



Bartels AutoEngineer® Version 4.4 Release Notes

This document contains information about the new features introduced with Bartels AutoEngineer Version 4.4. Forward compatibility from earlier versions to Bartels AutoEngineer Version 4.4 is ensured, but not backward compatibility.

Bartels AutoEngineer Version 4.4 Release Notes

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1 General

1.1 Bartels AutoEngineer Product Line

The following software configurations of Bartels AutoEngineer Version 4.4 are available:

- Bartels AutoEngineer Professional
- Bartels AutoEngineer HighEnd
- Bartels AutoEngineer Educate/Entry

Bartels AutoEngineer Professional is the basic BAE software configuration. BAE Professional is available for PCs with Windows, Linux, or DOS operating systems. SCM and/or Layout only configurations of BAE Professional are provided in order to satisfy special customer needs. BAE Demo software configurations of BAE Professional (fully-featured except for data output) are also available for test and evaluation purposes.

Bartels AutoEngineer HighEnd with its advanced features and functions such as high speed kernel, cross-probing, rule-driven Neural Autorouter, etc. is available for workstations and for PC systems (Windows NT, Windows 95/98, Linux).

Bartels AutoEngineer Educate/Entry is available for PCs with Windows, Linux, or DOS operating systems. BAE Educate is a low-price BAE configuration with considerably reduced functionality for educational purposes and/or semi-professional users.

The following software modules are *optionally* available with the workstation-based BAE systems:

- Bartels AutoEngineer IC Design
- Bartels AutoEngineer Mixed Mode Simulator

Bartels AutoEngineer IC Design (BAEICD) is a complete CAD/CAM system for the physical design of integrated circuits (gate arrays, standard cells, custom ICs and/or ASICs). BAEICD consists of a series of system components such as IC Mask Editor, IC Autoplacement, IC Autorouter, IC DRC (Design Rule Check), and GDS-II and CIF standard interfaces.

Bartels AutoEngineer Mixed Mode Simulator (BAESIM) is a compiler-driven simulator for mixed analog/digital circuits. BAESIM provides direct access to the net list data generated with the BAE Schematic Editor.

1.2 System Requirements

General System Requirements

A VGA or higher resolution monitor and a mouse or a corresponding pointing device are required on any BAE platform.

Up to 40 Mbytes hard disk space are required for installing the BAE software.

Operating System

BAE Professional and BAE Educate/Entry versions are available for Linux (Kernel 2.0.x), Windows NT 4.0, Windows NT 3.51, Windows 98, Windows 95, Windows 3.x, and MS-DOS.

BAE HighEnd systems are available for Hewlett-Packard 9000/7xx workstations with OSF/Motif and/or X11, and for PCs with Linux (Kernel 2.0.x), Windows NT 4.0, Windows NT 3.51, Windows 98, and Windows 95 operating systems.

PC System Requirements

PC systems should at least be equipped with a 80486DX processor. Any greater processor such as Pentium or compatibles is beneficiary.

A minimum of 8 Mbytes RAM is required for DOS and Windows 3.1 systems (16 Mbytes RAM recommended).

A minimum of 16 Mbytes RAM is required for Windows 95/98/NT and Linux systems (32 Mbytes RAM or more for Windows recommended).

The BAE software is usually provided on CD-ROM, i.e., a CD-ROM drive is required to install the software.

A hardlock key is used to protect productive (i.e., non-Demo) DOS and Windows versions against software piracy. I.e., a printer port (LPT1, LPT2, or LPT3) is required to run productive BAE versions under DOS and/or Windows.

Productive (i.e., non-Demo) Linux versions must have an Ethernet card to allow for software authorization check.

1.3 Documentation

Both the [Bartels AutoEngineer User Manual](#) and the [Bartels User Language Programmer's Guide](#) have been completely revised and are provided in HTML format.

1.4 Installing on Windows and DOS Platforms

Preparing for Update Installations

The BAE library and User Language directory contents are replaced when performing update installations. Thus it is strongly recommended to backup any user-specific data from these directories before installing the BAE update, and to restore the required data afterwards.

The "bsetup.dat" file from the BAE programs directory will always be re-installed when performing BAE Update Installations. Thus it is not necessary to run the time-consuming batch for compiling the BAE User Language programs provided with the BAE software. However, user-specific BAE parameter settings stored with the existing "bsetup.dat" file will get lost and must be restored after successfully installing the BAE software using the **bsetup** utility program (or the "Setup" function available from the BAE main menu of the Windows/Motif versions). Customer-specific User Language programs developed and compiled under the previously installed BAE version must also be re-compiled after performing the BAE Update Installation.

Running the Install Program

Under Windows 95/98/NT, the BAE setup program for installing BAE Professional and/or BAE Educate/Entry should start automatically after inserting the BAE CD-ROM to the CD-ROM drive. If this doesn't happen, simply start the "setupen.exe" program from the CD-ROM using the **Run** function from the Windows **Start** menu. Please follow the instructions of the setup program. You should install BAE to a directory without blanks in the pathname (otherwise the software might not run correctly). The setup ends with the BAE software configuration. Please select the BAE configuration which is authorized for your machine (Demo, Professional, Educate/Entry, SCM only, or Layout only; see also [table 1](#)).

For installing BAE Professional/Entry for Windows 3.11 or MS-DOS, or BAE HighEnd for Windows 95/98/NT, Windows 3.11, or MS-DOS, the CD-ROM must be inserted to the CD-ROM drive, and the drive and directory must be set accordingly. E.g., to install the BAE software from CD-ROM drive D, insert the BAE CD-ROM to CD-ROM drive D, and enter the following commands to the DOS prompt:

```
> D: <CR>
> install <CR>
```

Once the install program has been started, the instructions issued on the screen should be followed carefully. First you will be asked for the BAE language version (e.g., English, German, etc.) and for the operating system host platform (DOS, Windows NT, Windows 3.x, etc.).

The install program provides different modes for performing either new Installation or Update installations. The Update install mode is strongly recommended when just updating from earlier BAE Versions; this will prevent the install program from overwriting special BAE system and setup files ending on ".dat", ".def", and ".fnt" (otherwise user-defined color tables, aperture tables, fonts, layer definitions, library access path settings, and menu setups stored with these files might get lost!).

After selecting the install mode, you will be prompted to specify the destination directories for installing the programs, the libraries, the User Language source files, and the examples and test jobs. You can exclude certain destination directories by deleting the corresponding path names. Thus more experienced BAE users may e.g., suppress the installation of the BAE example jobs, or re-install certain parts of the BAE software later. For security reasons, the install parameter settings will be verified with user query before starting the installation process. The destination directories will be created automatically on request. The install program automatically copies the BAE software files to the selected destination directories on the hard disk.

At the end of the install process the install program asks for the licensed BAE software configuration in order to install the correct software authorization file (see [below](#)). When installing the DOS version, the user will also be asked to select the graphic device driver to be installed (see [below](#)).

Installing the Software Security Module

The BAE PC software for Windows and DOS (except for the Demo software configuration) is protected by a hardlock key (dangle) which must be plugged onto one of the parallel ports (LPT1, LPT2, or LPT3) of your PC. Switch off your computer before mounting the hardlock key shipped with the software, or otherwise the dangle might be damaged by high voltage! If you have connected a peripheral device such as a laser printer to the hardlock key, then you must *always switch on the peripheral device before switching on your computer* in order to ensure correct hardware authorization check.

The BAE PC software provides the license files according to the available software configurations as shown in the table below. You will be asked to select the BAE software configuration (and thus the appropriate license file) when installing the BAE software. Make sure to select the BAE software configuration to be installed and/or authorized on your computer.

Table 1: BAE Software License Files

Software Configuration	License File Name	Note
BAE Demo	demo.cfg	no Hardlock Key, no (CAM) output
BAE Professional	autoeng.cfg	SCM and Layout
BAE Schematics	schema.cfg	SCM only
BAE Layout	layout.cfg	Layout only
BAE HighEnd	highend.cfg	SCM and Layout
BAE Entry/Educate	educate.cfg	SCM and Layout

The "router.cfg" license file matching the BAE software configuration authorized on your computer must be available in the BAE programs directory. I.e., to install the correct license file you may also copy the desired CFG file to "router.cfg" within the BAE programs directory instead of selecting the valid BAE configuration during BAE software installation. E.g., the Demo software can be configured by simply copying the "demo.cfg" file in the BAE programs directory to "router.cfg".

Note that the BAE Demo software configuration is the only one to run without a hardlock key, since BAE Demo software is intended for evaluation purposes only. BAE Demo cannot produce any CAM or User Language output, and it will mask SCM and/or Layout plan elements in order to prevent from processing with productive software configurations afterwards. I.e., the BAE user version are not able to read Demo jobs, however, we are able to convert these jobs.

Windows NT Hardlock Key Check Driver

Special driver software is required for hardlock key check when running the BAE Windows and/or DOS software under Windows NT. To install this driver software, simply start an MS-DOS-Prompt, change to the BAE programs directory, and enter the following command (system administrator rights are required!):

```
> hlinst . <CR>
```

Ensure that "Boot Device" is selected with the Startup option of the Hardlock hardware device to be configured from the Hardware Devices dialog of the System Control panel. Note that the system must be re-booted after successfully installing the Windows NT hardlock key check driver software.

Selecting the BAE DOS Graphic Device Driver

With the Windows versions of the BAE software there is no BAE graphic device driver installation required, since BAE Windows software runs under the graphic interface of the corresponding operating system.

The DOS versions of the BAE software are shipped with a series of graphic device drivers. During installation you will be asked to select an appropriate BAE graphic device driver. Table 2 provides the list of graphic device drivers supplied with the DOS PC software of the Bartels AutoEngineer. Please select the graphic device driver matching the video adapter and/or graphic card installed with your computer. It is recommended to install the standard VGA driver VGA480, if you are not sure about which driver to select, since VGA480 is assumed to run on almost any PC system, and you may always select a different driver (e.g., with higher resolution) later (see below).

Table 2: BAE Graphic Device Drivers

Graphic Driver	Type	Resolution	Chip Set/Manufacturer
CCD480.DEV	PGA	640x 480	IGC (Cad Card)
EGA350.DEV	EGA	640x 350	Standard
EGA480EW.DEV	EEGA	640x 480	EGA Wonder
EGA480GE.DEV	EEGA	640x 480	Genoa, ATI
EGA600EW.DEV	EEGA	800x 600	EGA Wonder
EGA600GE.DEV	EEGA	800x 600	Genoa, ATI
EGA600PA.DEV	EEGA	800x 600	Paradise
QPC1024.DEV	-	1280x1024	Datapath QPDM
QPDM768.DEV	VGA	1024x 768	AMD QPDM
QPDM1024.DEV	VGA	1280x1024	AMD QPDM
VGA480.DEV	VGA	640x 480	Tseng ET3000 / ET4000
VGA600.DEV	VGA	800x 600	Tseng ET3000 / ET4000
VGA768.DEV	VGA	1024x 768	Tseng ET3000
TSENG768.DEV	VGA	1024x 768	Tseng ET4000
VESA600.DEV	VESA	800x 600	various
VESA768.DEV	VESA	1024x 768	various
MACH768.DEV	-	1024x 768	ATI Mach 64
MACH1024.DEV	-	1280x1024	ATI Mach 64
MACH1200.DEV	-	1600x1200	ATI Mach 64
MGA600.DEV	-	800x 600	Matrox Millenium/Mystique
MGA768.DEV	-	1024x 768	Matrox Millenium/Mystique
MGA1024.DEV	-	1280x1024	Matrox Millenium/Mystique

MGA1200.DEV	-	1600x1200	Matrox Millenium/Mystique
TIGA.DEV	TI	variable	Texas TMS34010 / TMS34020

The graphic driver ".dev" file matching the video adapter and/or graphic card of your computer must be copied to the "bae.dev" file in the BAE programs directory. This is achieved either by selecting the correct driver during BAE software installation or by manually copying the desired ".dev" file in the BAE programs directory to "bae.dev".

Setting up the DOS Environment

It is strongly recommended to add the BAE programs directory path to the "PATH" environment variable. Load the "autoexec.bat" file to your text editor and check whether "autoexec.bat" contains a PATH statement or not. If there is already a PATH statement defined in "autoexec.bat", then just add the following program path link to the PATH statement (assume BAE programs directory "c:\bae"):

```
;c:\bae
```

If there is no PATH statement defined in "autoexec.bat", then insert the following PATH statement (assume BAE programs directory "c:\bae"):

```
PATH=c:\bae
```

You may also insert the following command at the end of the "autoexec.bat" file in order to include the BAE programs directory path name with the PATH variable:

```
PATH c:\bae;%path%
```

The "config.sys" file must contain the statements

```
BUFFERS=<b>  
FILES=<f>
```

where the number of buffers should be at least 30, and the number <f> of files should be at least 20.

Note that you must reboot your computer if you made any changes to the "config.sys" or "autoexec.bat". Otherwise you might not be able to start BAE.

1.5 Installing on Linux and UNIX Platforms

Preparing for Update Installations

The BAE library and User Language directory contents are replaced when performing update installations. Thus it is strongly recommended to backup any user-specific data from these directories before installing the BAE update, and to restore the required data afterwards. The same backup and restore process should be applied to BAE programs directory files with extensions ".dat" (except for "bsetup.dat"; see next paragraph), ".def", and ".fnt" when just updating from earlier BAE versions, since these files may contain user-defined color tables, layer definitions, Gerber aperture tables, and character fonts which will be overwritten during update installations. The "router.cfg" file must also be saved and restored when updating from authorized BAE versions.

The "bsetup.dat" file from the BAE programs directory will always be re-installed when performing BAE Update Installations. Thus it is not necessary to run the time-consuming batch for compiling the BAE User Language programs provided with the BAE software. However, user-specific BAE parameter settings stored with the existing "bsetup.dat" file will get lost and must be restored after successfully installing the BAE software using the **bsetup** utility program (or the "Setup" function available from the BAE main menu of the Windows/Motif versions). Customer-specific User Language programs developed and compiled under the previously installed BAE version must also be re-compiled after performing the BAE Update Installation.

Linux Installation

The "baelinux" directory on the BAE CD-ROM contains the TGZ archive files "baeglib.tgz", "baelinux.tgz", and "baelinus.tgz" with different BAE Professional versions for Linux. Each of these TGZ files contains the directories "bin" (programs and setup files), "baelib" (symbol and part libraries), "baeulc" (User Language source files), and "baejobs" (examples and test jobs). An additional file named "baeeng.tgz" including the English BAE user interface setup is also provided.

"baelinus.tgz" must be installed on Linux systems without Motif. "baelinus.tgz" contains a *statically* linked BAE version including all X11/Motif and system libraries required to run BAE on any Linux Kernel 2.0.x distribution.

It is recommended to use one of the more efficient *dynamically* linked BAE versions from "baeglib.tgz" (linked to X11/Motif and libc6/glibc) or "baelinux.tgz" (linked to X11/Motif and libc5) on Linux systems where Motif is already installed. "baeglib.tgz" is designed for Linux systems supporting libc6/glibc (S.u.S.E. 6.0 or later, RedHat, etc.). "baelinux.tgz" is intended for older Linux systems supporting libc5 (e.g., S.u.S.E. 5.3 or older). The statically linked version from "baelinus.tgz" may always be used on Linux systems which fail to run any of the dynamically linked versions.

To install the BAE Linux software, simply mount the CD-ROM drive with the BAE-CD-ROM (e.g., under "/cdrom"), change to the directory where you want to install the BAE software, and unpack the appropriate archive file (e.g., "baelinux.tgz") using the **tar** command as in

```
> tar -xzf /cdrom/baelinux.tgz <CR>
```

The **-z** option is used to filter the TGZ file through the **gzip** utility. If your **tar** command does not support the **-z** option, simply use **gzip** and **tar** as in

```
> gzip -dv /cdrom/baelinux.tgz <CR>
> tar -xfv /cdrom/baelinux.tar <CR>
```

BAE is pre-configured with a German user interface. The English user interface can be activated by extracting the "baeeng.tgz" archive file from the CD-ROM "baelinux" directory to the destination directory.

UNIX Installation

The BAE HighEnd archive files for UNIX workstation are provided in specific BAE-CD-ROM directories such as "baehp" for the HP version. These archive files contain the directories "bin" (programs and setup files), "lib" (symbol and part libraries), "ulc" (User Language source files), and "jobs" (examples and test jobs). An additional file named "baeeng.tgz" including the English BAE user interface setup is also provided.

The BAE HighEnd archive files for HP workstations are provided in the "baehp" directory on the BAE CD-ROM. To install the HP software, simply mount the CD-ROM drive with the BAE-CD-ROM (e.g., under "/cdrom"), change to the directory where you intend to install the BAE software, and unpack the "baehp.tgz" archive using the **tar** command as in

```
> tar -xzf /cdrom/baehp.tgz <CR>
```

This installs the BAE HighEnd software with OSF/Motif interface. To activate the BAE HP software for X11, the "baehpx11.tgz" file from the "baehp" directory on the CD-ROM must be installed in the destination directory after installing "baehp.tgz".

BAE is pre-configured with a German user interface. The English user interface can be activated by extracting the "baeeng.tgz" archive file from the CD-ROM "baelinux" directory to the destination directory after installing the UNIX software.

Setting up the Linux/UNIX Environment

The access rights must be set properly (i.e., execute for the programs, read access to the libraries, read/write access to the job files, all rights for the system administrator, special rights for the library manager, etc.). The user must have read access to the BAE program directory files ending on ".cfg" (for authorization check) and read/write access to the files with extensions ".dat" and ".fnt". The user must also have write access in the working directory to enable temporary file creation.

The Linux/UNIX shell environment variable "PATH" must point to the BAE programs directory to allow for BAE program call from any other directory. The PATH variable may be set automatically through shell profile execution (shell script ".profile", ".login", ".bashrc", or ".cshrc", according to UNIX derivative, respectively).

1.6 Parameter Setup and Program Start

BAE System Parameter

The BAE software versions for Windows and Motif provide an interactive program for modifying the BAE system parameters. Under DOS, however, the **bsetup** utility must be applied as described herein.

With the BAE software, a setup definitions file template named "stdset.def" is supplied, which will be installed to the BAE programs directory. This file contains the following commands for setting the BAE library access paths:

```
SCMDEFLIBRARY (<libdir>\stdsym");  
LAYDEFLIBRARY (<libdir>\laylib");
```

where <libdir> is the path name of the BAE library directory. If the library e.g., has been installed to the directory "c:\baelib" under DOS or Windows then you should replace <libdir> with this path name in order to provide correct access to the BAE symbol libraries. If the library e.g., has been installed to the directory "/usr/bae/lib" under Linux or Unix, then you should insert the following commands to the setup definitions file for providing correct access to the supplied BAE symbol libraries:

```
SCMDEFLIBRARY ("/usr/bae/lib/stdsym");  
LAYDEFLIBRARY ("/usr/bae/lib/laylib");
```

The setup definitions file can be transferred to the BAE setup file "bsetup.dat" using the following **bsetup** program call (assuming "stdset.def" to be the name of the setup definitions file, and the BAE programs directory to be the working directory):

```
> bsetup stdset <CR>
```

The **bsetup** utility program is also used for defining important system parameters such as the documentary layer definitions and the menu setup. The documentary layer definitions and assignments have major impact on how manufacturing data is generated. Thus it is strongly recommended to get familiar with the features of the **bsetup** utility program before using BAE for the design of real layouts. See [Bartels AutoEngineer User Manual - Chapter 7.1](#) for details on how to use **bsetup**.

User Language Programs, Menu Assignments, Key Bindings

The BAE software installs more than 160 pre-compiled User Language programs to the "bsetup.dat" file of the BAE programs directory. The corresponding source files are also provided in the User Language directory ("baeulc" or "ulc"). See [Bartels User Language Programmer's Guide - Chapter 4](#) for a complete listing and short descriptions of the BAE User Language programs.

Some of the installed User Language programs define implicit User Language program calls for activating a modified BAE user interface with many additional functions. You can add even more functions, or you may modify and/or reset the predefined menu assignments and key bindings. For more details see [section 11.5](#) of these Release Note.

Usually, it is *not* necessary to (re-)compile the User Language programs delivered with the BAE software, since the compiled programs will be installed to the "bsetup.dat" file of the BAE programs directory. Nevertheless, the User Language directory provides several batch files for automatically compiling all BAE User Language programs. The CPLSLL (ComPiLe with Static Link Library) batch file is recommended for compilation. The compile batch can be started in the User Language directory ("baeulc" and/or "ulc") by entering

```
> cplsll <CR>
```

to an MS-DOS-Prompt (with the PATH variable pointing to the BAE programs directory!) or with the

```
> cplsll.bat <CR>
```

command from a Linux or UNIX shell. The compilation process might last some time according to the power of your computer.

Program Start

Use the following command to start the Bartels AutoEngineer from a DOS prompt or a Linux and/or UNIX command shell:

```
> bae <CR>
```

Design file access can be simplified by starting and/or running BAE from the design and/or project files directory.

Under Windows, the Bartels AutoEngineer may also be started by selecting the "bae.exe" file using the "Run" function from the Windows Start menu or the Program Manager Files menu. Windows also allows for application startup by double-clicking the application from within the Windows Explorer and/or the File Manager, and it is also possible to define an initial working directory for the application to start in. A shortcut to "bae.exe" may be placed on the desktop or the Windows Start menu to provide an even more convenient method of starting up the Bartels AutoEngineer. Please consult your Windows documentation for more details on how to configure applications for startup.

File Access Environment Variables

Environment variable references in file name specifications are automatically substituted. This allows for definitions such as "\$BAELIB" for the symbol library directory and combined specifications such as "\$BAELIB/laylib" or "\$BAELIB/\$STDLIB" to be used for path and file name specifications in functions such as "Select Library" from the Settings/Parameter menu. The environment variables are not evaluated until they are actually referred for file access. Thus they will be stored with design files to be transferred to different computers where they may refer to machine-dependent path specifications defined through corresponding environment variables. Environment variable references are preceded with a dollar sign ('\$') and must be either entirely lower-case or entirely upper-case. The '~' character refers to the "\$HOME" variable. Undefined environment variable references are substituted with empty strings.

System File Access Environment Variables

The environment variables listed in table 3 are evaluated for advanced configuration of BAE system file access in network installations.

Table 3: BAE System File Environment Variables

Environment Variable	System File Default Name	Contents
BAE_CFG	router.cfg	Configuration File
BAE_BSETUP	bsetup.dat	BAE System Parameters
BAE_ULCLIB	bsetup.dat	User Language Programs
BAE_RULELIB	brules.dat	Rules Database
BAE_LANG	language.dat	Messages Database
BAE_FONTLIB	ged.fnt	Character Fonts
BAE_SCMLIB	scm.dat	SCM Color Tables
BAE_GEDLIB	ged.dat	Layout Color Tables
BAE_CEDLIB	ced.dat	IC Layout Color Tables
BAE_CAMLIB	cam.dat	Gerber Aperture Tables
BAE_WINLIB	baewin.dat baexwin.dat	Windows Position File
BAE_DCOLLIB	bae.col	Display Color Table
BAE_PCOLLIB	baep.col	Printer Color Table

Environment variables must specify complete paths to the corresponding system files. This feature can be used in definitions such as

```
set BAE_WINLIB=d:\bae\user1.dat
```

where access to a machine-specific Windows positions file in network installations with central BAE programs directory is established.

System files without environment variable definition are accessed from the BAE programs directory using the default system file name.

1.7 User Interface

Performance

A new Compiler with an improved optimizer is used for generating the BAE Windows and DOS versions. This results in more efficient code, improving the overall performance of the BAE Windows/DOS software.

Status and Error Messages

The status and error messaging system of the BAE user interface has been improved in order to provide better guidance. Any messages displayed in the status line will only be displayed as long as they are relevant. Input prompts (e.g., for coordinate and/or length/width inputs) and error messages contain the name of the processed element if available. Graphic cursor inputs are accompanied by a status line message indicating the expected type of input.

Option Menus

The BAE Windows menus have been changed in order to indicate currently pre-selected options only in menus which allow for the selection of permanently active options.

Mouse Interaction

Middle mouse button menu interactions followed by right mouse button interactions could result in repeated menu selections. This problem has been fixed.

DDB File Name Query

DDB file name queries in the Schematic Editor and the layout system now accept "!" input for selecting the SCM and/or the layout standard library defined through the BAE setup.

Element Name Query

A new autoscroll feature for automatically scrolling the list box contents to the closest element name on text input has been added to the Windows element name query functions.

Close Element

The new **Close** function for closing the currently loaded element has been introduced to the **File** menus of the Windows SCM and Layout modules.

Load/Open Element, Create/New Element

The **Load/Open Element** and **Create/New Element** functions for loading and/or creating design and/or library elements activate a confirmation prompt if the currently loaded element has not been saved. This confirmation prompt has been re-scheduled to be the first rather than the last prompt of the **Load/Open Element** and **Create/New Element** functions.

Warning

User Language programs calling the **Load/Open Element** and/or the **Create/New Element** function through the interaction queue must be adapted to the new confirmation query sequence.

1.8 Symbol and Part Libraries

A definition for PLD part ispLSI 8840 has been added to the "lsc.ddb" SCM library (manufacturer Lattice Semiconductor Corporation; logical library "lsc.def").

A series of new package definitions for ballgrid arrays (BGAs) have been added to the "laylib.ddb" layout library.

A series of useful library management User Language programs for library management (library check, automatic symbol edit, automatic generation of library documentation, etc.) are provided with BAE Version 4.4. See [Bartels User Language Programmer's Guide - Chapter 4](#) for a complete listing of the User Language programs delivered with the BAE software.

2 Schematic Editor and Backannotation

2.1 General

Context-sensitive Function Menus

Pressing the left mouse button <LMB> within the graphic workarea activates a context-sensitive menu with specific functions for the object at the current mouse position if no other menu function is currently active. The **Open/Load Element** and/or **Create/New Element** file management functions are provided if no element is currently loaded. This feature is implemented through an automated call to the **SCM_MS** User Language program.

User Language Programs

A series of new SCM functions and features such as

- direct jump to Layout Editor or Packager, optionally with automatic Packager run (**UIFSETUP**)
- automatic part rename/numbering utility to be optionally applied on all sheets of a schematic plan (**SAUTONAM**)
- change bus display mode (**SCMCON**)
- load groups from different database hierarchy levels (**SCMGROUP**)
- select/deselect groups through rectangular polygons (**SCMGROUP**)
- SCM rule assignment (**SCMRULE**)
- schematic plan variants management (**SCMVAR**, (**SCMZOOM**))
- SCM EDIF data import (**SCMEDFDI**, **SCMIO**)
- option for PDF (Adobe Portable Document Format) and US Letter format Encapsulated PostScript (EPS) output (**SCMEPS**)

have been implemented with User Language programs.

2.2 File Management

Standard Library Selection

DDB file name queries now allow for the selection of the standard library by entering "!" to the file name prompt.

The file name prompt of the **Select Library** function from the **Parameter** and/or **Settings** menu now displays the last 20 characters of the currently selected library path name. Library path name queries under Windows are now being handled through a Windows file name dialog. The standard library can be selected through "!" input rather than "." input. This change was necessary to prevent the Windows file dialog from updating the current directory on "." input. A minus sign ("-") input to the file name query can still be used to reset to the library path name.

Element Name Query

A new autoscroll feature for automatically scrolling the list box contents to the closest element name on text input has been added to the Windows element name query functions.

The name of the currently loaded element is provided as default element name in the element name query of the **Save Element As** function.

Schematic Plan Sheet Size Selection

The **New Element / Plan** function for creating schematic plans activates a new options menu for selecting predefined sheet sizes after specifying the file and element names. This allows for the selection of A0, A1, A2, A3, A4, Letter (8.5*11 Inches), and Tabloid (11*17 Inches) formats in either portrait or landscape orientation. The **Other Format** option can be used to specify any other sheet size.

Warning

User Language programs for schematic plan generations must be adapted in order to process the new sheet size selection sequence.

2.3 Symbols, Labels

Library Element Access

The source file name popup menu of the symbol placement function provides the new (**Lib.**) button for selecting the standard library. Instead of hitting the (**Lib.**) button, the standard library can also be selected with ">" text input. Subsequent symbol element name queries under Windows are handled through a scrollbar.

Signal Routing

The functions for automatically re-routing adjacent connections whilst moving symbols have been considerably improved in order to avoid the generation of new connections (short-circuits), and to refrain from disconnecting all connections when placing symbols on top of larger (frame) symbols.

2.4 Connections

Automatic Point-to-Point Connections

The new `Point to Point Connection` function has been added to the `Connections` menu. This function automatically connects two selectable points on the currently loaded schematic plan if this is possible with up to three connection segments.

Bus Connections

The new `Rename Bustap` function for renaming bus connections has been introduced to the `Connections` menu.

Bus Display Mode

Assigning the `scm_bus_fill` rule on SCM plan level causes busses to be displayed and plotted in fill mode. The `scm_bus_fill` is defined in the "scm.rul" rule definition file from the User Language directory ("baeulc" and/or "ulc"). The `SCMRULE` User Language program can be used for assigning rules to SCM elements. The `SCMCON` User Language program can be used for setting the desired bus display mode through the `Outline Display` and/or `Filled Display` option. `SCMCON` can be called through `Run User Script` or through the `Bus Display Mode` function from the `Connections` menu if the `UIFSETUP` has been activated.

Warning

The bus display mode can only be set if the "scm.rul" rule definition file (and thus the `scm_bus_fill` rule) has been compiled with the Rule System Compiler `rulecomp`. `rulecomp` stores the compiled rules to the "brules.dat" file in the BAE programs directory. I.e., the rules are not saved with the design. When transferring the design onto a different computer, the `scm_bus_fill` rule must be transferred to this computer as well, or otherwise bus display mode assignments won't work.

Tag Symbol Connections

Connections to tag symbols outside the visible screen area are not faded-out anymore.

Symbols renamed with the `Change Symbol Name` function are not disconnected from adjacent tag symbols anymore.

2.5 Text, Attributes

Symbol Attribute Display

The new **Move Attribute** function for moving and/or placing selectable symbol attributes has been introduced to the Text/Symbol menu. Attribute text offsets defined through **Move Attribute** override the global text offset set with **Move Name**. The attribute to be moved is selected through a mouse-click on the attribute text. Since symbol names are internally stored as attributes, the **Move Attribute** function can also be used to move symbol names without changing the placement of other symbol attributes.

Text Rotation Mode

The **No Rotation** option has been added to the submenus of the **Add Text**, **Move Text**, and **Copy Text** functions. Once this mode is selected for a text, the text will be displayed and/or plotted without rotation on any database hierarchy level. The **No Rotation** text mode can be reset by applying the **Standard Text** option from the same submenu.

Version Control Attributes

The new system attribute texts **\$pltttime**, **\$pltdatede**, and **\$pltdateus** are substituted with the current time (**\$pltttime**) and/or the date in German (**\$pltdatede**) or US notation (**\$pltdateus**) when displayed and/or plotted on SCM plan level. Automatic time and date substitutions are applied throughout all database hierarchy levels (marker, symbol, plan), unless other attribute values are explicitly set for these attributes.

2.6 Graphic

Dotted Line Display

Arc segments in dotted/dashed lines are now correctly displayed as dotted/dashed lines rather than as continuous lines.

2.7 Group Functions

Save Group

To prevent from unintentionally overwriting existing database elements, the **Save Group** function activates a confirmation menu if an element with the same name exists in the selected destination file.

Warning

User Language programs calling the **Save Group** function through the interaction queue must be adapted in order to process the new confirmation prompt.

2.8 Print/Plot Output

Dotted Line Output

Arc segments in dotted/dashed lines are now correctly plotted as dotted/dashed lines rather than as continuous lines.

Pin Graphic Plot

On default, graphics (graphic lines, dotted lines, graphic areas) on pin marker level are not plotted. However, the `scm_pin_marker_plot` rule from the "scm.rul" rule definition file in the User Language directory ("baeulc" and/or "ulc") can be assigned to the current plan in order to force plot output of pin marker graphics. The **SCMRULE** User Language program can be used for assigning rules to SCM elements.

Warning

The pin marker plot rule can only be set if the "scm.rul" rule definition file (and thus the `scm_pin_marker_plot` rule) has been compiled with the Rule System Compiler **rulecomp**. **rulecomp** stores the compiled rules to the "brules.dat" file in the BAE programs directory. I.e., the rules are not saved with the design. When transferring the design onto a different computer, the `scm_pin_marker_plot` rule must be transferred to this computer as well, or otherwise pin marker graphic plot requests won't work.

HP-GL Pen Plot

The maximum allowed HP-GL pen plot number has been increased from 10 to 99.

Windows Generic Output Print Page Aspect Ration

The Windows printer dialog specifications for the number of copies, page sorting mode, and page range are considered by the **Generic Output** function.

The **All Pages** option from the Windows printer dialog of the **Generic Output** function plots all elements of the currently loaded database class. This allows for the output of, e.g., all sheets of a schematic plan. All SCM plans are plotted according to plan-specific plot parameter settings such as plot rotation modes.

The **selection** option from the Windows printer dialog allows for the selection of the print area for generic outputs.

The page aspect ratio will now be maintained when automatically scaling the plot according to the selected print page format.

3 Packager

3.1 Logical Part Definition Assignment

`$rlname` (Requested Logical Library Definition) symbol attribute value assignments cause the Packager to transfer symbols using non-default logical library definitions. This allows for the selection of part definitions with, e.g., manufacturer-specific library attribute settings or non-default package assignments. The non-default LOGLIB entry assigned through `$rlname` must refer to the same part class like the default LOGLIB definition (for LOGLIB part class definitions see also [section 10.2](#) of these Release Notes).

Warning

`mainpart/subpart` symbol sets must be assigned to corresponding parts. I.e., heterogeneous symbol definitions such as `amain/asub` and `bmain/bsub` may be assigned to `amain/asub` or `bmain/bsub`, but not to `amain/bsub` or `bmain/asub`.

4 Layout Editor

4.1 General

Context-sensitive Function Menus

Pressing the left mouse button <LMB> within the graphic workarea activates a context-sensitive menu with specific functions for the object at the current mouse position if no other menu function is currently active. The **Open/Load Element** and/or **Create/New Element** file management functions are provided if no element is currently loaded. This feature is implemented through an automated call to the **GED_MS** User Language program.

User Language Programs

A series of new Layout Editor functions and features such as

- direct jump to Schematic Editor (**UIFSETUP**)
- manual routing with automatic pin trace connection to offgrid pins (**LPINTRC**)
- convert polygon corners into arcs or diagonal segments (**POLYRND**, **GEDPOLY**)
- documentary line join function (**GEDPOLY**)
- load groups from different database hierarchy levels (**GEDGROUP**)
- select/deselect groups through rectangular polygons (**GEDGROUP**)
- group part text position reset function (**GEDGROUP**)
- layout variants management (**GEDVAR**, **LAYZOOM**)
- option for PDF (Adobe Portable Document Format) and US Letter format Encapsulated PostScript (EPS) output (**LAYEPS**)
- programmable generic insertion data output (**GINSOUT**)

have been implemented with User Language programs.

4.2 File Management

Standard Library Selection

DDB file name queries now allow for the selection of the standard library by entering "!" to the file name prompt.

The file name prompt of the **Select Library** function from the **Parameter** and/or **Settings** menu now displays the last 20 characters of the currently selected library path name. Library path name queries under Windows are now being handled through a Windows file name dialog. The standard library can be selected through "!" input rather than "." input. This change was necessary to prevent the Windows file dialog from updating the current directory on "." input. A minus sign ("-") input to the file name query can still be used to reset to the library path name.

Element Name Query

A new autoscroll feature for automatically scrolling the list box contents to the closest element name on text input has been added to the Windows element name query functions.

The name of the currently loaded part, padstack, and/or pad element is provided as default element name in the element name query of the **Save Element As** function. Layout plan element name queries provide the default layout element name defined through **bsetup** and/or **baesetup**.

4.3 Display, Design Rule Check

Millimeter Grid Selection

The new **mm Grid** option for selecting millimeter grids has been added to the input and display grid menus. The **mm Grid** option allows for the selection of 0.05 mm, 0.1 mm, 0.125 mm, 0.25 mm, 0.5 mm, 0.625 mm, 1.0 mm, 1.25 mm, 2.0 mm, 2.5 mm, or 10.0 mm grids. **Inch Grid** returns to the Inch grid selection menus. **Select Grid** allows for the specification of arbitrary grids. **No Grid** deactivates the input and/or display grid. **Abort** cancels the grid selection without changing the current grid.

Query Element

Part and text rotation angle display has been added to the **Query Element** function output. Mirroring is indicated by an 'm' character preceding the rotation angle display.

Report

The new **Power Layers in Use** and **Signal Layers in Use** entries have been introduced to the Report function to display the used power and signal layers. Signal layer 1 to top layer are always assumed to be in use. These entries help to identify power layers without global net assignment, hence with split power planes to be considered by connectivity.

Mincon Function

The **Mincon Function** of the Layout Editor has been supplemented by the **All Nets Visible** and **All Nets Invisible** options. **All Nets Visible** forces the graphical display of all airlines, whilst **All Nets Invisible** fades out all airlines.

Short Circuit Display

Pin/gate swaps on pins connected to power layers sometimes caused a redundant short circuit display which had to be reset with a screen redraw. This problem has been fixed.

4.4 Parts, Placement

Library Element Access

The source file name popup menu of the part placement function provides the new (**Lib.**) button for selecting the standard library. Instead of hitting the (**Lib.**) button, the standard library can also be selected with ">" text input. Subsequent symbol element name queries under Windows are handled through a scrollbox.

Jump Relative

The new **Jump relative** function has been added to the submenus of the **Add Part**, **Move Part**, and **Place Next Part** functions. This function performs a relative part placement based either on the origin of the currently loaded element (**Add Part**, **Place Next Part**) or on the previous part placement coordinate (**Move Part**).

4.5 Traces, Routing

Highlight Net

The **Highlight Net** function from the **Traces** menu now also allows for isolated pins and active copper areas to be selected for highlight display.

Trace Edit Display Mode

The **lay_edit_wide_filled** and **lay_edit_wide_outline** rules from the "layout.rul" rule definition file (see User Language programs directory "baeulc" and/or "ulc") can be assigned to layouts to force unfilled or filled wide trace segments display during manual routing. The **Edit Display** function from the **GEDTRACE** User Language program can be used for assigning one of the trace edit display modes **Line Display** (default), **Filled Display**, or **Outline Display**. **GEDTRACE** can be called through **Run User Script** or through **Other Functions** from the **Traces** menu if the **UIFSETUP** has been activated.

Warning

Trace edit display modes can only be set if the "layout.rul" rule definition file (and thus the **lay_edit_wide_filled** **lay_edit_wide_outline** rules) have been compiled with the Rule System Compiler **rulecomp**. **rulecomp** stores the compiled rules to the "brules.dat" file in the BAE programs directory. I.e., the rules are not saved with the design. When transferring the design onto a different computer, the trace edit display mode rules must be transferred to this computer as well, or otherwise trace edit display mode assignments won't work.

Trace Segment Processing

The **Move with Neighbors** and **Move without Neighbors** options often caused unpredictable routing results when used with the **Insert Segment** function from the **Traces** menu. Therefore, these options are only used by the **Move Segment** function, but not by **Insert Segment** anymore.

Trace Corner Processing

The new **Arc Direction** function has been introduced to the submenus of the **Add Trace**, **Insert Corner** and **Move/Delete Corner** functions for manipulating trace corners. **Arc Direction** toggles the angle-locked trace segment when working in **Grid+Rotation On** mode and/or inserts the 45-degree trace segment at the opposite trace segment end when operating in **Grid+Rotation octagonal** mode.

Pin Connections

The **Add Trace** function sometimes connected to a signal layer different from the preference layer when picking pins with pads placed on Inside Layers. This problem has been solved.

Vias on Part Level

Sometimes, the display of vias on part level with power layer connections was incorrect. This problem has been solved.

4.6 Text, Attributes

Part Attribute Display

The new **Move Attribute** function for moving and/or placing selectable part attributes has been introduced to the Text/Part menu. Attribute text offsets defined through **Move Attribute** override the global text offset set with **Move Name**. The attribute to be moved is selected through a mouse-click on the attribute text. Since part names are internally stored as "\$" attributes, the **Move Attribute** function can also be used to move part names without changing the placement of other part attributes.

Part texts and/or part attribute texts of group-selected parts can be reset to their library-defined default positions using the new **Part Texts Reset** function implemented with the **GEDGROUP** User Language program.

Version Control Attributes

The new system attribute texts `$pltttime`, `$pltdatede`, and `$pltdateus` are substituted with the current time (`$pltttime`) and/or the date in German (`$pltdatede`) or US notation (`$pltdateus`) when displayed and/or plotted on layout level. Automatic time and date substitutions are applied throughout all database hierarchy levels (pad, padstack, part, layout), unless other attribute values are explicitly set for these attributes.

4.7 Graphic, Copper Areas

Rotating and Mirroring Graphics

The new **Rotate Left**, **Rotate Right**, **Set Angle**, and **Mirror** options have been added to the submenus to be activated through the right mouse button <RMB> whilst operating the **Move Area** and **Copy Area** functions. This allows for the currently processed area and/or graphic to be optionally rotated or mirrored around the X-axis.

Dashed Line Display

The base length for dashed lines has been increased from 1 millimeter to 2 millimeters in order to comply with the SCM system and to provide improved plot visibility.

Assigning one of the `poly_dash1`, `poly_dash2`, or `poly_dash3` rules from the "polygon.rul" rule definition file (see User Language directory "baeulc and/or "ulc") to a documentary line cause the documentary line to be displayed in dash mode. `poly_dash1` creates standard mode dash lines. `poly_dash2` creates dashed lines with short line segments and long gaps. `poly_dash3` creates alternating short and long lines separated by short gaps. The **Dash Mode** function from the **GEDPOLY** User Language program can be used for assigning dash modes to documentary lines, or for resetting any previously assigned dash modes through the **Straight Line** option. **GEDGROUP** can be called through **Run User Script** or through **Other Functions** function from the **Areas** menu if the **UIFSETUP** has been activated.

Warning

Documentary dash line modes can only be set if the "polygon.rul" rule definition file (and thus the `poly_dash1`, `poly_dash2`, and `poly_dash3` rules) have been compiled with the Rule System Compiler **rulecomp**. **rulecomp** stores the compiled rules to the "brules.dat" file in the BAE programs directory. I.e., the rules are not saved with the design. When transferring the design onto a different computer, the polygon dash rules must be transferred to this computer as well, or otherwise documentary dash line mode assignments won't work.

Part Type specific Graphic and Text Display

Part type specific graphics and texts can be defined by assigning rules containing `l1nvis` predicate value settings (Logical Library Name Visibility; for examples see the `layout_l1name_*` rules in the `layout.rul` definition file of the User Language programs directory "baeulc" and/or "ulc") to documentary layer polygons and/or texts on layout part level. These part elements are only displayed on layout level if the `l1nvis` predicate value matches the part `$l1name` (Logical Library Name) attribute value. This, e.g., allows for the definition of footprints (e.g., SMD "s1206") with different insertion plan graphics for capacitors (e.g., `$l1name "c"`) and resistors (e.g., `$l1name "r"`).

4.8 Group Functions

Save Group

To prevent from unintentionally overwriting existing database elements, the `save Group` function activates a confirmation menu if an element with the same name exists in the selected destination file.

Warning

User Language programs calling the `save Group` function through the interaction queue must be adapted in order to process the new confirmation prompt.

5 Autoplacement

5.1 General

User Language Programs

A series of new Autoplacement functions and features such as

- direct jump to Schematic Editor, Autorouter, or CAM Processor (**UIFSETUP**)
- option for PDF (Adobe Portable Document Format) and US Letter format Encapsulated PostScript (EPS) output (**LAYEPS**)

have been implemented with User Language programs.

5.2 File Management

Standard Library Selection

DDB file name queries now allow for the selection of the standard library by entering "!" to the file name prompt.

The file name prompt of the **Select Library** function from the **Parameter** and/or **Settings** menu now displays the last 20 characters of the currently selected library path name. Library path name queries under Windows are now being handled through a Windows file name dialog. The standard library can be selected through "!" input rather than "." input. This change was necessary to prevent the Windows file dialog from updating the current directory on "." input. A minus sign ("-") input to the file name query can still be used to reset to the library path name.

Element Name Query

A new autoscroll feature for automatically scrolling the list box contents to the closest element name on text input has been added to the Windows element name query functions.

5.3 Display, Design Rule Check

Millimeter Grid Selection

The new **mm Grid** option for selecting millimeter grids has been added to the input and display grid menus. The **mm Grid** option allows for the selection of 0.05 mm, 0.1 mm, 0.125 mm, 0.25 mm, 0.5 mm, 0.625 mm, 1.0 mm, 1.25 mm, 2.0 mm, 2.5 mm, or 10.0 mm grids. **Inch Grid** returns to the Inch grid selection menus. **Select Grid** allows for the specification of arbitrary grids. **No Grid** deactivates the input and/or display grid. **Abort** cancels the grid selection without changing the current grid.

Short Circuit Display

Pin/gate swaps on pins connected to power layers sometimes caused a redundant short circuit display which had to be reset with a screen redraw. This problem has been fixed.

5.4 Manual Placement

Library Element Access

The source file name popup menu of the manual part placement function provides the new (**Lib.**) button for selecting the standard library. Instead of hitting the (**Lib.**) button, the standard library can also be selected with ">" text input. Subsequent symbol element name queries under Windows are handled through a scrollbox.

Jump Relative

The new **Jump relative** function has been added to the submenus of the **Add Part**, **Move Part**, and **Place Next Part** functions. This function performs a relative part placement based either on the origin of the currently loaded element (**Add Part**, **Place Next Part**) or on the previous part placement coordinate (**Move Part**).

Part Name Display

The part name offsets defined with the "Move Name" Layout Editor function are now preserved when manually moving parts in the Autoplacement module.

5.5 Full Autoplacer

Part Mirroring

The new **SMD 2 Pin Mirroring** option has been added to the **Mirroring Mode** function of the **Auto Placement** menu. This option restricts 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.

Part Expansion

The Full Autoplacer employs a new function for automatically reducing part expansion settings by 25 percent steps until either complete placement is achieved or part expansion is reduced to zero.

Block Capacitor Placement

A feature for block capacitor recognition has been integrated to the Full Autoplacer. Block capacitors are now preferably placed either on top or on the right-hand side of the integrated circuits, according to the ICs orientation. Block capacitors are also excluded from part expansion, thus allowing for tighter placement to the supplied parts.

Placement Grid

Parts with outlines not matching the placement grid were sometimes placed off-grid. The Full Autoplacer has been changed in order to force such parts onto the placement grid.

5.6 Automatic Copper Fill

Heat-Trap Generation

The copper fill algorithms sometimes failed to keep minimum distances when generating heat-traps on very dense placed pin rows. This problem has been solved.

6 Autorouter

6.1 General

Layer Assignment

In 12-layer layouts, layer 12 re-assignments were only possible after resetting the current layer 12 assignment. This problem has been fixed.

User Language Programs

A series of new Neural Autorouter functions and features such as

- direct jump to Schematic Editor, Autoplacement, or CAM Processor (**UIFSETUP**)
- option for PDF (Adobe Portable Document Format) and US Letter format Encapsulated PostScript (EPS) output (**LAYEPS**)

have been implemented with User Language programs.

6.2 File Management

Standard Library Selection

DDB file name queries now allow for the selection of the standard library by entering "!" to the file name prompt.

The file name prompt of the **Select Library** function from the **Parameter** and/or **Settings** menu now displays the last 20 characters of the currently selected library path name. Library path name queries under Windows are now being handled through a Windows file name dialog. The standard library can be selected through "!" input rather than "." input. This change was necessary to prevent the Windows file dialog from updating the current directory on "." input. A minus sign ("-") input to the file name query can still be used to reset to the library path name.

Element Name Query

A new autoscroll feature for automatically scrolling the list box contents to the closest element name on text input has been added to the Windows element name query functions.

6.3 Display, Design Rule Check

Millimeter Grid Selection

The new **mm Grid** option for selecting millimeter grids has been added to the input and display grid menus of the Neural Autorouter. The **mm Grid** option allows for the selection of 0.05 mm, 0.1 mm, 0.125 mm, 0.25 mm, 0.5 mm, 0.625 mm, 1.0 mm, 1.25 mm, 2.0 mm, 2.5 mm, or 10.0 mm grids. **Inch Grid** returns to the Inch grid selection menus. **Select Grid** allows for the specification of arbitrary grids. **No Grid** deactivates the input and/or display grid. **Abort** cancels the grid selection without changing the current grid.

Short Circuit Display

Pin/gate swaps on pins connected to power layers sometimes caused a redundant short circuit display which had to be reset with a screen redraw. This problem has been fixed.

6.4 Graphic Output

Graphic output and statistical readout during routing may now optionally be deactivated by pressing key 'd'. The "Router working. Press 'd' to activate display..." message is displayed whilst router graphic output is deactivated. Pressing the 'd' key again reactivates the graphic output and the statistical readout. With graphic output deactivated, the routing process is accelerated by up to 10 percent. A screen redraw is automatically performed after the routing process has finished.

6.5 Autorouter Algorithms

Rip-Up Router

The Rip-Up Router half-grid routing performance has been significantly improved.

Gridless Routing

The Neural Autorouter gridless routing performance has been significantly improved.

Re-Entrant Router

With the gridless option activated, the Load Layout function (Re-Entrant Router) sometimes failed to re-route certain traces correctly. This problem has been fixed.

Power Layer Routing

Active copper areas on unused power layers caused the "Incompatible options selected!" Autorouter error message. To avoid this redundant error message, the Autorouter does not check for active copper areas on unused power layers anymore.

Blind and Buried Vias

With special size relations between blind and buried vias and All Layer vias, the router failed to place All Layer vias in certain areas even though there was enough space. This problem has been fixed.

7 CAM Processor

7.1 General

User Language Programs

A series of new CAM Processor functions and features such as

- direct jump to Schematic Editor, Autoplacement, or Autorouter (**UIFSETUP**)
- automatic pen assignment pre-load for multi-layer plots (**CAMSETUP**)
- option for PDF (Adobe Portable Document Format) and US Letter format Encapsulated PostScript (EPS) output (**LAYEPS**)
- programmable generic insertion data output (**GINSOUT**)

have been implemented with User Language programs.

7.2 File Management

Element Name Query

A new autoscroll feature for automatically scrolling the list box contents to the closest element name on text input has been added to the Windows element name query functions.

7.3 Display

Millimeter Grid Selection

The new **mm Grid** option for selecting millimeter grids has been added to the input and display grid menus. The **mm Grid** option allows for the selection of **0.05 mm**, **0.1 mm**, **0.125 mm**, **0.25 mm**, **0.5 mm**, **0.625 mm**, **1.0 mm**, **1.25 mm**, **2.0 mm**, **2.5 mm**, or **10.0 mm** grids. **Inch Grid** returns to the Inch grid selection menus. **Select Grid** allows for the specification of arbitrary grids. **No Grid** deactivates the input and/or display grid. **Abort** cancels the grid selection without changing the current grid.

7.4 Plot Parameter

Inside Layer Pad Output in BAE HighEnd

The new **Plot Connected**, **Pins & connected Vias**, and **Vias & connected Pins** options have been added to the **All Layer Mode** plot parameter of the BAE HighEnd CAM Processor. These modes restrict the output of inside layer pin and/or via pads to only those pads which have connections to other elements on the selected inside layer. **Plot connected** plots only connected inside layer pin and via pads. **Pins & connected Vias** plots all inside layer pin pads and only connected inside layer via pads. **Vias & connected Pins** plots all inside layer via pads and only connected inside layer pin pads. Inside layers are all signal layers except for layer 1 and the signal layer selected with the **Set Top Layer** function.

7.5 HP-GL Pen Plot

HP-GL Pen Number

The maximum allowed HP-GL pen plot number has been increased from 10 to 99.

7.6 Windows Generic Output

The Windows printer dialog specifications for the number of copies, page sorting mode, and page range are considered by the **Generic Output** function.

The **All Pages** option from the Windows printer dialog of the **Generic Output** function plots all elements of the currently loaded database class. This allows for the output of, e.g., all layouts of a project. All layouts are plotted according to layout-specific plot parameter settings such as plot rotation modes.

The **selection** option from the Windows printer dialog allows for the selection of the print area for generic outputs.

The page aspect ratio will now be maintained when automatically scaling the plot according to the selected print page format.

8 CAM View

8.1 General

User Language Programs

A series of new CAM View functions and features such as

- direct jump to Schematic Editor, Layout Editor, Autoplacement, or Autorouter (**UIFSETUP**)

have been implemented with User Language programs.

8.2 Display

Millimeter Grid Selection

The new **mm Grid** option for selecting millimeter grids has been added to the input and display grid menus. The **mm Grid** option allows for the selection of **0.05 mm**, **0.1 mm**, **0.125 mm**, **0.25 mm**, **0.5 mm**, **0.625 mm**, **1.0 mm**, **1.25 mm**, **2.0 mm**, **2.5 mm**, or **10.0 mm** grids. **Inch Grid** returns to the Inch grid selection menus. **Select Grid** allows for the specification of arbitrary grids. **No Grid** deactivates the input and/or display grid. **Abort** cancels the grid selection without changing the current grid.

8.3 Processing Drilling Data

Drilling Data Display

The CAM View module has been changed to automatically activate the color table entry for the drilling data display when loading drilling data. This color table entry is set to white if it is still undefined (i.e., black and/or invisible). This ensures that drilling data load operations can be visually monitored.

8.4 Processing Gerber and Excellon Data

Coordinate Mode

The new **Coord.-Spec.** function can be used to select the coordinate input mode for Gerber and/or Excellon data load operations. With the **Abs. Coordinates** option, input coordinates are assumed to be absolute, whilst with option **Inc. Coordinates**, input coordinates are assumed to be relative and/or incremental.

9 Neural Rule System

9.1 General

Rule Definitions

The "brules.dat" file installed to the BAE programs directory contains precompiled rule definitions. The source files for these rule definitions are also provided (User Language directory; file extension ".rul"), i.e., the rule definitions can be modified and recompiled with the [rulecomp](#) Rule System Compiler.

9.2 SCM Rules

BAE Version 4.4 provides a series of new rules for the implementation of special SCM functions. These rules and their applications have already been described in [section 2](#).

9.3 Layout Rules

BAE Version 4.4 provides a series of new rules for the implementation of special layout functions. These rules and their applications have already been described in [section 4](#).

10 Utilities

10.1 COPYDDB

The new Merge Replace option `-mr` can be used instead of `-ms` and/or `-md` for replacing/overwriting existing destination DDB file elements only. This option allows for easy updates of job-specific libraries.

10.2 LOGLIB

The `part` command allows for the assignment of part classes as in

```
part tr_bc547 : class "npn-transistor" default to92 {  
    pin (e,b,c) ;  
    xlat (e,b,c) to (1,2,3) ;  
}
```

Part class assignments are used by the Packager in order to check whether alternate part definition assignments through the `$rlname` (Requested Logical Library Name) attribute are permitted (see also [section 3.2](#) of these Release Notes).

11 Bartels User Language

11.1 General

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

Internal User Language Version

The internal version of BAE Version 4.4 User Language has been changed. All User Language programs compiled under earlier BAE versions won't execute in the BAE Version 4.4 User Language interpreter environment (error message "`User Language program version incompatible!`"). This means, that each User Language program compiled under earlier BAE Versions must be recompiled under BAE Version 4.4 in order to regain compatibility.

11.2 User Language Compiler

This section describes the news and changes introduced to the BAE Version 4.4 User Language Compiler. See [Bartels User Language Programmer's Guide - Chapter 3](#) for detailed information on how to operate the User Language Compiler.

11.3 User Language Interpreter

This section describes the news and changes introduced to the BAE Version 4.4 User Language Interpreter. See [Bartels User Language Programmer's Guide - Chapter 3](#) for detailed information on how to operate the User Language Interpreter.

Memory Management

The User Language Interpreter memory management functions have been optimized in order to improve the performance at the processing of complex data types such as arrays.

11.4 System Functions

This section lists the new and changed User Language system functions released with BAE V4.4. See [Bartels User Language Programmer's Guide - Appendix C](#) for a detailed description of all system functions.

BAE Version 4.4 provides a series of new and/or improved User Language system functions for message and verification popups, activating applications under Windows, supporting BAE HighEnd interprocess communication, Chip Editor group selection, etc.

New System Functions

The following new User Language system functions are provided with BAE V4.4:

IP	System Function	Short Description
STD	bae_cleardistpoly	Clear internal BAE distance query polygon
	bae_defmenuusel	Set BAE menu default selection
	bae_querydist	Query point to polygon distance
	bae_setpopdash	Set BAE popup/toolbar polygon dash draw base length
	bae_storedistpoly	Store internal BAE distance query polygon
	bae_swversion	Get BAE software version
	synscanigncase	BNF/scanner keyword case-sensitivity mode setting

Changed System Functions

A default element name can now be passed through the first parameter of the [bae_askddbename](#) system function. An empty string must be passed if no default element name selection is required and/or allowed. Under Windows, the [bae_askddbename](#) combo-box supports autoscroll to the closest element name when typing in the element name.

The menu code 9005 for closing the currently loaded element can now be passed to the parameter of the [bae_callmenu](#) system function. New menu codes have also been defined for calling any BAE module from any other BAE module with UL functionality, also supporting automatic Packaging towards SCM and/or Layout.

A parameter has been added to the [bae_storemenuiact](#) system function to allow for optional hotkey inputs.

The [perror](#) system function now clears the status line display of the BAE user interface when passing an empty string to the message string parameter (previously, empty string inputs didn't change the display).

A new **int** parameter has been added to the [cap_ruleplanatt](#) and [cap_ruleplandet](#) system functions to allow for the attachment and/or detachment of rules to/from all sheets of the currently loaded SCM plan.

A new **int** parameter has been added to the text callback functions of the [cap_scanall](#), [cap_scanfelem](#), and [cap_scanpool](#) system functions. This flag is set to 1 if the text is a variant attribute, otherwise it is zero.

A new drill diameter parameter to be considered by the power plane distance check routines has been added to the [lay_getpowplanetree](#) system function.

New selection types have been introduced to the [ged_groupselect](#) system function for (de)selecting elements not on a specific layer, and for (de)selecting elements assigned and/or not assigned to a specific tree/net number.

The second parameter of the [cam_plothpgl](#) system function has been extended to allow for the specification of HP-GL pen numbers in the range 1 to 99.

The [cam_setgenpltparam](#) system function for setting the general CAM Processor plot parameters has been changed to allow for the specification of the new All Layer plot modes "Plot Connected", "Pins & connected Vias", and "Vias & connected Pins".

11.5 BAE User Language Programs

BAE Version 4.4 installs more than 160 pre-compiled User Language programs to the "bsetup.dat" file of the BAE programs directory. Additionally, the User Language *source* files (more than 2.6 Mbytes; almost 90,000 lines) are installed to a special directory ("baeulc" and/or "ulc"). See [Bartels User Language Programmer's Guide - Chapter 4](#) for a complete listing and short descriptions of the BAE User Language programs .

Include Files

The User Language include files already delivered with the previous BAE Version have been completely revised and extended by a series of new definitions and functions.

New User Language Programs

The following new User Language programs are provided with BAE Version 4.4:

IP	Program Name	Short Description
SCM	SCM_MS	SCM Mouse Action
	SCMCON	SCM Connection Functions
	SCMEDFDI	SCM EDIF Data Import
	SCMRULE	Schematic Rule Definition Utility
	SCMVAR	Schematic Plan Variant Selection
	SCMZOOM	Schematic Zoom Action
LAY	GINSOUT	Generic Insertion Data Output
	LAYZOOM	Layout Zoom Action
GED	GED_MS	GED Mouse Action
	GEDVAR	Layout Plan Variant Selection
	LPINTRC	Layout Pin Trace Connection
	POLYRND	Change Polygon Corners to Arcs or 45 Degree Segments

Changed User Language Programs

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

Menu Assignments and Key Bindings

Some of the BAE Version 4.4 User Language programs define implicit User Language program calls (startups, toolbars, menu assignments, key bindings). I.e., with the installation of BAE Version 4.4, a modified BAE user interface with many additional functions is activated. You can add even more functions, or you may modify and/or reset the predefined menu assignments and key bindings.

The **BAE_ST** User Language program is automatically started when entering a User Language Interpreter environment (Schematic Editor, Layout Editor, Autoplacement, Neural Autorouter, CAM Processor, CAM View, or Chip Editor). **BAE_ST** calls the **UIFSETUP** User Language program which activates predefined menu assignments and key bindings for the current BAE program module. With BAE Version 4.4, the key bindings and menu assignments defined through **UIFSETUP** were considerably modified. Any changes to the menu assignments and key bindings require modification and re-compilation of the **UIFSETUP** source code only. The **HLPKEYS** User Language program can be used to list the current key bindings. With the predefined menu assignments of **UIFSETUP** activated, **HLPKEYS** can be called from the **Key Bindings** function of the **Help** menu. Menu assignments, although obvious from the BAE user interfaces, can be listed with the **UIFDUMP** User Language program. The **UIFRESET** User Language program may be used to reset all currently defined menu assignments and key bindings of the currently active BAE program module. Simply give it a try and run the **UIFRESET** program; we bet you'll be surprised to see the difference (the predefined menu layout can always be restored by calling **UIFSETUP**). The **UIFSETUP**, **UIFDUMP**, and **UIFRESET** programs may also be called from the menu of the **KEYPROG** User Language program which provides additional facilities for online key programming and User Language program help info management.