Bartels AutoEngineer®
Version 6.6
Release Notes

This documentation contains information about the new features introduced with **Bartels AutoEngineer Version 6.6**. Forward compatibility from earlier versions to **Bartels AutoEngineer Version 6.6** is ensured, but not backward compatibility.

Bartels AutoEngineer Version 6.6 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.

1.2 User Interface and General Functions

System Performance (Windows)

The **Bartels AutoEngineer Windows** versions are now created with an updated compiler which supports optimizations for the latest processor technologies. As a result, the performance of time-critical functions such as autorouting, connectivity generation and design rule checking is significantly improved under **Windows**.

Autosave on Modul Change

The `SAVEPROMPT_STD` parameter for activating a user prompt for the saving of design changes when switching between BAE modules has been added to the `bae.ini` file.

Interactive Placement

Functions for moving the currently processed element by one pixel position during interactive placement with deactivated input grid have been assigned to the `SHIFT`/cursor keystrokes.

Menu Programming

The MMB Menu option for extending the middle mouse button context menu has been added to the Utilities / Menu Extension function.

Element History

Arrow left and arrow right buttons for moving backward and forward through the element access history of the current session have been added to the toolbar.

Window Backdrop on Modul Change (Windows)

On certain **Windows** versions, switching between BAE modules could cause the BAE window to loose focus and disappear behind other windows. This problem has been fixed.

DDB Element Selection

The default element name sort order of the DDB element selection dialogs has been changed to "natural order". I.e., element names with numeric content are sorted in a way a human being would list them (e.g., `b9` before `b10`). The `ESELSORT_STD` entry for selecting the element name sort mode (restoring alphanumeric sort order) has been added to the `bae.ini` file.

A Date : button area with the none, display and sorted buttons has been added to the element name dialogs of the Windows versions to support the display of element modification dates/times and the sorting of the element list by date/time (last modified first). The default setting is none. The `ESELMODE_STD` parameter in `bae.ini` can be used to activate the date/time display.

Dialog Box Sizes

The BAE dialog boxes were originally designed for a 800x600 pixel screen resolution. The `DIALOGXMAX_STD` and `DIALOGYMAX_STD` parameters for specifying a different dialog box size for certain dialogs such as the five-column layout part name selection or net name selection have been added to `bae.ini`. On default, these parameters are now set to support a 1024x768 screen resolution.

The size of the file name selection dialogs of the BAE **Windows** versions has been significantly increased. The new `FSELMODE_STD` parameter in `bae.ini` can be used to activate file modification time and file size display in the file selection dialogs.

Name Edit

Special (invalid) characters such as blanks are now automtaically substituted with underscore characters (_) when specifying symbol, part or macro names. Exempt from this rule are input dialogs with Pattern button to allow for name pattern specifications with wildcard characters such as ? and *.

Text Edit (Motif)

The text on the text input box of the BAE **Motif** user interfaces is now preselected to allow for immediate editing.

Mouse Wheel (Motif)

The mousewheel with its scroll, zoom, rotate and layer change functions is now also supported by the BAE **Motif** user interfaces.

Screen Size Adjustment

The `BAE_SCRXSCALE` and `BAE_SCRYSCALE` environment variables can be used to specify screen size correction factors in cases where these are setup incorrectly by the operating system. This feature can be used to correct the screen dimension ratio in order to ensure the correct screen display of circles.

1.3 Symbol and Part Libraries

ROUTE - Router Control, Rule System

The tag_pin_directcon tag symbol for assigning copper fill direct connection modes to specific pins and the att_netfillmindist, tag_net_netfillmindist, tag_netpin_netfillmindist and tag_netarea_netfillmindist symbols for specifyiing net-specific clearance distances for automatic copper fill functions have been added to the ROUTE library.

The symbols for activating simple net processing options have been updated. Such options are now assigned through logical library definitions, thus eliminating the need to apply the Assign Value(s) function.

Net attribute assignments were missing in the logical library definitions for the tag_pin_routwidth symbol and some of the `att_` symbols from the ROUTE library delivered with **Bartels AutoEngineer Version 6.4**. The affected logical library definitions have been amended.

The `var_docvisplc` rule for activating or deactivating screen display and CAM output according to the setting of the `$noplc` part placement control attribute has been added to the text and graphic elements of the part definitions from the LAYLIB library.

2 Schematic Editor

2.1 General

Schematic Editor Startup

The **Schematic Editor** command line syntax has been changed to the following:

```
> bae scm DDB-filename elementname [SYMBOL|LABEL|MARKER|ULC|ULC_QUIT] ↵
```

This command line syntax can be used to load a named element of the specified class upon **Schematic Editor** startup. Omitting the element class specification defaults to schematic sheets. `ULC` and `ULC_QUIT` cause the system to execute a **User Language** program specified by elementname. `ULC_QUIT` terminates the **Schematic Editor** after executing the **User Language** program. This feature can be applied by external programs to activate special functions such as symbol database import through the **SYMATTDB User Language** program.

Screen Display after Load

Zoom All has been changed to avoid screen redraws when restoring the last screen layout after loading elements. Additionally, the copyright message is displayed using the background color. This eliminates the "flickering" effect previously experienced when switching between BAE modules.

Mouse Button Context Functions/Active Elements

The mouse symbol from the toolbar can be used together with the Shift Function to configure an alternative right mouse button action to be triggered if the `Shift` key is pressed. On default, the Move operation is configured for this keystroke.

The new Settings / Rule Attachment / Context Functions submenu can be used to assign right mouse button context functions to specific elements. Context functions assigned on symbol or label level apply to all Plan level symbols and labels of this macro type. The Set Frame Attributes, Query Frame Symbol, Load Macro and Load Project Plan context functions have been assigned to the planhead SCM plan header symbol from the STDSYM library.

If only one context function is assigned to a library element, then this context function is immediately activated when clicking such an element with the right mouse button. This feature can be used to, e.g., create a right arrow symbol with Load Next functionality. Further interactions such as `:ml` for picking/selecting the element at the mouse cursor can also be added.

Element Position Pick and Element Data Editing

Functions for editing element data and/or snapping to the position of the currently edited element have been assigned to the `p` key.

Element Selection

The Pick Mode parameter for controlling the element pick behaviour at positions with more than one element has been added to the View / Settings dialog.

DDB Element Comment

The File / Element Comment submenu and a corresponding element in the Settings / Settings dialog for assigning comments to DDB file elements have been added. The element selection dialogs have been updated to display element comments together with the element names. Element name comments can be assigned to SCM sheets to allow for better guidance. The new `$pltecomment` system attribute can be used to display element comments. The PDF output functions have been amended to display SCM sheet comments rather than SCM sheet element names when creating tables of contents for SCM plans.

Demo Projects

The productive configuration of the **Schematic Editor** has been changed to allow for the loading/processing of schematic plans which have been saved with **BAE Demo**.

2.2 Symbols, Labels

Symbol Attribute Transfer

The `s` buttons of the toolbar windows with symbol attributes have been changed to differ between left and right mouse button clicks. Left mouse button clicks allow for attribute assignments to selectable symbols. Right mouse button clicks allow for attribute assignments to all group-selected symbols.

Net Attribute Labels

Net attribute labels sometimes caused the **Packager** to issue redundant double-defined part error messages. This problem has been fixed. Affected designs can be corrected by saving the schematic plan with the new software version.

Label Attribute Positions

The Move Attribute function can now also be applied to labels, e.g. to move the `$pageref` label attribute.

Attribute Cleanup

Features for displaying and resetting "removed" attributes have been added to the Edit / Other Functions / Set Group Attributes function. These are attributes which still exist but cannot be edited anymore because the attribute text definition had been deleted from symbol macro level. Previously, the attribute text had to be (re-)defined on symbol level to allow for the reset of such attributes.

SCM Cross Reference Attribute List

A list with all attibute name/value combinations/counts has been added to the symbol list output of the Symbols / Other Functions / SCM Cross Reference function.

Symbol Edit Functions

The Symbol Edit Tools submenu of the File / Library Utilities submenu has been renamed to Symbol Edit Functions and moved to the Symbols menu.

Symbol Bus Pin Definitions

The Define Bus Pins function for activating automatic SCM plan level bus connections for symbol bus pins has been added to the Symbol Edit Functions menu which is available through the e key.

This function has been applied to the symbol bus pins of the **Bartels AutoEngineer** symbol/part libraries.

Edit Symbol Logic

The `NEWATTRL_SCM` command for the specification of a list of attribute names and/or values to be automatically added to logical library definitions (`newattr`) with the Edit Symbol Logic command has been added to the `bae.ini` file.

The Import button can be used to import pin assignments and pin types from a `.csv` (Comma Separated Variables) files (as, e.g., created with **Microsoft Excel**).

The Table button activates a dialog with a layout pin name table for entering pin assignments for the `xlat` command.

The Graphically with Lines and Graphically with Texts buttons activate an interactive SCM to layout pin assignment (`xlat` command) editor. The pin assignment editor creates an SCM element with gates and texts for the layout pins. Pin assignments are defined by drawing graphic lines from symbol pins to layout pin texts or by moving layout pin name texts onto symbol pins. For convenient editing, the symbol logic editor assigns the Move Text function to the layout pin name texts and the Add Graphic Line function with automatic start point selection at the mouse position is assigned to the symbols (i.e., symbol pins). The pin assignment editor can be ended by re-activating the Edit Symbol Logic function.

Symbol Creation

The Create FPGA Symbol for automatically creating an SCM symbol from a **Xilinx** `top_pad.txt` pin assignments file has been added to the Symbols / Other Functions submenu. The symbol pins are placed to the left and right of the symbol depending on their signal type. A popup window for editing and/or confirming an automatically generated logical library definition is activated at the end.

Tag Symbol References

The Rename Parts and Renumber Parts functions from the Symbols / Other Functions submenu eliminated tag references from and to renamed symbols. This problem has been solved.

Default Setup

`DEFPINMAC_SCM` (pin marker), `DEFJCTMAC_SCM` (junction point marker), `DEFLABMAC_SCM` (standard label), and `DEFTAPMAC_SCM` (standard bus tap label) parameters added to the `bae.ini` file to allow for the specification of alternative standard macros to be used when creating new elements.

Symbol Selection Database

The symbol preview area with a Preview button for displaying the selected symbol graphics and < / > buttons for moving through the symbol preview list has been added to the symbol selection dialog.

New `bae.ini` parameters have been added to allow for the assignment of symbol status values for triggering user-specific warning messages such as `Part/Component xxx Order No. yyy discontinued!` or `Part/Component xxx Order No. yyy out of stock!`.

New `bae.ini` entries have been defined to allow for symbol database entries to be sorted by selectable table fields and for automatically generating and adding a counter field (to transfer symbol sort order from input files).

2.3 Connections

Destination Mark

A right mouse button context menu with the Jump Relative, Jump Absolute and Mark Destination functions has been added to Connections / Add Connection. Jump Relative and Jump Absolute allow for orthogonal jumps. Mark Destination can be used to set the connection destination point. The system displays an airline from the currently edited connection end point to the destination point. The connection definition is automatically finished when the user hits the destination point.

It is possible to create Add Connection menu functions with automated connection destination point selection through a `#400:m:mr:sl4` call sequence.

Net Name Location

The Find Net function for searching named nets has been added to the Connections / Other Functions submenu. A Highlight Net operation with a Zoom Window to the connected symbols and labels is automatically triggered if the currently loaded plan contains the selected net. If the selected net is on a single sheet different from the currently loaded, then the sheet containing the net is automatically loaded. A menu for selecting and loading a sheet containing the net is activated if the net is on different sheets. The Highlight Net and Zoom Window operation is also triggered after loading a different sheet for locating the net.

Net Name Tracking

The Load Label Sheet function for selecting and/or loading an SCM sheet containing a selected and/or selectable label has been added to the Connections / Other Functions submenu and to the label context menu.

Net Highlight with Zoom

The All Nets/Zoom and Named Nets/Zoom functions for highlighting nets and automatically zooming to connected symbols and labels have been added to the Connections / Other Functions / Highlight Nets function group.

BAE HighEnd automatically applies this function to any layout of the same project which is currently open in any other **Layout Editor**.

Net Combinations

The **Schematic Editor** issues now a warning message if two nets with different names are connected.

Bus Definition

The Define Bus function has been modified to change the bus status of the selected connection instead of simply converting the connection into a bus. This allows for bus connections to be converted back to normal connections.

Bus Tap Movements

Cancelling the Move Bus Tap function without having the bus tap placed could cause undefined behaviour such as endless loops and program crashes in special cases. This problem has been solved.

Pin Connections

The Full Pin Check option of the Settings / Rule Attachment / Connectivity function only reset the unconnected pin contact area display for direct connections between different pin macro types. This problem has been solved.

Bus Tap Context Funtions

The Add Connection and Load Macro functions have been added to the bus tap context menus.

2.4 Graphics

Circles/Arcs

A graphic line and graphic area context function for the quick drawing of circles and/or arcs has been assigned to the C key. A circle at the current position is drawn if the function is called from within another function without any previous graphic input. If a single graphic point has already been set, then the function uses the current position as centre point and creates a circle through the previous graphic input point. With more than one previously set graphic point, the behaviour depends on the function mode which can selected by pressing C whilst no other function is active. The Set Center default option sets a circle center point at the current mouse position, with the circle orientation in line with the positioning of the previously drawn segment. The 90 Degree Center option automatically appends a quarter-circle with selectable radius to the previously drawn segment. The Inner Corner option creates a round corner with a selectable radius from the previous segment and draws a segment to the current position.

Bitmap Data Import

The Bitmap Input function for importing PCX 24 Bit compressed, BMP monochrom uncompressed and BMP 24 Bit uncompressed bitmap data has been added to the File / Import/Export submenu. Imported bitmap data is converted to graphic areas and automatically group-selected to allow for subsequent repositioning and/or scaling. Please note that importing bitmaps can create huge amounts of data which might affect the system's performance.

2.5 Text, Attributes

Text Selection

The `DEFTEXTLST_SCM` entry for populating a list of predefined texts for the create text toolbar function has been added to the `bae.ini` file. On default, `DEFTEXTLST_SCM` 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.

Packager Data Display Attributes

The `$pltpname`, `$pltpdatede`, `$pltpdateus` and `$pltptime` attributes for displaying the layout element name and the date and time of the last **Packager** run have been added to the system.

Element Data Display

A `$Plt` system attribute for upper case text display has been added for each of the `$plt` element data display attributes.

Date Display

The `$pltdate2de`, `$pltdate2us`, `$pltsdate2de`, `$pltsdate2us`, `$pltpdate2de` and `$pltpdate2us` system attributes for displaying plot dates with two-digit years have been added.

2.6 Group Functions

Group Element Selection

Toggle options for inverting element group selection modes have been added to the Edit / Group Elements functions.

2.7 Plot Output

EPS/PDF Output

Plan-specific output file names for repeated EPS/PDF Output calls are now saved with the project.

Texts created with the Multi Line Text function are now automatically concatenated for outputs with PostScript fonts. Previously such texts had been vectorized using the BAE vector font to avoid gaps.

3 Packager

3.1 Test Point Generation

Test Point Generation

The Test Point Mode function for controlling the generation of net-specific test points has been added to the Settings. The All Nets default setting creates a test point for every net. The No Single Pin Nets setting creates a test point for every net except for nets with only one connected pin.

3.2 Attribute Assignments

Original Symbol/Net Information

The **Packager** has been changed to assign values to the new `$orgname` (original/internal SCM symbol/part name) and `$pagename` (SCM sheet name) system attributes to provide additional information about SCM symbol to layout part assignments. Comma-separated value lists are provided for parts consisting of multiple symbols.

For symbols from hierarchical schematic sub-blocks, the name of the referring block symbol is assigned to the new `$blkrname` (block reference name) system attribute value. This provides transparency over the assignment of parts to hierarchical blocks even after renaming such parts in the layout. Additionally, all block symbol attributes are transfered to the sub-block symbols to allow for the full documentation of user-defined attributes.

The `$orgname` net attribute is assigned to named nets. For nets consisting of different sub-nets, a comma-separated sub-net name list is assigned. I.e., combined nets can now not only be traced by examining the `.fre` file, but also through system net data queries.

The `$net` pin attribute for storing the pin net name is now automatically assigned to pins. This allows for `$net` text definitions on padstack level to display pin net names in the layout.

Alternative Part Package Type Assignments

The syntax for alternative package type specification with the `$plname` attribute has been changed to support package name suffixes through nested square brackets. I.e., a list of alternative package types such as, e.g., `[dil8,dil8a,dil8b,so8,so8a,so8b]` can now also be specified through `[dil8[,a,b],so8[,a,b]]`.

Part Name Assignment

A `[p1], [p2]` prefix is now added to the `$rpname` attributes of symbols/parts from hierarchical schematic subblocks to provide full control over the packaging of symbols/parts from different hierarchical sub-block instances.

Pin Attribute Assignment

Support for indirect pin attribute value assignments through attribute names starting with `$` in logical library `newattr` commands has been added to the **Packager**.

Alternate Logical Definitions

The `$rlext` system attribute for setting logical library part name extensions does not append an underscore letter anymore if an empty string is entered for this attributes. This allows for the `$rlext` attributes to be faded out on symbols with default definition and for `$rlext` entries in the symbol database to be left empty.

3.3 Hierarchical Design

Block Part Numbering

The way the **Packager** used to create automatically numbered part name prefices for hierarchy block references could cause irritating part numbering gaps when both Sub Blocks and Single Sub Blocks were used in a project. The **Packager**'s default block reference prefix generation method is now prioritizing Sub Blocks to avoid any such gaps in the block reference part name lists. To avoid any possible part name collisions and/or inconsistencies with existing part name lists from old layouts, the All Blocks common ID Range option for using the old block reference prefix numbering method has been added to the Block Numbering parameter from the Settings menu.

3.4 ERC

Gate ERC

At the end of the **Packager** run, warning messages are issued to list unused gates in parts consisting of multiple gates.

3.5 Error Messages

Error Messages

The error messages produced by the **Packager** have been improved. The `Symbol` indicator is now used together with SCM symbol names to avoid any confusion with layout part names (indicator `Part`).

A new chapter with an alphabetically sorted list of all **Packager** messages with instructions for solving **Packager** problems has been added to the User Manual.

4 Layout Editor

4.1 General

Layout Editor Startup

The **Layout Editor** command line syntax has been changed to the following:

```
> bae ged DDB-filename elementname [PART|PADSTACK|PAD|ULC|ULC_QUIT] ↵
```

This command line syntax can be used to load a named element of the specified class upon **Layout Editor** startup. Omitting the element class specification defaults to layout. `ULC` and `ULC_QUIT` cause the system to execute a **User Language** program specified by elementname. `ULC_QUIT` terminates the **Layout Editor** after executing the **User Language** program.

Screen Display after Load

Zoom All has been changed to avoid screen redraws when restoring the last screen layout after loading elements. Additionally, the copyright message is displayed using the background color. This eliminates the "flickering" effect previously experienced when switching between BAE modules.

Circles/Arcs

A trace and polygon context function for the quick drawing of circles and/or arcs has been assigned to the c key. A circle at the current position is drawn if the function is called from within another function without any previous graphic input. If a single graphic point has already been set, then the function uses the current position as centre point and creates a circle through the previous graphic input point. With more than one previously set graphic point, the behaviour depends on the function mode which can selected by pressing c whilst no other function is active. The Set Center default option sets a circle center point at the current mouse position, with the circle orientation in line with the positioning of the previously drawn segment. The 90 Degree Center option automatically appends a quarter-circle with selectable radius to the previously drawn segment. The Inner Corner option creates a round corner with a selectable radius from the previous segment and draws a segment to the current position.

Middle Point Snap

The Middle of 2 Points snap function for selecting the center point between two selectable points/objects has been added to the object and corner point context menu which is available through the x key. This feature can for instance be used together with the p key pin snap function centering a trace segment between two off-grid pins.

Element Rotation

A loop for rotating multiple selectable elements and/or the L/R Rotation Angle function for configuring the default rotation angle step value can now be activated when pressing the l (left rotate element) and r (right rotate element) keys while no element is currently selected/processed.

Element Mirroring

The m key context menu function for mirroring the currently selected/processed element has been extended to allow for the selection of either Mirror On or Mirror Toggle mode if no element is currently selected/processed. Mirror Toggle for toggling the mirroring mode of the currently selected element is the (new) default operation. Please note that with Mirror Toggle assigned to the m key, the Mirror Off function assignment to the n key becomes redundant and thus available for alternative use.

Mouse Button Context Functions/Active Elements

The mouse symbol from the toolbar can be used together with the Shift Function to configure an alternative right mouse button action to be triggered if the `Shift` key is pressed. On default, the Move operation is configured for this keystroke.

Element Selection Pick Mode can be used to iterate through all elements with different element types at the same position instead of only iterating through all elements matching the first selected element type.

The new Settings / Rule Attachment / Context Functions submenu can be used to assign right mouse button context functions to specific elements. Context functions assigned on part level apply to all parts placed on Layout level.

If only one context function is assigned to a library element, then this context function is immediately activated when clicking such an element with the right mouse button. This feature can be used to, e.g., assign the Highlight Net to test point macros. Further interactions such as `:ml` for picking/selecting the element at the mouse cursor can also be added.

Macro/Key Binding Action Sequences

The fact that user-defined signal layer configurations from the **Setup** had to be considered when configuring automated menu selection interactions through `:s` (Selection) in macro and key call sequences often caused problems when transferring such features/macros between different BAE configurations and/or users. The `:o` (Offset Selection) interaction type has been added to avoid such problems. `:o` doesn't count user-defined signal layer menu items. This allows for frequently used key programming sequences such as angle direction change during trace corner point movements to be programmed independentely from any user-specifc signal layer **Setup**.

DDB Element Comment

The File / Element Comment submenu and a corresponding element in the Settings / Settings dialog for assigning comments to DDB file elements have been added. The element selection dialogs have been updated to display element comments together with the element names. Element name comments can be assigned to layouts to allow for better guidance. The new `$pltecomment` system attribute can be used to display element comments on the layout.

Layout Name Change

The File / Save as function for saving layouts under a different name in the same project file is now automatically creating a copy of the layout-specific **Packager** and Backannotation DDB file elements. This allows for layouts to be easily copied and/or renamed together with all relevant pin/gate swap and part/package changes for subsequent **Packager** runs.

DRC Security

The `AUTODRC_GED` parameter for activating automatic or semi-automatic (prompted) Batch DRC after loading a layout has been added to the `bae.ini` file. The default value for this parameter is zero (no automatic Batch DRC). Activating automatic Batch DRC guarantees complete DRC error display for layouts which have been (intentionally) saved with DRC errors.

Layer Usage Report

The Settings / Report function included all legend layers with layer usage reports when using parts with layer legend definitions such as plan headers, even if the legend layers weren't actually used. This problem can now be avoided with the `lay_layerscan_ignore` rule which can be assigned to elements and/or macros using the Settings / Rule Attachment function. Elements with this rule are excluded from the layer checking of the Report function. The layer check routines of the EPS/PDF Output and the batch output functions of the **CAM Processor** are also considering this rule.

Data Import

The OrCAD MIN Input for importing layout data in **Orcad** MIN format has been added to the Import/Export submenu from the File menu. A `.par` file is used for controlling layer assignments and several other conversion parameters. A well-documented example file named `orcad.par` with all possible parameter definitions is provided in the `baejobs` directory.

Selective Airline Display

The Attribute Visible and Attribute Invisible buttons for activating and/or deactivating airline display through Part Attributes, Pin Attributes or Net Attributes selections have been added to the Mincon settings of the Settings / Settings parameter dialog.

4.2 Display, Design Rule Check

Color Palette Buffers

The s toolbar menu button for color palette buffers has been changed to allow for the setting of a Palette Prefix different from the `toolbar` setting. The Palette Prefix is saved with the element and restored when opening element. I.e., it is possible to use different toolbar color table sets for layouts with different layer counts.

Top Layer Display

The currently selected top layer is now indicated by an inverted right half of the signal layer number text in the layout toolbar.

Net Group DRC (BAE HighEnd)

The Net Group DRC function for defining net type specific DRC blocks through a table of input fields has been added to the Settings / Rule Attachment submenu in **BAE HighEnd**. The net group and DRC rules are automatically generated. This allows for the complete definition of net group specific clearance parameters without having to edit and compile specific rule definition files.

DRC Error List

The polygon types and/or the part names of the elements causing distance violations are now displayed by the Utilities / DRC Error List function.

4.3 Parts, Placement

Padstack Generation

An option for specifying solder mask and solder paste pad sizes relative to the signal layer pad size has been added to the Pad[stack] Generator facilities of the File / Library Utilities / Macro Generator function. New entries for setting default/predefined values for these options have been added to the `bae.ini` file.

The Via Staggered n-m option with a drill class query for specifying a via layer range has been added to the Via Staggered function for generating blind and buried via definitions.

Automatic Part Renaming/Renumbering

The Renumber parts option for deactivating part renumbering during part name prefix changes has been added to the Change Name Prefix dialogs of the Parts / Other Functions / Autoname Parts functions. With part renumbering deactivated, an empty string input to the Source Prefix simply causes the part names to b eprefixed with the Destination Prefix. This is useful when merging different projects with intersecting part name list.

The All Prefixes option for renumbering parts with specific prefices has been changed to support the removal of hierarchy block identifiers (`[p1]` etc.) from the part names. This allows for all parts, including parts from hierarchical SCM blocks, to be renamed/renumbered according to the specified Part Name Pattern pattern.

Variant Report

The Part Report for selecting different part report options for listing all variants, two selectable variants or variant differences has been added to the Settings / Variants dialog.

Hierarchical Block Placement

The Block Reference and List Block References functions for selecting parts from hierarchical schematic blocks through block instance names have been added to the Parts / Part Set submenu. A **Packager** run is necessary to activate this feature for old project files.

Part Data Editing

The element data manipulation context menu function which can be activated through the p key has been extended to allow for part name changes, part macro assignments (unless prohibited by net list definitions), part mirroring, and fixing and glueing/anchoring of parts.

Part List Output

The DBF ASCII Format and DBF ASCII Format Counts options of the File / Import/Export / Part List Output function have been renamed to CSV/DBF ASCII Format and CSV/DBF ASCII Format Counted to indicate that these functions are capable of generating **Excel** compatible `CSV` files.

The `PLPOSNR_LAY` parameter for including a position counter in the first column of `CSV` part list outputs has been added to the `bae.ini` file. On default, `PLPOSNR_LAY` is off/deactivated.

Part Space Estimation

For part space estimation purposes, the board area size and the sum of the part area sizes are now displayed by the Parts / Other Functions / Place Histogramm function. Part area sizes are calculated from the keepout area definitions on the `Part DRC` documentary layer. For parts without such a keepout area definition, the element boundaries are used for part area calculations.

Layout Part Attributes

Layout part level texts with `$?s:predicate` name patterns refer to part-specific rule system predicates rather than netlist attributes. The Settings / Rule Attachment / Part Attributes function can be used on layout level to assign values (such as the layout designer's name to a layout plan header part) to these predicates.

4.4 Traces, Routing

Net Trace Manipulation

The Fix Net, Unfix Net, Delete Net, and Set Net Trace Width function menu to be activated through keystroke f and applied to the currenlty selected/highlighted net has been added to the Traces / Net List Utilities / Highlight Nets functions.

Net Attribute Search

The Attribute Search/Zoom function for selecting nets to be highlighted by net attributes has been added to the Traces / Net List Utilities / Highlight Nets function group.

Pin Status Report

The Traces / Net List Utilities / Report Open Pins function has been renamed to Report Pin Status and lists now all net list part pins with their states. This list is sorted by pin status and then part names to make it easier to find short-circuit and/or free pins.

At the end of this report, a list of all nets created from SCM signals with different names/labels is provided with original SCM signal names.

Group Selection

The group selection mode is now preserved when editing traces.

The Trace Width option for selecting and/or deselecting traces with a specific trace width to be conveniently chosen from the list of trace widths used on the current layout has been added to the Edit / Other Functions / Select and Deselect functions.

Layer Change with Color Assignment

A layer selection popup menu has been added to the Select Layer trace context menu function available through the right mouse button. This menu also allows for the activation of the provides layer-specific options for activating the Change Colors" function and a source layer indicator (>).

Pressing the + or - key and the the enter key switches to the next higher and/or next lower layer number. These inputs can be automated in key programming sequences using `:mr:ol3:'+'` and/or `:mr:ol3:'-'`. This allows for the definition of keys for moving upwards or downwards through the layer stack. The default **Layout Editor** key bindings assign these sequences to the (and) keys (and thus also to mouse wheel interactions with the Strg key pressed).

Trace Data Editing

The element data manipulation context menu function which can be activated through the p key has been extended to allow for trace layer changes, trace width changes, fixing and/or glueing/anchoring of traces, via padstack assignments, and via fill net assignments.

Teardrop Generation

The Trace to Trace option for generation teardrops at trace necking/bending points has been added to the parameter dialog of the Traces / Other Functions / Teardrop Utilities / Create Teardrops function.

Creating teardrops as traces sometimes failed for special trace width/angle and pad size constellations. This problem has been fixed.

Editing Round Corners

The Move with neighbours option for the Segment Move mode has been changed to allow for the processing of segments adjacent to arcs. Semicircles are automatically divided into quarter-circles.

Glued Vias

The placement of glued vias on the layout prevented the manual routing functions from automatically setting required vias when changing trace layers. This problem has been fixed.

Trace DRC

The design rule check sometimes misinterpreted net-sepcific clearance distances for traces on part level. This problem has been fixed.

The **BAE HighEnd** design rule check of the Fill & DRC edit/display mode for manual routing has been extended to layer-specific clearance distance specifications from DRC blocks.

Trace Corner Pick

Normal corner points have now priority over arc center points when picking/selecting trace corner points

Trace to Area Conversion

The Traces / Other Functions / Trace to Power Layer function has been renamed to Trace to Area and extended with the Convert Single Elements, Copy Single Elements, Convert Group Elements and Copy Group Elements options. These functions activate trace clearance distance, destination area type and destination area layer prompts. The original trace is preserved when copyied to a new area or deleted when converted to an area. Thease functions not only allow for the transfer of traces onto power layers but also for the creation of keepout and/or shielding areas on alternative layers.

Short Circuit Elimination

The Delete Short Circuit Traces for deleting traces from a short-circuit until all traces connected to the short-circuit are removed has been added to the Traces / Other Functions submenu. Due to the advanced short-circuit analysis facilities in **BAE HighEnd** this function works more selectively in **BAE HighEnd** than in other BAE configurations.

Antenna Check

The Antenna Checkhas been added to the Traces / Other Functions submenu. Trace segments with one end without contact to any other trace segment, via or pin are considered to be antennas. Vias connected to only one trace and without power layer connection are also considered to be antennas. Pin checks only consider netlist pins. Trace segments ending on non-netlist pins are therefore also considered to be antennas. The antenna elements are automatically group-selected.

4.5 Graphic, Copper Areas

Router Keepout Areas

The Only Auto Routing and Only Fill & Routing options for the definition of keepout areas to be considered only by the **Autorouter** or only by automatic copper fill and the **Autorouter** have been added to the Keep Out Area option of the Areas / Other Functions / Set Polygon Type/Net function.

Conversion to Traces

The Trace option for converting documentary lines and area outlines to traces has been added to the Areas / Other Functions / Set Polygon Type/Net function. If the source element is a documentary line with a line width setting, then the width of the created trace is set to the documentary line width. Otherwise, the traces are created with the default trace width setting specified with the Trace conversion option.

Power Layer Selection

A power layer selection menu with net name display has been implemented for the Other Power Layer option of the Add Active Copper function for creating split power planes.

Polygon Data Editing

The element data manipulation context menu function which can be activated through the key has been extended to allow for polygon/line type/layer changes, fixing and/or glueing/anchoring of areas, documentary and split power plane line pen width changes, net assignments for active copper areas, and fill via padstack assignments, and signal layer keepout area assignments for automatic copper fill and/or the **Autorouter**.

Orthogonal Segment Snap

The Snap orthogonal to Segment function for adding a orthonogal polygon segments has been added to the context menu which is available through the key during the creation and/or editing of documentary lines.

Polygon Corner Pick

Normal corner points have now priority over arc center points when picking/selecting polygon corner points

Distance Measurement

A placement coordinate query for controlling the position of the distance measuring graphic has been added to the Areas / Other Functions / Drawing Utilities / Distance Measure function. During the placement coordinate query, a context menu with the Jump Relative (placement relative to start point), Jump Absolute (placement at fixed coordinates), Place 1:1 (placement at start point), Change Layer (distance measurement graphic layer change), Full Distance (diagonal distance measurement, default), Horizontal Distance (horizontal distance measurement), Vertical Distance (vertical distance measurement) and H+V &seperately (separate horizontal and vertical distance measurements) options is available through the right mouse button.

Bitmap Data Import

The Bitmap Input function for importing PCX 24 Bit compressed, BMP monochrom uncompressed and BMP 24 Bit uncompressed bitmap data has been added to the File / Import/ExportFile submenu. Imported bitmap data is converted to documentary areas on a selectable documentary layer, and automatically group-selected to allow for subsequent repositioning, scaling or area type modification. Please note that imported bitmaps can create huge amounts of data which might affect the system's performance and or cause problems with automatic copper fill or Gerber plot generation.

DXF Data Exchange

Support for keepout area output has been added to the Visible Layers and Layer Selection options of the File / Import/Export / AutoCAD/DXF Output function for exporting DXF data. The extension **KO** (for keepout) is added to the layer names for keepout area DXF output. Any Height Specification for the Height DRC is now added as element height attribute to the keepout area polygon to allow for 3D processing in mechanic CAD systems.

The File / Import/Export / AutoCAD/DXF Import function has been adjusted accordingly and imports polygon heights as Height Specification for the Height DRC when importing keepout areas onto documentary layers.

4.6 Text, Drill

Packager Data Display Attributes

The **$pltpname**, **$pltpdatede**, **$pltpdateus** and **$pltptime** attributes for displaying the layout element name and the date and time of the last **Packager** run have been added to the system.

Element Data Display

A **$Plt** system attribute for upper case text display has been added for each of the **$plt** element data display attributes.

Date Display

The **$pltdate2de**, **$pltdate2us**, **$pltsdate2de**, **$pltsdate2us**, **$pltpdate2de** and **$pltpdate2us** system attributes for displaying plot dates with two-digit years have been added.

Text Data Editing

The element data manipulation context menu function which can be activated through the p key has been extended to allow for text changes, text layer changes, text pen width changes, text mirroring, text frame assignments, text fixing and/or glueing/anchoring, and **LOGICAL** documentary layer text centering.

Pick Point Placement

The Center of Graphics Rectangle option for selecting the center of the graphics from a selectable documentary layer has been added to the Pick Point Text function of the File / Library Utilities / Layout Library Edit Batch.

Height DRC Documentation

The Height DRC Text option for automatically displaying part height texts in the center of the part height DRC area has been added to the File / Library Utilities / Layout Library Edit Batch function.

Font Editor

A descriptive text link for saving the character font has been added to the top of the character font layout created by Text, Drill / Other Functions / Font Editor / Font Edit.

The **FONTCONV** utility program for importing font data is now automatically activated after saving the font data to the `.fon` file. This allows for creating and using haracter fonts without having to leave the BAE graphic interface.

Drill Data Editing

The element data manipulation context menu function which can be activated through the p key has been extended to allow for drill hole diameter changes, drill class assignments, and the fixing and/or glueing/anchoring of drill holes.

Automatic Drill Display

The Place Drill Hole, Delete Drill Hole and Edit Drill Hole are now automatically activating the drill color (white on default) to ensure that the (currently processed) drill holes are visible.

4.7 Group Functions

Group Element Selection

Toggle options for inverting element group selection modes have been added to the Edit / Group Elements functions.

4.8 Automatic Copper Fill

Fill Area Via Placement

An option for assigning a net for automatic copper fill via connections has been added to the Traces / Via Functions / Place Vias function. This allows for the Place Vias function to be used for placing fill area vias.

5 Autorouter

5.1 General

Routing Layers

The maximum routing signal layer count specified through the Signal Layer Count from the Autorouter / Options dialog has been increased from 12 to 16.

Board Outline Clearance

The Board Outline Distance parameter for specifying a minimum clearance to the board outline (previously fixed to `1.05833 mm`) has been added to Autorouter / Options.

Pin to Via Clearance

The Pin-Via Minimum Distance parameter has been added to Autorouter / Options. This parameter can be used to set a gridless routing pin to via clearance which is higher than the Minimum Distance. The **Autorouter** uses the Minimum Distance setting if the Pin-Via Minimum Distance value is set to `0.0 mm` or to a value smaller than the Minimum Distance value.

Maximum Length SMD Fanout/Power Connections

The Maximum Power Con. Length and Maximum SMD Fanout Length parameters for specifying maximum trace lengths for power connections (previously fixed to `5.08 mm`) and SMD via fanout connections (previously fixed to `2.54 mm`) have been added to Autorouter / Options. Power connections are nets with connections to power layers. SMD via fanout connections are the SMD pin to via connections created by SMD Via Pre-Place. Please note that the Maximum SMD Fanout Length parameter is calculating physical trace segment lengths unlike the Pin-Via Minimum Distance parameter which calculates airline distances. I.e., the Maximum SMD Fanout Length value must be set to a value larger than the Pin-Via Minimum Distance parameter to allow for SMD via fanouts to be routed.

Trace/Via Keepout Areas (BAE HighEnd)

Support for the definition and recognition of trace and/or via keepout areas on signal layers through `poly_routernovias` and/or `poly_routernotraces` rule assignments to documentary areas has been added to **BAE HighEnd**.

Warning

The amount of memory required for the routing matrix is doubled when using trace and/or via keepout areas.

5.2 Autorouter Algorithms

Pin Connections

The Pin Entry Correction parameter for avoiding acute-angled SMD pin connections has been added to Autorouter / Options. The None setting deactivates this feature. The new 1:4 Routing Grid default setting causes trace connection points to be shifted in quarter routing grid steps to avoid acute-angled pad connections.

BGA Fanout Routing

An **Autorouter** problem which caused internal errors during BGA fanout routing on layouts with fixed traces has been fixed.

Selective Airline Display und Net Group Routing

The Attribute Visible and Attribute Invisible buttons for activating and/or deactivating airline display through Part Attributes, Pin Attributes or Net Attributes selections have been added to the Mincon settings of the Settings / Settings parameter dialog. Since the **Autorouter** only routes nets which are included in the airline display, this feature can be used to select net groups through `$nettype` attribute selections or hierarchical blocks through `$blkname` and/or `$blkrname` attribute selections for autorouting.

6 CAM Processor

6.1 General

6.2 Control Plot

EPS/PDF Output

Options for PDF layer information output have been added to the parameter dialog of the EPS/PDF Output function to support the PDF layer display modes introduced with **Acrobat Version 6.0**. On default, the BAE layer names are being exported. Output batch configurations also allow for the merging of layers (e.g., `Part Side View` through the assignement of BAE layers to PDF output layers.

Texts created with the Multi Line Text function are now automatically concatenated for outputs with PostScript fonts. Previously such texts had been vectorized using the BAE vector font to avoid gaps.

The Derive Batch option for creating a batch using the current output parameters/options has been added. This is useful if output layers are selected with the Visible Layers or Layer Selection options.

Special layer output support for `Workarea`, `Origin` and `Errors` has been added. Batch outputs also support different colors for layer-specific `Errors`.

The `PSVISW2B_STD` entry for automatically converting white screen display color to black plot color with Visible Layers outputs has been added to the `bae.ini` file. On default, `PSVISW2B_STD` is activated (value `ON`.

Plan-specific output file names for repeated EPS/PDF Output calls are now saved with the project.

Output to DDB Element

The Output to DDB File for writing multi-layer data to a DDB file element has been added. The layers created by this function are not connected anymore amongst each other, thus allowing for layer-specific design rule checks to prepare for automatic optical board inspections.

Elements from power layer 1 through 12 are transfered to signal layers 51 to 62, and texts are converted to lines. I.e., part names and power layer connections are detached from the netlist. This allows for unrestricted mixed project panelization using arbitrary rotation angles.

The Output to DDB File has been added to the multilayer plot output options of the CAM-Batch Output function.

6.3 Gerber Photo Plot

High Precision Gerber Formats

Gerber format/precision information is now included with all Extended Gerber plot outputs, also those created with CAM-Batch Output formats 2.5 and 2.6. Previously, this information was only included with 2.3 and 2.4 Gerber output.

Aperture Utilities

The **GAPTUTIL** utility with its BAE Aperture Dump, ECAM Aperture Dump, Load Aperture Data, Reset Apertures functions and the new Aperture Table for Library function has been added to the Aperture Utilities submenu of the Gerber Photoplot menu.

Support for importing **Topcad** format aperture tables has been added to the Load Aperture Data function.

The new Aperture Table for Library function automatically creates an aperture table with apertures for all circular, square and rectangular pad shapes and circular apertures for the creation of finger pads of a selectable layout library. Two rectangular apertures with different orientation are created for each rectangular pad shape. Aperture tables created with Aperture Table for Library may have to be supplemented with circular apertures for the drawing of different trace widths which can not be derived from the layout library data.

6.4 Insertion Data Output

Generic Insertion Data Output

The **GINSOUT** insertion data output utility has been added as Generic Insertion Output function to the Drilling+Insertion menu.

7 CAM View

7.1 General

CAM View Startup

The **CAM View** command line syntax has been changed to the following:

```
> bae gerview Dateiname [GERBER|EXCELLON] ↵
```

This command line syntax can be used for automatically loading a CAM file with the specified format upon **CAM View** startup (Gerber data is assigned to signal layer 1). Under **Windows**, this feature can also be used to configure **CAM View** as default application for handling Gerber and Excellon files (since there is no "standard" file name extension in use for these formats, **Bartels AutoEngineer** does not install itself as default handler for such files).

7.2 Data Import

Panelizing of Boards

The File / Batch / Load function has been changed to allow for multiple copies of the selected project file data to be loaded onto a matrix. New input fields for defining the matrix have been added to the batch name selction box.

8 Utilities

8.1 LOGLIB

Pin Lists

The **startpin-endpin[:step]** pin name range pattern can now be used for specifying pin lists. This allows for definitions such as **pin(a1-a4)** for **pin(a1,a2,a3,a4)** or **pin(c2-c10:2)** for **pin(c2,c4,c6,c8,c10)**. It is also possible to include multiple pin name ranges such as **pin(a1-a32,b1-b32,c1-c32)** within a single command. Pin name range patterns are only pin list aliases, the system still saves and displays (function Show Symbol Logic) the complete pin name lists.

Variant Attributes

The syntax of the **newattr** command has been changed to allow for the assignment of variant-specific attributes by specifying a comma-separated variant number after the attribute name quotes. This allows for the assignment of different fixed attributes to different predefined project variants such as **110 Volt** and **230 Volt** or **deutsch** and **english**. **newattr** attribute values without variant number specification are assigned to the default/base variant.

8.2 EDUCONV

File Transfer

The general restrictions for loading design data from project files created with different BAE configurations have been removed. The **EDUCONV** utility program has thus become obsolete and is not delivered with the software anymore.

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 Index Variable Types

This section lists new and changed **User Language** index variable types. See Bartels User Language Programmer's Guide - Appendix B for a detailed description of all index variable types.

Changed Index Variable Types

The `MACRO` attribute for querying the bus tap macro name has been added to the **C_BUSTAP** index variable type.

9.3 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
STD	**bae_askname**	Activate BAE name selection dialog
	bae_crossarcarc	Determine cross point(s) of two arcs
	bae_crosslineline	Determine cross point of wide line segments
	bae_crosslinepoly	Determine cross point of wide line with polygon
	bae_crosssegarc	Determine cross point(s) of segment with arc
	bae_crosssegseg	Determine cross point of segments/lines
	bae_dialboxbufload	Restore BAE dialog box data from buffer
	bae_dialboxbufstore	Store BAE dialog box data to buffer
	bae_getdblpar	Get BAE double parameter
	bae_getintpar	Get BAE integer parameter
	bae_getpacktime	Get last project Packager run date/time
	bae_getstrpar	Get BAE Stringparameter
	bae_nameadd	Add BAE name selection list element
	bae_nameclr	Clear BAE name selection list
	bae_setdblpar	Set BAE double parameter
	bae_setintpar	Set BAE integer parameter
	bae_setstrpar	Set BAE Stringparameter
	ddbgetelemcomment	Get DDB file element comment
	ddbrenameelem	Rename DDB file element
	ddbsetelemcomment	Set DDB file element comment
	kbstate	Shift/control key state query
CAP	**cap_gettagdata**	Get SCM tag symbol destination data

	cap_getscstkcnt	Get SCM scan function stack depth
SCM	**scm_drawelem**	Redraw SCM figure list element
	scm_findpartplc	Layout part placement status query (BAE HighEnd)
	scm_getgroupdata	SCM group placement data query
	scm_getinputdata	SCM input data query
	scm_getstrpar	Get SCM Stringparameter
	scm_pickanyelem	Pick SCM any SCM figure list element
	scm_setpickelem	Set SCM default pick element
	scm_setstrpar	Set SCM Stringparameter
	scm_settagdata	Set SCM tag symbol pin destination
LAY	**lay_getscstkcnt**	Get layout scan function stack depth
GED	**ged_drawelem**	Redraw GED figure list element
	ged_pickanyelem	Pick any GED figure list element
AR	**ar_drawelem**	Redraw Autorouter figure list element
CV	**cv_aptgetcolor**	Get CAM View aperture color
	cv_aptsetcolor	Set CAM View aperture color
	cv_deldataset	Delete CAM View data set
	cv_getdblpar	Get CAM View double parameter
	cv_movedataset	Move CAM View data set
	cv_setdblpar	Set CAM View double parameter
CED	**ced_drawelem**	Redraw CED figure list element

Changed System Functions

Support for activating rubberband circle display drawing mode has been added to the **bae_inpoint** and **bae_inpointmenu** functions.

The **strdelchar** function deleted all characters beyond the specified end position. This behaviour has been changed. The substring beyond the end position is now preserved.

Support for activating comment text callback functions has been added to the **synparsefile** and **synparsestring** functions.

Support for named SCM net connection warning mode queries/settings has been added to the **scm_getintpar** and **scm_setintpar** functions.

Support for **CAM View** color table assignment and area display mode queries/settings has been added to the **cv_getintpar** and **cv_setintpar** functions.

9.4 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 6 Mbytes; some 200,000 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	ARC	Draw Arc/Circle
	BITMAPIN	Import Bitmap Data
	STEPDOWN	Step One Layer Down
	STEPUP	Step One Layer Up
SCM	SCMPEDIT	SCM Position Pick/Element Edit
GED	LMININ	Orcad MIN Layout Data 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.