



Bartels AutoEngineer®

Update History

This document contains short information about the most important new features, enhancements and changes introduced by **Bartels AutoEngineer** update versions released since **Bartels AutoEngineer Version 1.2**. Forward compatibility from earlier versions to newer **Bartels AutoEngineer** versions is always ensured, but not backward compatibility.

Bartels AutoEngineer Update History
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Bartels AutoEngineer Version 7.4

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 7.4** are:

- **Bartels AutoEngineer** available for **SUN Solaris/OpenSolaris** on **Intel** and **AMD** platforms.
- System limits for maximum text and attribute value lengths increased from 40 to 200 characters.
- New functions for importing and exporting SQL tables in CSV format.
- New features for memory access violation project data recovery.
- Improved BAE window focus function.
- New option for permanently displaying the BAE menu in a tree view.
- Option for selecting a centered zoom window with the **Zoom Window** function.
- New graphic workarea control element for scrolling in arbitrary directions.
- Improved/extended key programming and input focus control functions.
- **Ctrl** key info display function improved.
- New dialog window function key **Ctrl-Q** for copying selection list box entries to the clipboard.
- User-specific **baeuser.ini** file instead of system parameter file **bae.ini** supported for saving default system parameters.
- New toolbar buttons for displaying and setting the input and display grids.
- Schematic sheet and layout previews added to the DDB file element selection dialogs of the BAE **Windows** versions.
- Dialog box position memory implemented in all BAE **Motif** versions.
- Arc drawing functions with improved user guidance.
- Standard sheet size information added to **Schematic Editor** element reports.
- New **Schematic Editor** function for deleting logical netlists from DDB files.
- New **Schematic Editor** functions for renaming DDB file elements with convenient options for numbering the schematic sheets in a project file.
- **Schematic Editor** function for copying SCM sheets modified to include logical library definition copies.
- **Schematic Editor** function for copying schematic sheets with automatic symbol renaming to resolve symbol name conflicts.
- **Schematic Editor** symbol and info query pick performance improved.
- **Schematic Editor** symbol search functions improved.
- **Schematic Editor** **Symbol/Label Query** output improved/extended.
- Option for displaying logical library definitions added to the **Schematic Editor** **Symbol Browse** function.
- New **Schematic Editor** functions and features for symbol name pattern queries/checks.
- Example definitions and **Help** button added to **Edit Symbol Logic** dialog.
- New option for processing all DDB files of a selectable library directory and all its subdirectories added to the **Schematic Editor** **Symbol Edit Batch** function.
- **Schematic Editor** **Symbol Database** function with new/improved symbol pool access facilities.
- **Replace Pattern** **Schematic Editor** function extended to allow for the substitution of name patterns at fixed positions in symbol names.
- New option for substituting symbol name patterns added to the **Symbol Edit Batch** **Schematic Editor** function.
- New **Schematic Editor** function for placing pins on symbol level or labels on plan level using **Windows** clipboard text for pin/label names.
- New **Schematic Editor** attribute value selection menu options for querying SCM symbols without attribute value assignment.
- New **Schematic Editor** **Text Pin** function for placing pins with names derived from selectable texts.
- New **Schematic Editor** function for generating FPGA symbols from pin description import files.
- New **Schematic Editor** function for placing labels using names from an imported label name list.
- Improved features for automatically correlating SCM symbol plot visibility and placement status settings.
- New SCM rule system predicate for assigning external document file references to SCM symbol macros.
- New **Schematic Editor** facilities for querying and locating antenna highlights and unconnected pins.
- **Add Bus Connection** function added to the **Schematic Editor**.
- Improved/simplified SCM bus tap selection.
- New SCM options for project-wide bus tap renaming.
- New SCM feature for selecting bus tap names prior to bus tap placement.
- New/improved functions for connecting SCM symbol pins to busses.
- New SCM signal router facility for automatically indicating unrouted connections after complex symbol or group placement operations.
- Improved SCM bus connection rerouting algorithms.
- Functions for naming busses and bus taps improved.
- SCM net highlight functions for unnamed nets improved.
- New **Schematic Editor** functions for placing texts from the **Windows** clipboard.
- Extended **Schematic Editor** functions for selecting and/or deleting symbol through attribute values and/or attribute value patterns.
- New **Schematic Editor** functions for selecting and/or deleting polygons by polygon type.
- New **Schematic Editor** function for converting group-selected graphic lines to connections.
- New function for selecting different modes for redrawing texts and connections during group placement operations in the **Schematic Editor**.

- Support for layer level sort order specifications in **Schematic Editor** PDF batch definitions.
- EPS/PDF output of SCM plans with new options for selecting and/or deselecting output pages/sheets by element name patterns.
- **Packager** modified to check for symbol modifications which were carried out after saving the project's SCM plan.
- New autosave facility for externally loaded **Packager** parameter sets.
- New features for implicit symbol/gate assignments to layout parts through matching symbol/part attribute value assignments.
- New options for automatically shrinking element boundaries when saving SCM or layout elements.
- **Schematic Editor** and **Layout Editor** functions for drawing polygon arcs with improved user guidance.
- New **Schematic Editor** and **Layout Editor** functions for center-aligning texts horizontally and/or vertically.
- Coordinate labeling functions added in both **Schematic Editor** and **Layout Editor**.
- Improved SCM and layout part list outputs.
- New ASCII import option for importing all project-specific ASCII input files in one go.
- New **Schematic Editor** and **Layout Editor** functions for updating project-specific rule definitions with corresponding rule definitions from the central rule definition database.
- Extended variant selection facilities in **Schematic Editor** and **Layout Editor**.
- Improved **Schematic Editor** and **Layout Editor** functions for assigning PDF output colors to elements.
- Multiple area support for **HATCH** DXF commands implemented in the **Schematic Editor** and **Layout Editor** AutoCAD/DXF import functions.
- Layout system to support new **Layer 2+Inner Layers** top layer selection/assignment.
- **BAE HighEnd** performance for loading layouts with many parts significantly improved.
- New option for processing all DDB files of a selectable library directory and all its subdirectories added to the **Layout Editor** **Layout Library Edit Batch** function.
- New **Layout Editor** functions for renaming DDB file elements.
- Improved **Layout Editor** **Change Colors** dialog with new buttons for loading and saving color tables.
- New element pick mode for exclusively limiting layout element picks to the currently selected pick preference layer.
- Improved and extended **Layout Editor** net parameter DRC.
- Improved and new **Layout Editor** DRC error display functions.
- Part macro information added to the **Layout Editor** part tooltips.
- Improved **Layout Editor** via element query functions.
- Improved net element query functions in the **Layout Editor** of the **BAE HighEnd** system.
- Extended and improved **Layout Editor** functions for assigning net visibility modes to parts.
- New options for applying automatic layout part renaming/renumbering to selected group only.
- New **Layout Editor** function for automatically substituting name patterns in group-selected part names or texts.
- **Delete Constructive** **Layout Editor** function modified to allow for the selection of the constructive parts to be deleted from the layout.
- New option for fading out layout part names and attributes by setting their text size to size zero.
- New options for including passive and/or active copper areas in Mincon generation with **Corner** options.
- Performance of Mincon generation function with **Corner** options significantly improved for large copper-filled layouts.
- Net coloring/hatching button added to the net name display in the element attribute dialog which can be activated through the **g** key.
- Improved **Layout Editor** trace width functions with new option for partially modifying trace segments according to design rule settings.
- New/improved **Layout Editor** trace length adjustment functions.
- New **Layout Editor** functions for placing fixed vias.
- **Layout Editor** functions for editing traces and polygons with improved user guidance.
- New and improved **Layout Editor** functions and options for editing differential trace pairs traces.
- Function **Insert Segment** added to the **Areas** **Layout Editor** menu.
- **Layout Editor** functions for editing polygons with improved feedback and guidance through polygon type and polygon layer display in the status line.
- New layout polygon mirror display options for fixed mirrored and unmirrored visibility settings.
- New and improved **Layout Editor** functions for resetting part, attribute and pin text positions.
- New **Layout Editor** functions for placing texts from the **Windows** clipboard.
- New **Layout Editor** functions for selecting and deselecting traces connected to group-selected part pins.
- **Layout Editor** copper fill functions with improved heat-trap position check algorithm for placing heat-traps at narrow positions.
- Extended copper fill heat trap connection type rule sets for controlling heat trap connections for individual pins/vias and/or parts/vias on part and/or layout level.
- **Layer Browse** function added to **Autorouter**.
- Routing matrix memory requirements entry added to **Autorouter** info/report functions.
- New **Autorouter** mode for routing partially placed layouts.
- **Autorouter** startup performance and optimizer pattern search performance for nets with many pins significantly improved.
- **Autorouter** optimizer output quality improved.
- New **Autorouter** batch mode for net visibility controlled net group routing.
- **BAE HighEnd Autorouter** with advanced DRC support for layer-specific net, net type/group and via pad clearance settings.

- Support for layout layer level sort order specifications in PDF batch definitions.
- Support for multiple **SCM EPS/PDF Batch Output** steps added to the **CAM-Batch Output** function.
- CAM mirror mode option added to the **DXF Data Output** function.
- New EPS/PDF batch output options for controlling plot element visibility without rule assignments.
- Neue **CAM View Call** batch step added to the **CAM-Batch Output** function.
- New **Hyperlynx Output** option for exporting copper areas using Hyperlynx Format 2.34 polygon commands.
- New **WRL/VRML Data OutputWRL/VRML Ausgabe** option for exporting trace and/or copper structures.
- New **WRL/VRML Data OutputWRL/VRML Ausgabe** option for transparent PCB outputs.
- **WRL/VRML Data OutputWRL/VRML Ausgabe** to support model scaling factors and placement height offset parameters.
- CAM batch processor definition files to support the inclusion of external CAM batch files.
- **Generic Insertion Output CAM Processor** function to support part attributes set through `$?s:attributname` part texts when processing layout attribute references.
- Format specification of the **Generic Insertion Output CAM Processor** function extended to allow for uppercase or lowercase name and attribute value outputs.
- New and improved **User Language** system functions.
- New and improved **User Language** programs.
- New definitions added to the symbol and part libraries.

Bartels AutoEngineer Version 7.2

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 7.2** are:

- Window size/position memory facilities improved.
- Improved visual guidance for interactive zoom window selections.
- Element origin displayed in toolbar element overview window.
- Zoom to display grid visibility function implemented in toolbar.
- Undo function usability improved and optimized.
- New **Undo/Redo List** function for full undo/redo buffer access and multi-step undo/redo.
- New/improved command repetition facilities.
- Improved grid favorites facilities.
- New key and menu programming facilities for directly assigning grid favorites to keys and/or menu entries.
- New options for saving user-specific dialog default parameter settings.
- New functions for creating and configuring user-defined dialog boxes and/or toolbars.
- Keystroke programming support added to macro function editor.
- New option for interactively selecting polar coordinate end points added to **Jump Relative** and **Jump Absolute** context menu functions.
- **File / Operating System** function now also available under Windows.
- New and improved features for configuring and activating external applications and/or programs.
- New **Schematic Editor** function for adjusting the origin of the currently loaded element to the internal system grid origin.
- New SCM color table entry for elements which are disabled for plot outputs.
- Improved functions for logical library definition checks.
- New **Layout Editor** function for importing generic BAE ASCII schematic data.
- Improved and new **Schematic Editor** rule assignment functions.
- New **Packager Error List** function added to **Schematic Editor**.
- **Schematic Editor** symbol list search function improved.
- **Schematic Editor** equipped with additional symbol data consistency checks.
- **Schematic Editor** function **Symbol Logic Edit** with improved user interface and improved error messaging.
- New Option for importing pin names and texts from external files added to the **Schematic Editor** functions for placing symbol pin lists/rows and texts/labels.
- Improved **Schematic Editor** functions for automatically renaming symbols and/or pins on plan and/or symbol level.
- New **Schematic Editor** functions for automatically renaming symbols throughout the currently loaded SCM sheet or the current project file.
- New **Schematic Editor** functions for automatically renaming labels.
- New **Schematic Editor** feature for automatic numeric default attribute value assignments when placing new symbols on a schematic sheet.
- New **Schematic Editor** signal router options for automatic antenna optimizations during group move operations.
- Improved layout part set selection functions in the **Schematic Editor** of **BAE HighEnd**.
- New **Schematic Editor** functions and features to allow for pin symbols to be moved on SCM sheet level.
- New **Schematic Editor** functions and features for excluding selectable symbol pins from being rotated and/or mirrored on SCM plan level.
- New option for swapping pin marker macros added to the **Symbol Edit Batch** function of the **Schematic Editor**.
- Improved **Schematic Editor** signal router algorithms for rerouting symbols and/or groups.
- Shortcuts for calling connection functions added to **Schematic Editor** toolbar buttons.
- Improved **Schematic Editor** net highlight functions to allow for the selection of unconnected label and bus tap pins.
- Improved **Schematic Editor** bus tap placement functions.
- New **Schematic Editor** **Draw Assistant** dialog with powerful functions for creating standard texts and polygons and placing scalable text/polygon groups onto the current SCM element.
- Angle and area measuring functions added to **Schematic Editor**.
- Improved interactive **Schematic Editor** functions for editing polygon corners.
- New **Schematic Editor** system attribute `$pltpagecount` for displaying project SCM sheet count.
- **Schematic Editor** context menu for multi-line texts implemented.
- **Schematic Editor** function for selecting group elements with improved feedback and confirmation messages.
- **Schematic Editor** function **Move Group** with improved connection rerouting.
- New feature for automatically cleaning up variant-specific group data when loading groups in the **Schematic Editor**.
- **Schematic Editor** options for automatically passing PDF outputs to the system's PDF file viewer now also supported by EPS/PDF batch output definitions.
- New **Schematic Editor** PDF batch output option for deactivating the fit to page print setting in **Acrobat Reader**.
- New **Schematic Editor** PDF batch output option for variant-specific EPS/PDF outputs.
- New `bae.ini` parameter for specifying alternative character fonts for **Schematic Editor** DXF outputs.
- New `bae.ini` vector text parameters for **Schematic Editor** DXF outputs.
- Multiline/multipart text concatenated for **Schematic Editor** DXF outputs.
- New functions for saving and reactivating **Packager** parameter settings.
- Layout load check prior to **Packager** run.
- **Packager** messages improved.

- **Packager and back** and **Packager and Layout Editor** to support automatic module switch after successful **Packager** runs.
- Option for assigning power pin connection widths to normal pins.
- New **Packager** function for automatically reassigning previously placed test points.
- **Packager** modified to allow for constructive pins to be ignored when generating physical net lists.
- **Eagle** ULP programs provided for exporting BAE ASCII data from **Eagle** which can then be imported into the **Bartels AutoEngineer** using the **BAE/ASCII Input** functions of the **Schematic Editor** and the **Layout Editor**.
- New functions for rotating multiple selectable elements added to the **Q** and **R** key assignments of the **Schematic Editor** and **Layout Editor**.
- New functions for mirroring multiple selectable elements added to the **M** key assignment of the **Schematic Editor** and **Layout Editor**.
- New **Schematic Editor** and **Layout Editor** functions for loading selectable files into external applications registered for those files.
- New buttons for performing move, delete or group selection operations on multiple selectable elements added to the **Schematic Editor** and **Layout Editor** toolbars.
- **New Workspace Rectangle** function for setting the element boundaries by selecting two rectangle corner points added to both **Schematic Editor** and **Layout Editor**.
- Variant consistency check added to functions for loading schematic plans and layouts.
- New/improved symbol/part browser dialogs in both **Schematic Editor** and **Layout Editor**.
- Center text output support improved in the **AutoCAD/DXF Output** function of both **Schematic Editor** and **Layout Editor**.
- Text frame output supported in the **AutoCAD/DXF Output** function of both **Schematic Editor** and **Layout Editor**.
- Additional parameter settings in the **AutoCAD/DXF Input** dialogs of the **Schematic Editor** and the **Layout Editor**.
- Improved text import in the **AutoCAD/DXF Input** functions of the **Schematic Editor** and the **Layout Editor** improved.
- Improved interactive **Schematic Editor** and **Layout Editor** functions for creating areas.
- New functions for automatically creating symmetric (mirrored and/or rotated) polygons added to the polygon drawing functions in both the **Schematic Editor** and the **Layout Editor**.
- New **Schematic Editor** and **Layout Editor** options for assigning environment variable values to text attributes (e.g., for reference in EPS/PDF batch output file names).
- Modeless dialogs implemented for frequently used **Layout Editor** functions.
- New **Layout Editor** options for X and Y coordinate snaps during interactive placement operations.
- New and/or improved via clearance checking facilities.
- **Layout Editor** dialog **DRC Error List** improved and extended by new features.
- New **Layout Editor** function for importing generic BAE ASCII layout data.
- Element specific distance check in **BAE HighEnd** with immediate DRC clearance display.
- New option for toggling between layout part side and layout solder side view.
- Usability of the **Layout Editor** element layer query functions for top layer elements improved.
- **Layout Editor** layer scan and layer access function improved.
- New option for configuring a display pattern for the **Layout Editor** **DRC Distance Display**.
- Option for **VRML V2.0 / VRML97** output and features for referencing/including external 3D part models added to **Layout Editor** **WRL/VRML Data Output** function.
- New **Layout Editor** part rename function for automatically substituting hierarchical part name prefix patterns with block reference symbol names.
- Improved **Layout Editor** part set selection functions.
- New **Layout Editor** functions for placing drill hole macros on layout and/or part level.
- **Layout Editor** function **Select Via(s)** moved from **Parts** to **Traces** menu.
- **Layout Editor** net list import and export functions modified to support arbitrary net attribute definitions.
- More detailed net data/information retrievable through **Layout Editor** element property dialogs.
- **Layout Editor** net assistant dialog improved.
- **Layout Editor** functions for deleting nets with improved status messages and user guidance.
- Start point snap added to **Layout Editor** **Add Trace** function.
- **Highlight Net** function added to the **Layout Editor** right mouse button context menu for part pins.
- **Highlight Net** function added to the **Layout Editor** right mouse button context menu for part pins.
- New option for display pattern assignments added to **Highlight Net** facilities.
- New options added to **Layout Editor** functions for trace length adjustments in differential pairs.
- Unroutes/airline listing with net highlight and zoom to airline functions added to **Layout Editor** **Unroutes Report** function.
- New options added to **Layout Editor** functions for trace length adjustments in differential pairs.
- New options added to **Layout Editor** functions for converting traces with large vias into parallel trace pairs with smaller vias.
- New **Layout Editor** functions for replacing via macros on selectable traces and/or nets.
- **Layer Stackup** dialog in the **BAE HighEnd** version of the **Layout Editor** extended by a series of new and additional features and options.
- Improved interactive **Layout Editor** functions for editing trace and polygon corners.
- Improved **Layout Editor** dialogs for net visibility mode settings.
- New **Layout Editor** **Draw Assistant** dialog with powerful functions for creating standard texts and polygons and placing scalable text/polygon groups onto the current layout element.

- **Layout Editor** polygon combination functions now also applicable to board outline.
- **Layout Editor** tile polygon function with new option for creating tile polygons with rounded corners.
- **AutoCAD/DXF Input** function modified to create interpolated polylines for imported ellipses.
- **Layout Editor** context menu for multi-line texts implemented.
- New **Layout Editor** function for mirroring groups at the Y axis without layer change.
- **Layout Editor** copper fill performance significantly improved.
- **Layout Editor** copper fill cutout area processing improved.
- **Layout Editor** copper fill functions to display error markers at problematic segments in fill area outline.
- Improved **Autorouter** status display.
- **BAE HighEnd Autorouter** with advanced DRC support for layer-specific minimum distances.
- New **CAM Processor** function for selecting the layout variant for CAM output.
- New **CAM Processor** function calculating and reporting plot layer coverages.
- Color **CAM Processor** PDF/EPS output to support net color highlight settings.
- **CAM Processor** options for automatically passing PDF outputs to the system's PDF file viewer now also supported by EPS/PDF batch output definitions.
- New **CAM Processor** batch output command for setting environment variables.
- New **CAM Processor** batch output command for adding use-specific comments to the batch output report.
- **CAM Processor** **SCM EPS/PDF Batch Output** function for automatically activating SCM batch outputs after successfully processing CAM batch outputs.
- New **CAM Processor** PDF batch output option for deactivating the fit to page print setting in **Acrobat Reader**.
- New **CAM Processor** PDF batch output option for variant-specific EPS/PDF outputs.
- New **bae.ini** parameter for specifying alternative character fonts for **CAM Processor** DXF outputs.
- New **bae.ini** vector text parameters for **CAM Processor** DXF outputs.
- Drill hole output with drill-class specific DXF layer assignment implemented in DXF export functions.
- Multiline/multipart text concatenated for **CAM Processor** DXF outputs.
- **CAM Processor** to support new options and features for generic insertion data outputs of both PCB sides to the same output file.
- **CAM View** function for loading Gerber data with automatic color setup for input layer visualization.
- Rule system to allow for rule comments to be added/compiled.
- Logical library definition file syntax for **LOGLIB** utility program to support pin-specific pin assignment lists and layout pin name ranges.
- Swap pin/gate definition check added to **LOGLIB** utility program.
- New and improved **User Language** system functions.
- New **User Language** preprocessor statement for excluding compiled **User Language** programs from undo mechanism.
- New and improved **User Language Compiler** warning messages.
- New **User Language Compiler** option for specifying a non-default output directory for listing files.
- New and improved **User Language** programs.
- Many new definitions added to the symbol and part libraries.

Bartels AutoEngineer Version 7.0

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 7.0** are:

- **Windows Vista** support.
- Automatic **User Language** program call after element save supported.
- Notes about DDB file write and/or read access restrictions included with file access error messages.
- **Project Recovery** function for recovering data from damaged DDB files added to **File** / **Library Utilities** / **Copy Elements**.
- New functions and features for system character font selections under **Windows**.
- Tooltips added to toolbar and selection menus.
- New options for configuring toolbar buttons with arbitrary user-defined command sequences.
- Toolbar button for saving color tables.
- New mode for user-specific toolbar positioning memory.
- BAE Dialog box position memory.
- New modes/options for permanently activating the mouse coordinate/info display.
- Improved symbol/label query function.
- Automated Spice netlist export processing.
- EDIF SCM plan import with automatic compilation of logical library definitions.
- Project-wide SCM symbol search with automatic SCM sheet load facility.
- Improved **Schematic Editor** symbol selection dialogs.
- SCM symbol pin and text list placement parameter memory.
- Alternate package selector added to symbol logic editor.
- Improved functions for creating SCM connections.
- New **Schematic Editor** options for automatically moving and/or deleting bus taps when moving/deleting connected connection segments.
- New **Schematic Editor** antenna highlight functions.
- **Symbol Edit Batch** function to support plotter pen width settings for graphic lines and texts.
- Project-wide SCM sheet comment text display.
- **Schematic Editor** group functions now also available on marker level.
- New **Schematic Editor** options for scaling plot outputs.
- New **Schematic Editor** option for generating variant-specific PDF output files.
- New **Schematic Editor** option for automatically passing PDF outputs to the application registered for opening PDF files.
- **Packager** error messaging improved.
- New **Packager** options for selecting different net name assignment schemes.
- New **\$netname** system attribute for net name assignments supported by **Packager**.
- New and improved functions for listing DDB file elements.
- **Update Library** to be applied immediately in **Schematic Editor** and **Layout Editor**.
- New features and options for configuring and accessing SCM and layout favorites.
- SCM and layout library documentation output with symbol names in PDF bookmarks.
- New options for configuring class-specific modes for fixed or dynamic element boundaries for new elements.
- Improved pick element selection facilities in **Schematic Editor** and **Layout Editor**.
- Polygon graphic display added to polygon property dialogs.
- Arc radius display added to polygon property dialogs.
- Modified and improved PDF output functions with higher compression ratios.
- Layout PDF outputs with layer assignments to include display grid layer if visible.
- Modified DXF output functions to support additional third party DXF systems.
- DXF export functions to support vectorized text output.
- New feature for reloading the last layout color table.
- Improved layout report functions.
- Improved pin placement reports.
- Performance of airline calculations in **BAE HighEnd** significantly increased.
- Input grid and pick point markers display added at the edges of the **Layout Editor** workarea.
- New **Layout Editor** functions for adding element-specific coordinates to the input grid.
- New **Layout Editor** and **Autorouter** options for displaying the input grid.
- New options for adding power layer color setup buttons to the **Layout Editor** toolbar.
- New **Layout Editor** option for automatically passing WRL/VRML outputs to a WRL/VRML application.
- Modal **Layout Editor** layer browse dialog.
- Information about vias and traces causing DRC violations added to **DRC Error List** reports.
- New and improved advanced DRC features in **BAE HighEnd**.
- DRC performance in **BAE HighEnd** significantly increased.
- Multiprocessor systems (dual-core, quad-core, etc.) and hyperthreading technologies facilitated by **BAE HighEnd** DRC functions.
- Layout part query function to display part attributes at the graphic cursor and in the info/status window.
- New part system attribute for controlling part mirroring.
- Options for changing drill classes added to padstack edit batch functions.

- New padstack system attribute for part name display on layout level.
- Improved **Layout Editor** part selection dialogs.
- New and/or improved **Layout Editor** functions for automatic placement part selection.
- New **Layout Editor** functions for highlighting routed or unrouted nets.
- New and improved **Layout Editor** functions for trace length queries.
- New modeless net assistant dialog added to **Layout Editor**.
- Improved **Layout Editor** functions for manual routing.
- **Layout Editor** function for teardrop generation with new option for controlling teardrop lengths.
- New **Layout Editor** functions for deleting net-specific and/or trace-specific teardrops.
- New **Layout Editor** functions for optimizing and/or straightening trace segments.
- New **Layout Editor** functions for adjusting trace lengths by meandering.
- New **Layout Editor** functions for synchronizing parallel trace lengths.
- New **Layout Editor** functions for visualizing phase shifts for pairs of parallel traces.
- New **Layout Editor** functions for managing power layer configurations.
- Improved coordinate display functions during the editing of documentary lines in the **Layout Editor**.
- Invisible input layer automatically faded in when creating polygons in the **Layout Editor**.
- Board outline to documentary line copying support added to **Copy Area** **Layout Editor** function.
- New **Layout Editor** functions for combining intersecting polygons.
- New **Layout Editor** functions for generating tiled polygons to support stencil design for thermal pads.
- Hatch areas supported by layout polygon type group selection.
- **Layout Library Edit Batch** function to support plotter pen width settings for graphic lines and texts.
- **Layout Editor** group functions now also available on pad level.
- Copper fill function performance significantly increased.
- Part side layer layer assignment support for fill and hatch areas.
- New copper fill mode for optionally generating pin and via heattraps with traces instead of copper areas.
- Automatic copper fill with new options for cutting out keepout areas without clearance.
- Automatic copper fill functions in **BAE HighEnd** to support net group DRC settings.
- **Autorouter** with improved color table access/management facilities during routing procedures.
- New options for saving and automatically activating layout-specific **Autorouter** control parameters.
- **Autorouter** gridless routing algorithm performance significantly increased.
- **Autorouter** algorithm for gridless pin connections improved.
- New **CAM Processor** options for controlling CAM batch warning message output.
- New **CAM Processor** options for scaling control plot outputs.
- New **CAM Processor** option for generating variant-specific PDF output files.
- New **CAM Processor** option for automatically passing PDF outputs to the application registered for opening PDF files.
- New features for including layout part lists with EPS/PDF outputs.
- New options for controlling the display of drill holes in EPS/PDF output batches.
- New **CAM Processor** and **CAM View** options for selecting metric Gerber formats.
- New and improved heat trap generation for Extended Gerber output.
- New option for creating insertion data output from part macro origins.
- New and improved element query functions in **CAM View**.
- Drilling data tool table added to **CAM View** report output.
- Functions for loading and saving of drilling data assigned to **CAM View** toolbar buttons.
- New and improved Gerber data display functions and options in **CAM View**.
- New **CAM View** parameters for displaying and/or generating flashed heat traps when processing Extended gerber data.
- New and improved **User Language** system functions.
- New and improved **User Language** programs.
- New tag symbol for assigning part mirror modes.
- New pin marker symbol for labels. Label symbols updated and optimized for label pick functions.
- New layout library with page templates for part list outputs.

Bartels AutoEngineer Version 6.8

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 6.8** are:

- New/advanced element edit locking mechanism for multi-user environments.
- Interactive `bae.ini` file editors for changing BAE system parameters within the current BAE session.
- Symbol preview pane and library element search function added to element selection dialogs.
- New toolbar functions for assigning mouse button context functions in **Schematic Editor** and **Layout Editor**.
- Configuration and activation of user-specific grid settings through `[G]` toolbar button.
- BAE command history accessible through `[H]` toolbar button.
- New toolbar functions for full access to the element load history.
- Advanced favorites menu function configurator added to **Schematic Editor** and layout toolbar.
- New options for controlling mouse positioning during or after popup menu activation.
- New system parameter for the configuration and/or deactivation of mouse rectangle definitions through the left mouse button.
- Project-specific directory and base file name variables supported in file name parameter specifications.
- New functions for copying and/or cleaning up project files.
- Number ranges supported in wildcards for specifying element name ranges and/or texts.
- Key programming facilities to support `[Shift]+[Ctrl]` with letter key combinations.
- Improved BAE window access (window "hopping") in **BAE HighEnd** multi-window/multi-screen environments.
- `[Query Element]` function added to **Schematic Editor**.
- Additional **Schematic Editor** input and display grid settings/options.
- SCM symbol and label pick functions improved.
- New options for assigning symbol/part name patterns added to `[Symbol Edit Batch]`.
- SCM sheet resize functions added to **Schematic Editor**.
- New tools for creating SCM symbol selection databases.
- New features and options for the automated generation of SCM symbol and label library documentation files in PDF format.
- New SCM functions for placing label lists and label rows on SCM sheet label.
- New SCM functions and options for replacing part numbers/ids.
- New SCM functions for automatically replacing patterns in symbol names, label names and texts.
- New SCM function for correlating symbol/part names with layout part names.
- SCM symbol logic editor improved.
- List of SCM symbol macros without logical library definition included in SCM cross reference listing.
- Attribute assignment function added to `[P]` context dialog for SCM symbols.
- Support for attribute-specific default value lists added to SCM attribute value assignment function.
- New system attribute for displaying SCM label sheet comment lists.
- New features for automated default value assignments to `$(rpname)` SCM attributes.
- New/improved dialogs for editing variant-specific attribute values.
- New rule for deactivating single label warnings during SCM label list checks.
- New automatic connection corner insertion mode added for manual SCM routing functions.
- Signal router to consider symbol standard texts as obstacles.
- Signal router algorithm for rerouting connections during SCM group repositioning SCM improved.
- New group functions for selecting and/or deselecting SCM symbols according to their attribute setting.
- Feature added for cancelling multi-page generic SCM print outputs.
- New options for scaled SCM EPS/PDF output.
- SCM EPS/PDF output batch support with new color assignment options.
- Option for including predefined headers with Spice export/output files.
- New and improved functions for SCM circuit variants management.
- New `[Backannotation]` feature for transferring layout pin attributes back to the schematic plan.
- Layout part name lookup table for SCM part name assignment checks created by `[Backannotation]` and **Packager**.
- **Packager** error messaging improved.
- New and improved **Packager** backannotation procedures for layout part and pin attributes.
- Length unit support added to the specification of clearance, length and width parameters to be passed to the **Packager**.
- New system attributes for displaying/plotting the **Bartels AutoEngineer** version and build numbers.
- New system attributes for displaying **Packager** and `[Backannotation]` name update information.
- Scrollbars added to net name dialogs.
- `[Zoom All]` to include currently picked group elements when setting overview window.
- New tools for importing multiline texts from ASCII/text table files.
- Automated display of the currently active SCM and/or layout variant name.
- Additional information produced by the **Schematic Editor** and **Layout Editor** `[Report]` functions.
- New **Schematic Editor** and **Layout Editor** functions for semi-automatic symbol/part renaming/renumbering.
- New option for modifying the reference point for processing SCM and layout multiline texts.
- SCM and layout polygon corner point modification with improved context functions/dialogs.
- New shortcut keys for activating freehand polygon sketching in SCM and layout.
- Group polygon toggle functions added to **Schematic Editor** and **Layout Editor**.

- Plot preview functions and features added to **Schematic Editor** and **Layout Editor**.
- PDF output from SCM and layout to support compressed PDF format.
- New system attribute for displaying page numbers with EPS/PDF outputs.
- New rules for assigning non-default EPS/PDF output character fonts to texts and symbols and/or parts.
- New options for setting element-specific colors for EPS/PDF outputs.
- Autocad 14 command support option for fill area output added to DXF export functions.
- New/improved options for DXF multilayer import to SCM and layout.
- Layout net highlights in **BAE HighEnd** automatically transferred to SCM.
- Improved layout color setup dialog with layer usage indication and legacy/third-party documentary layer visualization.
- New layout color table entry for top layer elements.
- New layout color table entries for drill class specific color and display mode assignments.
- **Layer Browse** function added to **Layout Editor**.
- New feature for importing layout macro definition to the **Layout Editor**.
- Connectivity generation and dynamic airline calculation performance in **BAE HighEnd** significantly increased.
- New option for deactivating part macro level DRC when placing parts on the layout.
- DRC error count displayed with **Batch DRC** status message. Feature added for cancelling the **Batch DRC** procedure.
- New **Layout Editor** functions and options for deactivating the online design rule check and for applying the DRC to mouse-selectable or group-selected elements only.
- Layout DRC/report function with improved (more detailed) distance violation error display.
- Inside layer pads excluded from DRC in two-layer layouts.
- DRC 3D Height Model Export to wrl/VRML format.
- New layout DRC rule for optionally treating via copper areas like traces.
- New functions and features for activating a DRC line display mode for net-specific and element-specific minimum clearance settings.
- New **BAE HighEnd** functions and features for assigning non-default DRC parameter blocks for clearance checks to specific elements.
- Layout pin information displayed in part/pin context dialogs activated through **Ⓟ** key.
- Interactive layout placement and selection functions with new/improved element query functions.
- New options for selecting the position of the origin when creating new layout elements.
- New layout symbol edit batch options for text string modifications.
- New option for creating rectangular pads with rounded corners added to layout macro/pad generator.
- New functions and options for automatically assigning constructive part names and pin names when placing layout parts and/or part pins.
- Part pick functions improved.
- New function for rotating layout parts at their pin center point.
- New part macro update facility for automatically correcting part package type selections according to changed net list assignments.
- New **Layout Editor** placement matrix definition dialog.
- New **Layout Editor** functions and features for changing part macro pin positions on layout level.
- New **Layout Editor** function for querying the autorouting grid of selectable traces.
- New **Layout Editor** functions for saving and re-activating net highlight and airline display settings.
- New **Layout Editor** function for splitting trace segments at via positions.
- New **Layout Editor** features for configuring the DRC-controlled trace necking/bending functions in the.
- New and advanced layout DRC block management functions in **BAE HighEnd**.
- New/improved dynamic airline display facilities in the **Layout Editor**.
- New **Layout Editor** functions for moving and copying multi-layer trace groups.
- New gridless object border snap mode for manual routing.
- New **Layout Editor** function for incrementally widening group-selected traces.
- New **Layout Editor** option for specifying a maximum trace width for the generation of teardrops.
- New **Layout Editor** function for generating "snowman" teardrops.
- New trace shield function for placing via rows alongside selectable traces.
- Options for selecting polygon types added to the **Layout Editor** polygon batch processing functions.
- Documentary layer keepout area class support.
- Improved/simplified layout drill hole selection and new feature for selecting layout parts and vias through their drill hole(s).
- New and improved features and functions for defining part outlines and/or dimensions for automatic placement.
- New parameter for specifying fixed part contour expansions for automatic part placement.
- Improved dialogs for activating group functions.
- New options for selecting and/or deselecting layout elements which are only partially placed inside the group polygon.
- New group functions for selecting and/or deselecting multi-layer trace sets/routes.
- New group functions for resizing group-selected areas and setting the pen widths for group-selected texts, documentary lines and split power planes.
- Copper fill parameter access added to **Ⓟ** context dialog for copper fill workareas.
- New features for assigning pad-specific copper fill connection modes on padstack library level.
- Net-specific copper fill area outlines considered by net highlight and net selection functions.
- New copper fill area list function with fill area selection and direct copper fill function access.

- New features for copper fill and hatching function application on all fill areas at a selectable position on either all layers or on a selectable layer.
- New copper fill option for suppressing heat-trap generation for adjacent part pins on the same net.
- Text center alignment support extended to layout signal layers and **PHYSICAL** documentary layer.
- New layout functions for placing text lists and text rows/matrices.
- New and improved **Layout Editor** drawing functions.
- New **Autorouter** function for saving the current control and strategy parameters to `bae.ini` for automatic activation with subsequent **Autorouter** calls.
- Improved **Autorouter** options dialog.
- New **Autorouter** functions for saving and/or re-activating net and airline display and visibility configurations.
- New **Autorouter** options for automatic blind and buried via selection for power layer connections.
- New **CAM Processor** highlight focus display function.
- New **CAM Processor** option for programming the sequence of CAM batch output steps.
- New **CAM Processor** option for including Generic Insertion Output with preselected format specifications in CAM batch output processes.
- New and improved **CAM Processor** options for controlling EPS/PDF batch outputs.
- Increased resolution for single-layer bitmap outputs to Windows clipboard.
- New Gerber format options added to **CAM Processor** photoplot parameter settings dialog.
- Overlapping drill holes recognition. Drill output without redundant drill holes.
- Drill hole output added to AutoCAD/DXF layout data export.
- Option for importing a board outline added to AutoCAD/DXF layout data import function.
- New options and/or features for selecting an origin for insertion data outputs different from the currently selected CAM/plot origin.
- New options for modifying part placement angles when creating insertion data outputs.
- New options and features for CAM batch outputs such as output sequence, drill class check, etc.
- Improved **CAM View** color setup dialog with multi-layer and multi-aperture color assignment support.
- Features for associating Gerber and Excellon files with the Windows **CAM View** module.
- Cache for SQL database access through **User Language** system functions.
- Features for associating **User Language** program source code files with the Windows **User Language Compiler**.
- New feature for automatically activating a **User Language** program when exiting the currently active BAE program module.
- New tag symbol for assigning pin-specific copper fill heat trap connections added to symbol libraries.

Bartels AutoEngineer Version 6.6

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 6.6** are:

- Performance of BAE **Windows** versions significantly improved.
- Option for user prompt activation for saving design changes when switching between BAE modules.
- New command line options for loading library symbols and/or starting **User Language** programs upon **Schematic Editor** and/or **Layout Editor** startup.
- New options for selecting the default element list sort mode for element name selection dialogs.
- New options for element modification time display/sorting in element name selection dialogs under **Windows**.
- New options and/or parameters for adjusting BAE dialog box sizes to different screen resolutions.
- New options for file modification time and file size display in file selection dialogs under **Windows**.
- New options for extending/configuring the middle mouse button context menus.
- New toolbar buttons for quick access to previously loaded elements.
- Redundant redraw operation after BAE module activation eliminated to avoid "flickering" effects.
- Improved text editing and mousewheel support under **Motif**.
- Element position pick and element data editing functions assigned to **Schematic Editor** **Ⓟ** key.
- New options for controlling **Schematic Editor** element pick modes.
- Attribute list output added to schematic cross reference lists.
- New function for automatically creating FPGA symbol/part definitions from **Xilinx** pin assignment files.
- New and improved **Schematic Editor** functions for searching and/or locating nets and/or labels in SCM plans.
- New and improved **Schematic Editor** functions for assigning attributes to SCM symbol groups.
- New **Schematic Editor** function for moving schematic label attributes.
- Symbol bus pin definitions for automatic symbol bus pin connections.
- Symbol logic editor to support automatic part/symbol attribute assignments.
- New symbol logic editor option for importing pin assignments and pin types from **.csv** files.
- New symbol logic editor dialog for entering SCM to layout pin assignments.
- New symbol logic editor functions and options for interactive SCM to layout pin assignments.
- **Symbol preview** pane added to SCM symbol database/selection dialogs.
- **Add Connection** and **Load Macro** functions added to **Schematic Editor** bus tap context menus.
- New and improved functions for creating SCM connection.
- Improved features for defining and manipulating SCM bus definitions.
- New **Schematic Editor** net highlight functions with automatic zoom.
- Advanced **Schematic Editor** context functions for quick circle and/or arc insertion during graphic line/area editing.
- New **Schematic Editor** functions for importing bitmaps.
- **Schematic Editor** create text dialog with programmable menu for selecting frequently used SCM texts.
- New system attributes for upper-case element data display.
- New **Packager** functions for automatic test point generation for all nets or for multi-pin nets.
- New **Packager**-assigned layout part attributes for tracking hierarchical schematic sub-block origins.
- Extended **\$plname** syntax for alternative part package type specifications.
- Improved control over part package assignments for symbols/parts from multiple hierarchical sub-block instances.
- New and improved **Packager** functions for automatic hierarchy block part numbering.
- **Packager** to support indirect pin attribute assignments through **newattr** logical library definitions.
- **Packager** to support automatic net name assignments to **net** pin attributes.
- **Packager** to issue warnings about unused gates in multi-gate parts.
- Complete listing of **Packager** messages with instructions for solving possible problems added to the **BAE User Manual**.
- New options for assigning right mouse button context functions to SCM and layout library elements.
- Name range pattern support for pin list specifications in logical library part definitions.
- New options for specifying variant-specific fixed part attributes in the part library.
- New system attributes for displaying last **Packager** run information.
- New date display system attributes with two-digit year format.
- New system attribute and facilities for assigning and displaying DDB file element comments.
- New SCM and layout functions for toggling element group selection modes.
- EPS/PDF output functions in SCM and layout to save plan-specific output file names.
- EPS/PDF output functions in SCM and layout to support PostScript fonts for multi-line texts.
- New layout EPS/PDF functions and options for generating output batches, plotting special layers (workarea, element origin, errors), and converting white display elements to black plot output.
- **Layout Editor** context menus for object placement and polygon corner point input with new function for automatically selecting the center point between two selectable objects or corner points.
- **Layout Editor** with improved toolbar functions for using/accessing technology-dependent color tables.
- **Layout Editor** DRC error listing with error element display.
- Advanced **Layout Editor** key programming facilities for moving through the layer stack.
- New **Layout Editor** function key assignments for changing to the next lower or higher layer.
- New **Layout Editor** option for activating automatic **Batch DRC** when loading layouts.
- New function for importing **Orcad** MIN format layout data.
- Improved **Layout Editor** functions for automatic part renaming/renumbering.

- New features for assigning part specific attributes through the **Layout Editor** rule system.
- New **Layout Editor** options for controlling part list outputs when generating reports for layout variants.
- New **Layout Editor** functions for selecting parts from hierarchical schematic blocks for placement.
- Board area size and part space requirements display added to layout placement histogram function.
- New **Layout Editor** options for activating and/or deactivating airline display through part, net or pin attribute selections.
- New **Layout Editor** context functions for net/trace manipulation during net highlight.
- New **Layout Editor** options for selecting nets to be highlighted by net attributes.
- New **Layout Editor** function for deleting short-circuit traces.
- New **Layout Editor** functions and options for creating in-trace teardrops for necking/bending trace segments.
- Numerous new and improved **Layout Editor** context menu functions for layout part, trace, polygon and/or line, text and drill hole editing.
- **Layout Editor** function for creating split power planes with new power layer selection menu.
- Advanced **Layout Editor** context functions for quick circle and/or arc insertion during trace and polygon editing.
- New layout part edit batch option for placing/displaying part height DRC texts.
- **Layout Editor** drill hole display enforced during layout drill hole editing.
- **Layout Editor** with improved pad/padstack generator and new functions for automatically generating blind and buried vias.
- New **Layout Editor** function for automatic group selection of antennas (traces with trace ends not connected to any netlist element).
- **Layout Editor** group selection mode to be preserved when editing layout traces. New group functions for selecting and/or deselecting traces with a specific width.
- New **Layout Editor** functions for trace to area conversions.
- New **Layout Editor** functions for converting documentary lines and area outlines to traces.
- New **Layout Editor** function for defining layout keepout areas to be only considered by automatic copper fill and/or the **Autorouter**.
- New **Layout Editor** function for placing fill area vias.
- New **Layout Editor** function for inserting orthonogal segments during the creation of layout documentary lines.
- Improved **Layout Editor** functions for distance measuring.
- New **Layout Editor** functions for importing bitmaps.
- Improved BAE font editor.
- Maximum **Autorouter** routing signal layer count increased from 12 to 16 (**BAE Professional, BAE HighEnd**).
- **BAE HighEnd Autorouter** to support trace/via keepout areas on signal layers.
- New **Autorouter** parameter for specifying a minimum board outline clearance.
- New **Autorouter** parameter for setting a via-to-pin minimum clearance value for gridless routing which is different from the standard minimum distance.
- New **Autorouter** option to prevent acute-angled SMD pad connections.
- New **Autorouter** options for activating and/or deactivating airline display and for defining net groups for autorouting through part, net or pin attribute selections.
- Layout DXF export and import functions to support keepout area output and input with element height specifications for DRC.
- Layout PDF export functions to support **Acrobat Version 6.0** PDF layers.
- **CAM ProcessorCAM Processor**
- New functions for automatic design/multilayer data output to different layers/elements of a DDB file.
- **TopcadCAM ProcessorCAM ProcessorTopcad**
- Support for format added to Gerber aperture table impot functions.
- **CAM ProcessorCAM Processor**
- New function for automatically creating Gerber aperture tables for selectable layout libraries.
- New **CAM View** command line options for automatically loading Gerber and/or Excellon files upon **CAM View** startup.
- New **CAM View** functions and features for importing CAM data set copies onto a matrix.
- New and improved **User Language** index variables and **User Language** system functions.
- New and simplified tag symbols/definitions for pin and net attribute assignments added to symbol and part libraries.
- New tag symbols for assigning net-specific and pin-specific copper fill parameters added to symbol and part libraries.
- New tag symbols for assigning part-specific attributes.
- Rule for text and graphic display/output control according to part placement status added to all layout part library definitions.
- Many new definitions added to the symbol and part libraries.

Bartels AutoEngineer Version 6.4

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 6.4** are:

- Improved features for specifying user-specific parameter configurations.
- Enhanced features for mouse button function assignments in BAE pulldown menu user interfaces.
- Module-specific window positions and dimensions to be restored when re-starting and/or switching between different BAE modules.
- Interactive (grid) placement through shift/arrow and enter keys.
- Improved toolbar design data view window management.
- Improved and extended key programming and menu configuration function.
- New features for defining and activating different favorite menu configurations for different tasks.
- Options for specifying different Undo buffer sizes for SCM and layout.
- Improved DDB element selection dialogs.
- Menu functions for deleting DDB file elements and overwriting DDB file elements or groups with automatic element backup.
- Improved global net highlight (cross-probing) in **BAE HighEnd**.
- New feature for creating text/hyper links between different SCM sheets.
- New `bae.ini` entries for setting the bus display mode and the symbol numbering mode for new SCM sheets.
- Automatic SCM Sheet Frame Insertion.
- New functions for automatically appending and deleting SCM symbol name extensions.
- New SCM functions for selecting and managing symbol/part pools/sets for placement.
- Toolbar and context menu functions for copying symbols and attributes to support symbol rule transfers.
- New features for optionally locking SCM attribute value assignments.
- Improved symbol router for re-routing SCM connections to moved symbols and/or groups.
- Optional mode for creating SCM connections by placing pins onto each other or by drawing connection segments over pin rows.
- New feature for group-selecting labels on SCM plan level.
- Improved and enhanced bus tap processing functions. New functions for selecting and assigning non-default bus tap symbols on SCM plan level.
- Extended features for net attribute assignments on SCM plan level.
- New function for automatically generating block symbol definitions for hierarchical schematic block circuit drawings.
- New and improved functions for automatically placing and naming pin lists and/or pin rows on SCM symbol definitions.
- SCM text definitions to support different positioning on unmirrored and mirrored symbols.
- New **Packager** functions for automatic test point generation.
- Improved library symbol and part browsers.
- New system attributes for SCM and layout project file name display.
- Feature for assigning copper fill parameters to SCM signals.
- New SCM and layout options for displaying and/or indicating text and symbol and/or part pick points and polygon and connection and/or trace corner points.
- New option for placing objects outside the currently defined element boundaries and automatically adjusting the element boundaries.
- New feature for selection the reference origin for SCM and/or layout clipboard operations.
- New function for transferring symbol name and attribute text positioning to group-selected symbols.
- Improved SCM and layout functions for entering polygon point coordinates.
- DXF import in SCM and layout with improved functions for converting polygons.
- New layout toolbar feature for adding buttons for documentary layer color and visibility mode selection and documentary layer element generation.
- New option for displaying part attribute position rubberbands on PCB layout level.
- New feature for fixing ("glueing") layout element positioning and/or placement.
- Layout design rule check to support part definitions with space underneath.
- New `bae.ini` entries for setting the trace edit display mode, the via checking range, the default via padstack and the automatic board outline generation and element expansion modes for new layouts.
- Improved **Layout Editor** net name selection dialogs.
- New function for adjusting layout element origins to the internal system grid origin.
- Improved layout element query functions for documentary layer elements, height DRC settings and logical part pin names.
- Improved **Layout Editor** functions for manipulating documentary lines.
- Layout macro generator with new options for automatically generating SMD pads and/or padstacks with different mirror display dimensions and SMD/solder mask size offsets.
- Improved and extended batch functions for automated layout library symbol editing.
- New part naming function for automatically numbering layout parts with part name prefix.
- New layout part placement snap function.
- Manual pin/gate swap display improved.
- Automatic part pin placement function with new options for pin matrix placement (e.g., for BGA footprint definitions) and parallel pin row placement in reverse order (e.g., for DIL or SO footprint definitions) with arbitrary alphanumeric index pattern support for the pin numbering.

- New option for generating layout library documentation with **Bae Light** software.
- New key-assigned functions for changing trace segment widths, text sizes and group scaling factors during placement.
- New option for changing trace widths of group-selected traces with Design Rule Check.
- New layout functions for modifying group-selected trace and polygon corners.
- New layout functions for automatically creating parallel trace bunches and trace patterns.
- Improved blind and buried via selection methods for layer changes during manual trace routing.
- Facilities for temporarily defining layout keep out areas.
- Visual distinction between visible mirrored and visible unmirrored layout areas.
- New options for assigning area-specific and pad-specific copper fill parameters. New feature for setting the copper fill area processing sequence. New functions for automatically filling layout copper fill areas with via patterns.
- New function for changing drill hole parameters.
- Group function application restrictions on layout padstack level removed.
- **BAE HighEnd** layer stackup definitions with new feature for assigning layer comments and a new option for exporting the layer stackup definition to a text file.
- **Autorouter** to support net-specific via type.
- Feature for excluding specific nets from the autorouting process.
- Feature for net-specific routing layer assignments for the autorouting process in **BAE HighEnd**. Feature for reserving autorouting layers for specific nets and/or net groups in **BAE HighEnd**.
- Gridless autorouting performance significantly increased.
- Feature for presetting **CAM Processor** HPGL plot parameters.
- New **CAM View** color selection dialog for Gerber aperture display.
- **CAM View** drilling data loader to support import of data sets with different tool tables. New function for saving merged drill tool tables to Sieb & Meier format.
- **CAM View** Extended Gerber import to support finger-shaped (oblong) apertures and simple aperture macros.
- Simplified layer selection for **CAM View** Gerber data import.
- New **CAM View** functions for automatically importing and exporting batch-generated drilling data and Gerber plot files./
- New **CAM View** function for clearing/purging a single/selectable CAM data set from the current display.
- Logical library definition feature for automatically generating derived footprint-specific part assignments.
- New feature for automatically activating a **User Language** program after creating a new element.
- New SQL **User Language** system functions for quickly inserting large amounts of data into SQL database tables.
- SCM symbol libraries updated and supplemented by new symbols and templates.

Bartels AutoEngineer Version 6.2

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 6.2** are:

- Update installation with automatic parameter configuration update.
- Module-specific color table configurations. **Schematic Editor** optimized for white background display. Predefined BAE system color files for white background configurations supplied.
- Windows and Motif menu shortcut key display.
- Improved support for command history access, command sequence memory and command (sequence) repetition through right mouse button.
- Features for programming special/nonstandard keys.
- Horizontal scroll through mouse wheel.
- New toolbar functions for configuring and activating a user-defined favorites menu.
- History function for quickly accessing recently saved/loaded elements.
- Features for defining and activating macro command sequences.
- Element overview windows of the **Schematic Editor** and **Layout Editor** toolbars with zoom window selection facility.
- Mathematical expressions supported in Windows and Motif dialog elements for numerical value queries.
- **2.5 mm** and **0.25 mm** options added to **Schematic Editor** grid selection menus.
- Net highlights to be kept when loading different SCM sheets from the same project file. Project net highlight for bus signals.
- New SCM symbol/label copy function. Improved features for repeated SCM symbol and label placement with name and attribute text position preservation. New option for non-default label macro selection during SCM label placement.
- Label check with automatic single label/bustap reference zoom.
- New SCM function for moving connection corner/end points.
- SCM signal router to reroute bus tap connections when moving bus taps, connection segments or groups. Bus tap function with bus signal name selection dialog.
- Bus tap listing added to **SCM Cross Reference**.
- New SCM function for automated connection pattern (connection comb, multiple parallel connections) generation.
- New SCM functions for changing and setting graphic and text line widths.
- New SCM function for assigning text classes to group-selected texts.
- New SCM function for generating group matrix copies.
- New feature for assigning net attributes to non-virtual logical library symbol definitions.
- New **\$r1ext** (Requested Logical Library Name Extension) attribute evaluated by the **Packager** for controlling logical library definition assignments.
- SCM symbol/part frame display in **BAE HighEnd** to reflect layout part placement status.
- Feature for automatically selecting the last saved project element when loading SCM and/or layout elements. Advanced features for selecting the name of the SCM sheet and/or layout to be automatically loaded when switching to the **Schematic Editor** and/or the **Layout Editor**, respectively.
- New grid setting options for automatic input/display to display/input grid adjustments.
- Highlight focus functions for selective/exclusive display of highlighted SCM and/or layout elements.
- New SCM and layout functions for repetitively placing pins on symbol and/or part level.
- New functions for setting graphic and/or polygon line dash modes in SCM and/or layout.
- Advanced text default settings for repeated add and edit text operations in **Schematic Editor** and **Layout Editor**.
- Symbol/and part reference display during **Move Name** and **Move Attribute** operations.
- **Schematic Editor** and **CAM Processor** **HP Laser Output** and **Generic Output** functions of the BAE Windows versions to consider standard line width and/or plotter pen width settings when plotting texts and/or lines (without line width assignment).
- EPS/PDF plot output functions with new character font selection options. **Schematic Editor** with new EPS/PDF output option for deactivating EPS/PDF comment text output. New EPS/PDF output option for automatically selecting the currently visible layers/objects for monochrome output. New layout functions for creating arbitrary EPS/PDF batch output configurations.
- Logical/SCM pin names displayed with layout placement data queries.
- Improved **BAE HighEnd** functions for locating layout part SCM symbols.
- Layout octagon grid settings for traces only, areas only or traces and areas.
- New layout polygon cross and center point snap functions during trace and polygon editing.
- Layout layer selection menus improved.
- **Layout Editor** with new/improved polygon cross and center point pick functions.
- Layout distance query function with current distance display during end point selection.
- Layout toolbar with new buttons for default input layer and signal layer color and visibility mode selections.
- Layout group movement functions with option for automatically selecting part areas with connected trace ends.
- **Layout Editor** with dynamic distance and airline length display during manual part placement.
- Trace length display during manual routing in **Layout Editor**.
- Part type errors and short-circuit net names displayed in layout DRC error listing.
- **Layout Editor** **Swap Parts** function to preserve part name and attribute text positions.
- New options for part and pin specific airline display net selection in **Layout Editor** and **Autorouter**.
- Layout airline density diagram dialog.
- New **Layout Editor** option for deactivating via optimization during manual routing.

- New **BAE HighEnd** functions for querying and setting layout trace impedance characteristics.
- New layout functions for changing and setting text line widths, documentary line widths and power layer isolation widths.
- New layout functions for centering documentary layer texts.
- Improved **Layout Editor** drawing utility functions for the quick generation of rectangular and/or circular polygons.
- New functions for splitting layout areas.
- Improved functions for generating and deleting layout keepout areas alongside polygon outlines.
- New functions for selecting and/or deselecting groups of layout elements inside existing polygons.
- Copper fill functions with automatic cutout area polygon correction.
- Teardrop generation with new teardrop parameter dialog.
- New configuration file entries for setting default **Autorouter** control and strategy parameters.
- New configuration file entry for setting the **Autorouter** task priority.
- HyperLynx layout simulation data output.
- **CAM Processor** drilling data output with drill class selection dialog.
- New function for exporting layout data to GENCAD 1.4 format.
- New and improved **User Language** system functions for creating directories, setting BAE process priorities, retrieving file type specific applications, system color palette queries, interactive coordinate input, setting raster modes, processing dashed polygons, displaying bitmaps in dialogs, assigning rules to layout layer stackups, for querying and setting the **Layout Editor** trace segment move and via optimization modes, etc.
- Layout library updated and supplemented by new definitions.

Bartels AutoEngineer Version 6.0

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 6.0** are:

- Special characters added to BAE system character font.
- BAE system file name extensions changed to simplify BAE update installations.
- More flexible dialogs for numerical value specification.
- Improved zoom functions.
- Improved, multi-column element/name selection dialogs.
- Element selection type configurations for context functions.
- Standard directory selection dialogs under Windows.
- Mouse wheel support under Windows.
- SCM functions for renaming and/or renumbering symbols to retain text positions.
- Improved SCM label and library element selection functions and dialogs.
- Improved part search functions and dialogs.
- New function for moving SCM symbols relative to old position.
- Enhanced SCM functions for automatic symbol naming.
- Enhanced SCM features for automatic bus tap placement.
- New functions for rotating and mirroring SCM graphics.
- Joined net indicators in **Packager** report file.
- Improved layout color table selection.
- Improved display function for layout element queries.
- **Layout Editor** DRC error list to display power layer errors and automatically fade-in error layers.
- Layer default mode for placing layout traces, areas and texts.
- Improved layout trace and pad layer selection menus.
- **Layout Editor** pin row placement dialog with optional name prefix/suffix specification(s).
- **Layout Editor** layer change option during polygon and text placement.
- **Layout Editor** airline display to next unconnected pin during manual routing.
- New function for moving layout texts relative to old position and for creating and editing multi-line texts.
- New **Autorouter** functions for saving and loading control and strategy parameter sets.
- **Autorouter** via connections to split power planes.
- **Autorouter** algorithms for BGA fanout routing and microvia ("via-in-pin") support.
- **Autorouter** with enhanced via position check options for more economic placement of blind and buried vias.
- New **Autorouter** option to support via offsets for arbitrary routing grids.
- Halfgrid Rip-Up routing resolution dramatically increased.
- Rip-Up and Optimizer Cleanup routing procedure CPU time requirements for large PCB boards with a high number of pins and vias reduced by several factors.
- Maximum number of procedures for **Autorouter** batches increased to 20. New option for loading predefined **Autorouter** parameter settings between different routing procedures of **Autorouter** batches. New functions for saving and loading **Autorouter** batches.
- **CAM Processor** and **CAM View** with enhanced dialog for Gerber aperture table definition.
- Drilling data output with tool tables for rule-assigned drill tool tolerances.
- **CAM View** layout generation with G36/G37 Gerber code conversion.
- New **User Language** system functions for path name and environment variable retrieval, part and net name selection, polygon range query, split power plane check, power layer error count query and default layout layer (mode) query and setup.
- Centralized layout symbol library.

Bartels AutoEngineer Version 5.4

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 5.4** are:

- **Bartels AutoEngineer Version 5.4** can be operated on Windows XP systems.
- New BAE software configuration **BAE FabView** for generating manufacturing data for PCB production; compatible with **BAE Professional** and **BAE HighEnd**, however, without the possibility of saving PCB design changes; cost-effective CAM output facility for PCB manufacturing service providers/departments who wish to serve BAE users.
- All autoplacement and automatic copper fill functions from the **Autoplacement** module have been integrated to the **Layout Editor** of **BAE Version 5.0**. The **Autoplacement** module has therefore become obsolete and has been removed from the BAE software.
- Text input through dialogs with cursor key support and operating system specific cut, copy and paste functions.
- Size specification functions improved.
- SCM symbol placement functions with advanced dialogs for library element selection.
- Advanced SCM symbol attribute value assignment dialogs.
- Option for preserving name and attribute text positions when moving symbols.
- Text class assignment options for **Schematic Editor** text display and plot visibility control.
- SCM group selection by symbol name. Label symbol assignment option for group-selected SCM labels.
- Net attribute assignments through label symbols and/or busses.
- Improved SCM functions for automatically re-routing connections when moving symbols and/or groups.
- Features for defining logical parts consisting of arbitrarily connected SCM symbols and/or different layout parts (logic synthesis).
- Automatic generation of project specific layout libraries during **Packager** runs.
- New **Packager** options for specifying an alternate layout library, updating logical part definitions in the project file and relaxing missing layout part/pin error severity levels.
- **Packager** to perform ERCs (electrical rule checks) through pin type attribute evaluation.
- Special texts/attributes for displaying project file and element names. Special texts for displaying the last modification date and time of the currently loaded SCM element.
- New functions for naming groups to support persistent multiple group definitions per SCM and/or layout element. New functions for saving and loading SCM and layout group elements to/from clipboard.
- Layout group selection by part name, polygon type or net. New functions for changing polygon types of group-selected layout polygon elements.
- ICAP net list import.
- Improved layout functions for part set definitions, net name input/selection and via selection.
- Element query to indicate fixed mode. Pin and via element query to display drill classes.
- **1/240 Inch** and **1/480 Inch** fine grid options added to layout grid selection menus.
- Layer-specific polygon display pattern assignments for improved multi-layer structure visibility.
- Improved direct power layer connection display.
- Dialog for layer-specific minimum distance value settings for the advanced DRC in **BAE HighEnd**.
- New layout feature for part insertion pick point query.
- Improved **Layout Editor** functions for moving trace segments improved.
- New functions for generating layout angle measuring graphics.
- New copper fill option for automatically selecting isolated areas.
- Features for active copper area definition on layout part and padstack level.
- Facility for copper fill keepout area generation (e.g., to suppress heat-trap connections for specific pins).
- New option for arbitrary hatching angle settings for hatched fill area generation.
- Advanced copper fill functions for generating prototype milling contours, positive solder resist masks from negative layers, dielectric layers for hybrid circuits, etc.
- Netgroup-specific clearance check in **BAE HighEnd**.
- Layout PDF and EPS output with new options for arbitrary output scaling factor settings.
- Sieb & Meier drilling data output with drill tool table integrated to drilling data output file and a resolution of up to 1/1000 mm.
- Project specific rule databases.
- More efficient **User Language** programs through additional **User Language Compiler** optimizations and optimized **Bartels User Language Interpreter** string operations.
- New **User Language** index variable types for accessing layout net list data in SCM. Layoutnetzlistendaten im Schaltplanpaket. New **User Language** system functions for **Packager** data query, layout net list data query in SCM, SCM and layout element text attachments and queries, **CAM Processor** drill tool tolerance setting and query, etc.
- All **User Language** programs completely revised and extended by a series of new features and functions.
- SCM and layout libraries supplemented by a series of new symbol and part definitions. SCM symbol name and attribute text placement generalized. Insertion pick point texts added to layout symbols.

Bartels AutoEngineer Version 5.0

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 5.0** are:

- All autoplacement and automatic copper fill functions from the **Autoplacement** module have been integrated to the **Layout Editor**. The **Autoplacement** module has therefore become obsolete.
- Customized system and display parameter to be activated/loaded from **bae.ini** file.
- Cursor/arrow keys, Page Up/Down keys and Home/End keys to support graphic workarea scrolling under Windows. Scrollbars added to text output areas under Windows.
- Project element load functions added to **File** menus.
- Improved part and net name selection dialogs and menus.
- Context and import/export menu configuration.
- Dynamic menu function key assignments in pulldown menu configurations and dynamic mouse key function assignment in **Schematic Editor** and **Layout Editor**.
- Improved functions for block circuit diagramming and hierarchical circuit navigation.
- Automatic SCM symbol/part clone generation and placement.
- Improved **Schematic Editor** functions for attribute value assignment, attribute value transfer and attribute value display and query. Default SCM symbol attribute settings.
- Symbol/label query function with attributes display added to **Schematic Editor** context menus for symbols/labels.
- Features for displaying and/or querying alternate layout part package type assignments on SCM plan level
- New functions for SCM text center-alignment.
- Advanced **Schematic Editor** functions for renaming/renumbering symbol/part groups.
- SCM connection rule assignments and advanced SCM net highlight functions,
- Spice model type and pin output sequence assignments to SCM symbols and Spice net list output.
- SCM plot element visibility settings.
- **Schematic Editor** and **CAM Processor** bitmap plot output to Windows clipboard for further processing in other Windows applications.
- **Packager** to support SCM sheet error tracking, layout gate assignments and alternate layout part package assignments.
- Symbol/part search and group selection through attributes.
- Hotkeys for SCM and layout text size settings, layout trace width settings and layout group scaling.
- Group function operation on mouse-selectable SCM and layout regions.
- Layout (part) height design rule checking.
- Layout DRC error list with DRC error localization.
- Improved layout part, trace and polygon pick functions. New trace edit display modes for manual routing.
- Hotkeys for rotating layout pick elements (parts, pins, texts, polygons, groups) at arbitrary angles.
- Automatic equidistant parallel traces generation.
- Layout keepout area generation alongside polygon outlines.
- Text and polygon line width specifications for display and plot output.
- Drill hole power layer assignments.
- Special texts for displaying the last modification date and time of the currently loaded layout element.
- Improved autoplacement part set selection. Initialplacement to be applied on selected part set only. Layout part set selection through SCM group symbols.
- New **Layout Editor** group display mode option for dynamically displaying group-selected traces, vias and drill holes during interactive group placement.
- Automatic copper fill with improved net/connectivity recognition.
- Improved **Autorouter** status display.
- Net-specific **Autorouter** airline display. Autorouting processes restricted to displayed nets/airlines ("net group routing").
- Improved gridless mode diagonal autorouting.
- Reflow-reflow SMT/SMD soldering support.
- Simplified generation and assignment of rules which only set a single predicate value. All system-supported rules transparently processed through menu-assigned **User Language** programs.
- All **User Language** programs completely revised and extended by a series of new features and functions.

Bartels AutoEngineer Version 4.6

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 4.6** are:

- **Bartels AutoEngineer Schematics** available for free.
- Number of simultaneously accessible layout documentary layers in **Bartels AutoEngineer Professional** increased from 12 to 100.
- New low-end/low-cost BAE configuration **Bartels AutoEngineer Light** for educational purposes and/or semi-professional applications, with full **BAE Professional** functionality, however, limited to a maximum PCB layout size of 180mm x 120mm and a maximum of two signal/copper layers.
- BAE configuration **Bartels AutoEngineer Educate/Entry** renamed to **Bartels AutoEngineer Economy**. Full **BAE Professional** functionality, however, limited to a maximum PCB layout size of 350mm x 200mm and a maximum of four signal layers to be simultaneously routed by the **Autorouter**. All other restrictions (no bus definitions on SCM symbol level, no layout polygon mirror mode definitions, only 9 predefined layout documentary layers, minimum **Autorouter** grid 1/40 inch, no availability of **Neural Autorouter** and **Neural Rule System**) dropped.
- Improved support for BAE network installations through retrieval and verification of modification times when loading and/or saving elements.
- **Undo/Redo** steps increased from 10 to 20.
- **BAE HighEnd** design data management functions optimized for significant performance increase when loading and/or processing copper fill areas on large layouts.
- New **BAEHELP** utility program for accessing the BAE online documentation under Windows 95/98/ME/NT/2000.
- Option for saving the currently modified element when exiting BAE under Windows. Escape key to cancel Windows element name query dialogs, tabulator key to focus on listbox in Windows element name query dialogs.
- New parameter setup dialogs for optional use under Windows and Motif.
- Facilities for configuring cascading menus under Windows and Motif. Right mouse button repeat function to allow for repeated call to submenu functions under Windows and Motif.
- Advanced features for BAE program start and DDB file access under Windows 95/98/ME/NT/2000.
- Improved SCM symbol pick functions.
- New SCM functions for repeatedly replacing and/or changing selectable texts.
- New SCM group mirror option.
- New SCM rules for optional single-segment pin connection highlight display ("antenna highlight").
- New SCM rules for controlling symbol text visibility according to symbol rotation.
- New features for editing and compiling logical library part definitions from the **Schematic Editor**.
- New SCM and layout library utility functions for copying and deleting menu-selectable DDB file elements.
- Color support, A3 paper size option and parameter dialog box added to the SCM and Layout facilities for EPS (Encapsulated PostScript) and PDF (Adobe Portable Document Format) output. A4 PDF scaling option and mirrored PostScript font support added to the layout facilities for EPS and PDF output. Multi-layer selection introduced to the EPS/PDF output and to the AutoCAD/DXF export layout facilities.
- Enhanced drill class definitions for mirroring blind and buried vias.
- New **User Language** programs for exporting and importing CIF format layout data.
- Semi-automatic layout element creation support on **Layout Editor** startup after successfully running **Packager** on design file without layout.
- **Layout Editor** **Query Element** function extended (padstack macro name display for part pins, maximum drill diameter display for padstacks and vias). **Query Element** function integrated to **Autoplacement** module.
- **Layout Editor** **Report** function to distinguish between number of copper layer distance violations and number of documentary layer errors.
- **Layout Editor** functions for moving parts to support new options for either displaying all airlines or part-specific airlines only.
- New **Layout Editor** function for splitting trace segments.
- New option for selecting different trace edit display modes.
- Specification of nets to be included to or excluded from airline display to support net name pattern input.
- **Layout Editor** **Highlight Net** function with new option for coloring highlighted nets.
- New option introduced to **Layout Editor** load, move and copy group functions for scaling placement coordinates and dimensions of currently selected group elements.
- New Copper Fill options for substituting full circles with octagons to reduce Gerber output data amount when Gerber arc commands are not allowed.
- New Gridless Router to be optionally activated in the **Neural Autorouter**, allowing for traces to leave the routing grid under virtually any condition and rout between off-grid pins, thus providing significantly better routing results for dense SMT boards. This makes the **Bartels AutoEngineer** the first PCB router worldwide to combine advanced autorouting technologies of gridless routing, rip-up/retry/backtracking routing and router-triggered pin/gate swaps.
- Rip-Up Router much more efficient when routing nets with large trace widths. Redundant Optimizer passes avoided through automatic rip-up parameter adjustments during rip-up routing.
- New options for saving and loading project-specific CAM parameter settings. CAM mirror mode and rotation indicators to be displayed at CAM origin.
- Maximum number of apertures for Gerber photoplot aperture tables increased from 200 to 900.
- New **User Language** system functions for dialog box programming, post processing, text edit field implementations, logical library definition compilation, layout part pin query, net highlight color query/settings, etc.
- All **User Language** programs completely revised and extended by a series of new features and functions.

- New router control attribute assignment tag symbols added to SCM symbol library. New parts (connectors, SMDs) provided with new layout libraries.

Bartels AutoEngineer Version 4.4

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 4.4** are:

- Overall performance of BAE Windows and DOS software improved.
- SCM and layout symbol/part library file access improved.
- Functions for element name specification improved.
- New SCM and Layout functions for closing the currently loaded element.
- Possibility of directly switching between BAE modules also allowing for automatic Packaging when switching from the **Schematic Editor** to the layout system.
- Windows and Motif user interfaces improved by a series of new features such as element name query autoscroll.
- New options menu for automatically selecting predefined sheet sizes when creating new schematic plans.
- SCM signal router for automatic connections re-routing during symbol and/or label move operations improved. New function for automatically connecting two selectable points on the currently loaded SCM sheet.
- New **Schematic Editor** function for moving/placing selectable symbol attribute texts.
- New **Schematic Editor** function for renaming bus connections.
- New system attributes for automatically displaying and plotting the current time and/or date on SCM sheet and layout level.
- Context menus providing object-specific functions in SCM and **Layout Editor**.
- Generic Output functions of the BAE Windows **Schematic Editor** and **CAM Processor** versions to support multi-copy output, multi-page (i.e., multi-element) output and plot area selection.
- New feature for dynamically assigning non-default logical library definitions to SCM symbols.
- New options for selecting millimeter input and display grids in the layout system.
- **Layout Editor** **Report** function to display additional information on used signal and power layers.
- New **Layout Editor** functions for rotating and mirroring documentary polygons and/or copper areas, converting polygon corners into arcs and/or diagonal segments, and for joining documentary lines.
- New **Layout Editor** function for moving/placing selectable part attribute texts.
- New features for documentary layer graphic and text display depending on part type.
- New **Autoplacement** option for restricting automatic part mirroring to 2-pin SMDs only, thus allowing for solder side placement of small parts such as block capacitors whilst placement of SMDs with more than 2 pins is forced onto the PCB part side.
- New **Full Autoplacer** function for automatically reducing part expansion settings until complete placement is achieved or part expansion is reduced to zero. Block capacitors excluded from part expansion, thus allowing for tighter placement to supplied parts. Block capacitors placement preferably on top or on right-hand side of ICs.
- **Neural Autorouter** gridless routing performance and Rip-Up Router half-grid routing performance significantly improved.
- New **Autorouterw** option for suppressing graphic output during routing to speed-up the routing process.
- New **BAE HighEnd CAM Processor** option for suppressing output of unconnected pads when plotting inside layers.
- New **CAM View** option to process incremental coordinates when loading Gerber and/or Excellon data.
- New **COPYDDB** utility program option for replacing existing destination file elements only.
- Optimized **Bartels User Language Interpreter** memory management significantly improving **User Language** program run-time performance.
- EDIF data import, SCM rule assignment functions, group selections through rectangles, schematic sheet and layout variants management, automatic off-grid pin connection when manually routing, programmable generic insertion data output and new options for PDF (Adobe Portable Document Format) output from SCM and layout implemented with **User Language** programs.
- Symbol and part libraries supplemented by a series of new definitions.

Bartels AutoEngineer Version 4.2

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 4.2** are:

- New interactive **AutoEngineer** setup utility **BAESETUP** for Windows/Motif versions. Environment variables introduced for user-specific BAE system setup in multi-user network environments.
- Toolbars supplemented by buttons for calling frequently used file management functions. Improved user interaction introduced to functions such as Exit BAE, verification queries, part name change, text input, Windows/Motif graphic workarea scrolling, etc.
- **Backannotation** integrated to **Schematic Editor**. **Backannotation** requests to be processed automatically when loading plans to the **Schematic Editor**.
- New feature for automatic symbol attribute transfer integrated to SCM toolbar.
- New SCM functions for moving and deleting bustaps introduced to SCM.
- New features introduced for defining texts with surrounding boxes.
- SCM and layout extended by facilities for simultaneously and/or optionally displaying both logical and physical part and pin names.
- **BAE HighEnd** supplemented by a series of messaging functions for selecting and/or placing layout parts by clicking the corresponding symbols in the **Schematic Editor**, synchronising SCM and layout group selections and highlighting layout traces on SCM symbol pin selection.
- New interactive **Packager** module with file selection popup menus and functions for switching directly to SCM and/or layout.
- Part side layer assignment for traces on layout part level allowed. Improved **Layout Editor** element query function to display trace information on layout part level.
- New rule system facilities for assigning drill holes of blind and/or buried vias to certain power layers.
- Layout system error display modified to improve distance violation recognition.
- Improved functions for manually routing diagonal trace segments integrated to **Layout Editor**.
- Allow for direct call of **Schematic Editor**, **Packager** and **CAM View** module from **Layout Editor**.
- **BAE HighEnd** Design Rule Check to allow for the specification of layer-specific, area-specific, and net-specific minimum distance checking parameters.
- Automatic copper fill function with new feature for explicitly specifying heattrap clearance.
- Manual layout part placement functions to consider default rotation and mirroring preferences specified through rule system.
- Optimized **Autorouter** functions for loading and/or routing power layer connections much faster.
- New net-specific optimizer mode introduced to **Autorouter** to avoid complex routing.
- **BAE HighEnd** rule system to allow for the definition of net-type specific routing areas.
- Improved **Autorouter** status reports.
- Improved **Autorouter** algorithms for connecting grid-shifted vias and pre-routed fixed traces.
- New finger pad recognition function implemented in **CAM Processor** to allow Gerber photoplot functions to treat finger pads like traces thus considerably reducing Gerber photoplot file size.
- **CAM View** to allow for the transfer of flashed structures onto signal layers when converting Gerber data to layout.
- Implicit **User Language** program call facilities extended in order to default to global program names (**bae_***).
- New **User Language** functions implemented and applied for message and verification popups.
- New **User Language** function for designating the currently selected user interface language.
- New **User Language** functions for supporting communication between different **BAE HighEnd** modules.
- All **User Language** programs completely revised and extended by a series of new features and functions.
- New option for automatically recovering damaged design files implemented with **COPYDDB** utility program.
- Symbol and part libraries revised and supplemented by a series of new part definitions.

Bartels AutoEngineer Version 4.0

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 4.0** are:

- New **Bartels AutoEngineer Professional**, **Bartels AutoEngineer HighEnd** and **Bartels AutoEngineer Educate/Entry** software versions provided for Linux platforms running on Linux Kernel 2.0.x with Motif support (an Ethernet card instead of a hardlock key is required for running authorized BAE Linux versions, whilst BAE Linux Demo versions do not require any specific/additional hardware for authorization check).
- **Bartels AutoEngineer HighEnd** with advanced features such as HighSpeed Kernel, cross-probing, etc. now also available on PC platforms (Windows NT, Windows 95, Linux).
- A series of general improvements introduced to the BAE user interface such as design view management, current element name display, improved parameter setup menus, menu customization facilities, etc.
- A large number of new features for adapting the Windows and Motif version to Windows look-and-feel such as optionally activating a BAE menu setup according to Windows conventions, scrollbars for the graphic workarea, context-sensitive ghost menus with non-executable functions faded out, fully programmable toolbars to be optionally activated, etc.
- New feature implemented for defining logical parts without physical package assignment to generate logical (e.g., EDIF) net lists for PLD and/or LCA design.
- Logical library to allow for pin-specific attribute definitions and/or pin attribute assignments such as e.g., pin type or fanout for electronic rule check (ERC) or for generating net list interfaces to simulators such as PSpice.
- Special attribute assignment facility introduced to allow for part-specific power supply definition in SCM.
- Improved control function implemented for displaying unconnected and/or processed pins on SCM level. SCM report function adapted to notify SCM drawing errors.
- New tag symbol type introduced to SCM for assigning attributes and/or attribute sets to (groups of) parts, pins or nets. This feature can also be used to introduce more complex design information such as preferences for test procedures or logical relations between parts, pins and/or nets.
- Layout level design rule check to be optionally deactivated between traces on part level to allow for the definition of printed inductors.
- New features introduced for defining layout element placement preference rules for part rotation and/or part mirroring.
- New option introduced to the **Layout Editor** function for rearranging adjacent trace segments.
- New feature implemented to allow for the definition of isolated areas in power layers.
- New options introduced to the move layout group function for automatically rerouting traces between moved group and rest of the layout.
- New options introduced for selecting and/or deselecting visible/invisible elements to/from group.
- **Layout Editor** element query function enhanced to allow for the selection of copper fill workareas, split power planes and documentary areas.
- New options implemented for net-specific airline display.
- Automatic copper fill function with new options for differing between pins and vias when selecting fill area connection type (heat-trap or direct).
- Improved **Autorouter** algorithms for off-grid pin connections to generate straighter off-grid pin connections, thus making the manufacturing process more simple.
- **CAM Processor** control plot function for generating Windows Generic output to support color output on multilayer plots. Windows Generic output to consider plot scaling factor specifications.
- **CAM Processor** Gerber photo plot to support rectangular apertures and optimized Gerber output format (i.e., amount of plot data reduced by avoiding repetition of redundant plotter control commands).
- New **CAM Processor** option to support Gerber fill mode G36/G37, i.e., outlines of non-flashable structures are filled by the plotter, thus reducing the amount of plot data and eliminating plot overdraw errors.
- New **CAM Processor** option for generating RS-274-X format Gerber output (Extended Gerber with Embedded Apertures), i.e., the aperture table is automatically generated and embedded with the plot file.
- New **CAM Processor** function implemented for generating Excellon II drilling data output.
- **CAM View** grid options extended to general BAE scheme. New option for selecting wide draw mode introduced to **CAM View** display menu.
- New **CAM View** functions and options implemented for loading and writing Gerber format RS-274-X with or without Gerber fill mode G36/G37 and/or optimized Gerber format according to new **CAM Processor** features.
- **Bartels User Language Interpreter** integrated to **CAM View** module.
- New **User Language** index variable types implemented for accessing system variables and new database objects. Many new and/or improved **User Language** system functions provided for displaying graphics in popup menus, customizing the BAE menu, defining toolbars with (dynamically adaptable) icons for frequently used functions, improved DDB and file system access, querying module-specific design parameters, defining global variables for exchanging data between **User Language** programs, improving access to currently processed design elements, etc.
- New **Bartels User Language Interpreter** features implemented for implicit **User Language** program call after loading an element, before saving an element, when changing the graphic display zoom factor or when selecting a toolbar item.
- New **User Language** programs and a series of improvements and new functions introduced to existing **User Language** programs (e.g., toolbar definition, routing data analysis, design view management, graphical symbol browsers, online help, etc.).
- Symbol and part libraries completely revised and supplemented by a series of new part definitions; general attribute for naming part manufacturer introduced wherever appropriate; comment attributes provided in both English and German language.

Bartels AutoEngineer Version 3.4

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 3.4** are:

- New **Bartels AutoEngineer** software versions for windows platforms running on Windows NT 4.0, Windows NT 3.51, Windows 95, Windows 3.11 and OS/2 Warp (with WIN-OS/2 support). New **Bartels AutoEngineer HighEnd** OSF/Motif software versions for workstation platforms. OSF/Motif and Windows versions can be operated with either BAE standard user interface (with side menu) or with Windows pull-down menus.
- **Back** button featuring page-up function added to popup menus for file name selection, element name selection, etc.
- **Back** button also added to the popup menus of the supplied **User Language** programs.
- **Dump** button added to the popup menus of the supplied **User Language** programs to support optional output of popup menu contents to file.
- **Autosave** option added for automatic design data backups at selectable time intervals.
- Important design and operational parameters such as autosave time interval, input and display grid, angle and grid lock, color table name, coordinate display mode, standard placement angle and mirror mode, standard text size, library access paths, plot file names, **Mincon** function class, airline display mode, placement matrix, copper fill parameters, etc. to be automatically saved with the currently processed layout and/or SCM sheet or with the processed library hierarchy level (part, padstack, pad, SCM symbol, etc.).
- SCM signal router for re-routing connections when moving symbols and/or labels improved. Signal router to be activated or deactivated on request.
- New **Layout Editor** functions for defining and processing traces and vias on part level. **Autorouter**, **CAM Processor** and **User Language** system functions to support these features as well.
- Features for rotating and/or mirroring loaded groups during placement implemented with the **Layout Editor** **Load Group** function. **Load Group** to reset previous group selections and group-select loaded group elements automatically.
- Context-sensitive popup menus for selecting parts and/or part names when manually placing parts added to **Layout Editor** and **Autoplacement**. New popup menus for selecting layout library file and library element when placing non-net list parts, loading pin definitions onto parts or loading pads onto padstacks.
- **Autorouter** **Load Layout** function for re-entrant routing considerably improved.
- **Neural Autorouter** with new control option for activating automatic placement optimization (pin/gate swap) during rip-up routing.
- **Neural Autorouter** with new option for performing gridless routing on request.
- New **CAM Processor** features for simultaneously plotting multiple (different) layers to a single plot file and/or plot device. Multi-layer plot function to provide layer selection popup menu with option for automatically selecting all currently visible layers. Layer-specific pen number specifications support added for HP-GL pen plots.
- **CAM View** to load and store drill data in Sieb&Meier or Excellon format (previously only Sieb&Meier supported).
- New **CAM View** functions implemented for processing milling data in Excellon format.
- New **CAM View** functions implemented for moving drilling data, milling data or Gerber data.
- New **CAM View** parameter setup options introduced for mirroring input data at X-axis, Y-axis, or origin.
- New **User Language Compiler** options implemented for optionally generating linkable **User Language** libraries. New **User Language Compiler** options for performing static and/or dynamic **User Language** library linkage. **User Language** specification now supporting **static** storage class declarations. Compatibility check at the assignment of different structure data types improved. Features for compiling different **User Language** programs with a single ULC call by specifying multiple source file names and/or using wildcards. Source file name specifications extended to other than **.ulc** name extension. Program and/or library name extraction from source file path name introduced. New options implemented for alternate include file search path specification and macro definitions on ULC call. Improved ULC error handling with warning severity support. Improved ULC message system with log file generation.
- New **Bartels User Language Interpreter** features implemented for dynamically linking **User Language** libraries during program runtime.
- Part libraries completely revised and supplemented by a series of new symbol and part definitions. New digital library provided, including more than 3800 symbols/parts definitions according to IEEE standards.
- Up to 12 layout signal layer menu entries freely definable with layer number and layer name.
- Temporary directory on PC freely definable with environment variable to avoid problems with temporary file generation on network-based PC systems.
- New **BAE Professional** (PC/MS-DOS) graphic device drivers provided for supporting ATI Mach 64 graphic cards (resolutions 1024*768, 1280*1024 and 1600*1200).
- Arbitrary attribute definition allowed in **BAE Educate/Entry** software configurations.

Bartels AutoEngineer Version 3.2

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 3.2** are:

- Currently active BAE menu function to be canceled with **ESC** hotkey.
- Introduced intelligent popup for optional directory selection on file name queries. Directory popup background color to be set with a new color setup option supported by **BSETUP** utility program.
- BAE menus freely configurable via **User Language** by assigning menu item texts and **User Language** program calls. Fast online key programming supported via **User Language**.
- New SCM function for Logical Library definition query during SCM sheet edit.
- Feature for fast color fade-out/fade-in introduced to Layout color setup menus.
- Additional entries for number of yet unplaced parts and number of parts placed with wrong package type introduced to **Layout Editor Report** function.
- New function for changing part package type during part placement introduced to **Layout Editor** and **Autoplacement**. Both **Packager** and **Backannotation** to support and control alternate physical part package type definitions and assignments.
- Interactive **Layout Editor** routing functions to keep traces fixed flag on pre-routed traces.
- **Packager** to keep internal net numbers on repeated packaging, thus ensuring correct connectivity correlation on stand-alone vias, power layers, etc.
- Full automatic initial placement algorithms provided with **Autoplacement** module: complete initial placement with automatic part/pin/gate swap; single pass and multi pass cluster and/or area placement with rip-up and retry. Initial placement algorithms to consider board outline, pre-placed parts and keepout areas; featuring automatic SMD and block capacitor recognition; automatic SMD mirror option; unrestricted and restricted automatic part rotation in 90 degree steps; placement grid freely selectable; part clearance optionally definable; heuristic parameters for net list preference control and consideration of part segment matching/fitting.
- Automatic pin/gate swap algorithm improved to consider only nets of interest, thus considerably speeding up the pin/gate swap process.
- Automatic copper fill routines improved to avoid unpredictable results in a series of very exotic cases; automatic splitting of critical copper fill polygons introduced, thus yielding larger fill area.
- SMD via fanout autorouting algorithm to ignore layer-specific routing direction preferences, thus yielding better results in PLCC SMD via pre-routing.
- New **Neural Autorouter** module based on the standard **Autorouter** module, but providing user interface similar to **Layout Editor** and/or **Autoplacement** (including color setup, **Undo/Redo**, interactive routing, **User Language**, etc.); special routing functions such as single net router, area/block routing, mixed grid routing provided with the **Neural Autorouter** module; placement optimization functions integrated to **Neural Autorouter** algorithms.
- Advanced **BAE HighEnd** module providing powerful autorouting technologies based on patented neural network technology; supporting skilled analog signal routing, microwave structure generation; features for learning and automatically applying special routing preferences and/or rules; grid-less object-orientated routing with automatic placement optimization supported.
- **CAM Processor** Gerber plot routines now optionally supporting I/J Gerber arc commands to reduce amount of Gerber output data.
- **User Language Compiler** improved to speed-up optimization. **User Language Interpreter** integrated to **Neural Autorouter**. A series of new index variable types and system functions implemented for element and file name query, function key programming, menu assignments, logical library definition query, layout part package type assignment, etc. **User Language** programs completely revised and extended by new programs and/or functions, now providing more than 1.44 Mbytes/47000 lines of source code.
- **BSETUP** utility program to support new option for releasing BAE software updates and/or authorizations on previously delivered hardlock keys.

Bartels AutoEngineer Version 3.0

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 3.0** are:

- Split Power Plane and Power Plane Edit introducing features such as power layer display, placing active copper and text on power layers; intended for implementing more than one electrical connection on a single power layer.
- Popup menu functions introduced to **User Language** and extensively utilized in supplied **User Language** programs; popup menus also introduced to important BAE system functions such as Layout color setup, SCM net name selection on label placement, etc.
- **User Language** integrated to **Autoplacement** module, i.e., **User Language** program call facilities introduced to **Autoplacement**, and new **Autoplacement User Language** system functions implemented.
- Features for arbitrary net attribute definitions (with **Backannotation**) introduced.
- Powerful SQL facilities for managing relational database systems provided via **User Language** system functions; both relational tables and database objects are stored to DDB files. See **User Language** program **SSYMATTR** for an application example (automatic part attribute settings according to part database).
- AutoCAD DXF input/output interfaces for SCM and Layout provided via **User Language** programs.
- BNF-based ASCII format description precompiler introduced to **User Language**; provide a powerful tool for implementing ASCII input interfaces (see the **READLPLC User Language** program for an application example).
- A series of new **User Language** programs provided (EPS output, library management tools, automatic layer assignments, semi-automatic pad/padstack generator, online key programming tool, etc.), bringing the total number of delivered **User Language** programs to about 200 (with more than 34000 lines/1 Mb of source code).
- Libraries have been completely revised; LAYLIB and KMLAY have been merged to a single DIL/SMT layout library also including a series of new part/symbol definitions; pad definitions and layer assignments have been standardized.
- Introduced features for displaying layout groups at movement (either with all layers or with group display layer only).
- Special layout signal layer **Signal Inside** (i.e., all signal layers between solder side and component side) introduced for simplifying multilayer PCB design.
- Improvements on existing functions such as integrated DDB index cache for fast DDB element access (on functions such as load/store element), **Zoom Last** display function to toggle between two previously defined windows, popup menu pointer position memory, popup menu button for SCM project library selection, net name popup menu for SCM label placement, new SCM **User Language** system functions, automatic copper fill routines improved, copper fill cross hatching function introduced, new graphic drivers for VESA provided, repetitive single element selection introduced to **Schematic Editor** and **Layout Editor** group functions, new layout group mirror function, automatic mirror mode for SMD placement in **Layout Editor** and **Autoplacement**, HP Laser/PCL output with rotation (SCM/Layout) and/or mirroring (Layout), improved features for attribute selections/settings, etc.

Bartels AutoEngineer Version 2.6

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 2.6** are:

- DPMS (DOS Protected Mode Interface Specification) support for **Bartels AutoEngineer** operation under Microsoft Windows Version 3.x (as DOS Box in Enhanced Mode) and IBM OS/2 Version 2.0.
- XMS (eXtended Memory Specification) and VCPI (Virtual Control Program Interface) support introduced.
- Popup menus for file and element name selections implemented.
- Global design/project naming facilities introduced.
- Automatic block name attribute annotation for hierarchical circuit designs with **Autoplace** block selection features for floor-planning.
- Automatic pin/gate swap **Autoplace** functions implemented.
- Automatic copper fill routines to consider net-specific minimum distance settings for spacing.
- Copper area hatching features introduced to copper fill functions.
- **Authorouter** menus changed.
- Arbitrary routing grid option and half-grid routing introduced to **Authorouter**.
- SMD via pre-routing function for improved SMT routing of multilayer layouts introduced to **Authorouter**.
- File inclusion (`#include` preprocessor statement) introduced to **Bartels User Language**. New system functions, index variable types introduced to **User Language**. A series of new **User Language** example programs provided, making up for a total of about 150 programs with more than 20000 lines/600 Kbytes of source code.

Bartels AutoEngineer Version 2.4

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 2.4** are:

- BAE **INSTALL** program provided.
- TIGA graphic driver provided for PC-based systems.
- Libraries completely revised and extended by a series of new symbol/part definitions.
- Hierarchical circuit design facilities introduced to **Schematic Editor** and **Packager**
- **Bartels User Language** integrated to **Schematic Editor** with new system functions and index variable types for SCM.
- New **CAM Processor** function for multi-aperture fill mode provided for Gerber output for filling irregularly shaped areas.
- Drill data processing features (load/save/sort drills) introduced to **CAM View** module.
- New features for implicit **User Language** program call by pressing function keys introduced.
- Combined data types (arrays, structures) introduced to **Bartels User Language**.
- More than 130 new **Bartels User Language** system functions implemented.

Bartels AutoEngineer Version 2.2

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 2.2** are:

- Graphic driver for Tseng Labs ET4000 chip set provided.
- A series of improvements introduced to the BAE user interface such as improved connection re-routing after SCM symbol movements, element name queries with name lists, improved SCM symbol pick function, layout editor text change function, etc.
- Functions for generating arc-shaped traces introduced to the **Layout Editor** traces menu.
- Improved copper fill features with new copper fill area polygon type. New copper fill functions for filling/deleting all and/or selectable copper fill areas.
- **Bartels User Language** (C-based programming language) with **Bartels User Language Compiler** and **Bartels User Language Interpreter** integrated for defining macros and/or user scripts. **User Language** contains special variable types for accessing BAE design data (such as net list and layout geometry data); **Bartels User Language** also provides an in-built function library including standard C and BAE system functions. With **Bartels User Language** the user is able to design special postprocessor programs and to define user-specific BAE menu functions. **User Language** programs can be called from both the **Layout Editor** and from the **CAM Processor**.

Bartels AutoEngineer Version 2.0

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 2.0** are:

- PostScript and HP Laser (PCL, Printer Command Language) output formats provided for SCM and **CAM Processor** control plot output.
- **Select Font** functions in **Schematic Editor** and **Layout Editor** to save the selected font name with the job.
- Blind and buried vias supported by **Layout Editor** interactive routing and **Autorouter**.
- Drill classes introduced for drill hole definitions to support blind and buried vias on CAM output; can also be used for differing between plated and non-plated drill holes.
- Automatic copper fill now supporting automatic heat trap generation with definable connection width.
- New Pin Connect Mode option introduced to **Autorouter** for avoiding/admitting pin corner routing on oblong and finger-shaped pins.
- New **CAM View** program module provided for viewing and processing Gerber data; includes special features for panelization and for importing and/or transforming Gerber data third party systems.
- New **FRAMECOLOR** command introduced to **BSETUP** utility program for supporting BAE menu color setup.

Bartels AutoEngineer Version 1.6

The most significant new features and/or improvements introduced with **Bartels AutoEngineer Version 1.6** are:

- `mainpart` and `subpart` definitions introduced to Logical Library maintenance to support part definitions consisting of different SCM symbols such as relays or opamps with variable power supply.
- Comment text generation facility introduced to **Schematic Editor**.
- Bus tap net name range support introduced to **Schematic Editor** for automatically placing and naming sub-net bus taps.
- **Packager** to generate internal logical net lists to support logical net list output for simulators.
- Area display mode option introduced to layout polygon generation, supporting part outline and pad definitions with different shapes on component and/or solder side.
- Automatic copper fill algorithm improved; minimum structure size setting, isolated area mode option and traces fill mode option introduced to copper fill.
- New **NETCONV** utility program provided for transferring logical net lists from ASCII format to **Bartels AutoEngineer**.
- New **COPYDDB** utility program provided for copying selectable database class entries between different BAE DDB files.