setting the mouse pointer to the specified position and **8** for activating the BAE window have been added to the fourth parameter (mouse coordinate mode) of the **bae_storemouseiact** function.

The bit values **4** and **8** of the **kbstate** function are now used for indicating the states of the left and right `Alt` keys.

The **sqlcmd** supports the new commands `cache read on`, `cache write on` and `cache off` for optionally keeping SQL databases open for multiple read/write SQL operations. These features can be used to avoid time-consuming database open and close operations between multiple SQL read/write operations. Facilitating the SQL cache can increase the performance of certain applications (e.g., SCM symbol selection database access) dramatically, especially if SQL databases are accessed over a network.

Support for parameter queries/settings has been added to the **scm_getintpar**, **scm_setintpar**, **scm_getstrpar** and **scm_setstrpar** functions.

Function paramters for querying the default trace width and the block name have been added to the **lay_getplanchkparam** function.

The **scm_elemgrpchg**, **scm_conseggrpchg**, **ged_elemgrpchg**, **ged_groupselect** and **ged_layergrpchg** have been changed to support the toggling of the group selection status of the processed elements.

The **ged_elemgrpchg** can now also be used on padstack level for changing drill hole groups selection.

Support for parameter queries/settings has been added to the **ged_getintpar** und **ged_setintpar** functions.

The **ged_partnamechg** has been changed to support the renaming of non-netlist parts. I.e., **ged_partnamechg** can now be also be used on part macro level for the renaming of pins.

9.5   BAE User Language Programs

BAE installs more than 200 pre-compiled **User Language** programs to the `ulcprog.vdb` file of the BAE programs directory. Additionally, the **User Language** *source* files (more than 7 Mbytes; some 240,000 lines) are installed to a special directory (`baeulc`). See Bartels User Language Programmer's Guide - Chapter 4 for a complete listing and short descriptions of the BAE **User Language** programs.

User Language Include Files

The **User Language** include files have been revised and extended by a series of new definitions and functions.

New User Language Programs

The following **User Language** programs have been implemented:

IP	Program Name	Short Description
STD	BAE_EXIT	BAE Program Exit Action
	INIEDIT	bae.ini Editor
SCM	DEF2CSV	Create Symbol Selection Database from .def Files
LAY	NETSTAT	Net Higlight/Visibility Status Database Management
	WRLOUT	WRL/VRML 3D Data Output
GED	DRCBLOCK	Advanced DRC Utilities (BAE HighEnd)
	LMACREAD	Layout Macro Definition Import

Changed User Language Programs

The **User Language** programs already delivered with the previous BAE Version have been completely revised and extended by many new features and functions. A series of significant improvements and enhancements have already been mentioned in the previous sections of these Release Notes.