Bartels AutoEngineer®
Version 6.0
Release Notes

This document contains information about the new features introduced with **Bartels AutoEngineer Version 6.0**. Forward compatibility from earlier versions to **Bartels AutoEngineer Version 6.0** is ensured, but not backward compatibility.

Bartels AutoEngineer Version 6.0 Release Notes
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1   General

1.1   Bartels AutoEngineer Product Line

The following **Bartels AutoEngineer** software configurations are available:

- **Bartels AutoEngineer Schematics**

- **Bartels AutoEngineer Light**

- **Bartels AutoEngineer Economy**

- **Bartels AutoEngineer Professional**

- **Bartels AutoEngineer HighEnd**

- **Bartels AutoEngineer IC Design**

- **Bartels AutoEngineer FabView**

Bartels AutoEngineer Professional is the standard BAE software configuration. **BAE Professional** is available for PCs with Windows, Linux or DOS operating systems. **BAE Schematics**, the schematic editor of **BAE Professional** is *freely available* and can be operated in stand-alone mode. Demo software configurations of **BAE Professional** (fully-featured except for data output) are available free of charge for test and evaluation purposes.

Bartels AutoEngineer Light is a shareware price-level BAE configuration for educational purposes and/or semi-professional users, available for PCs with Windows, Linux or DOS operating systems. **BAE Light** has full **BAE Professional** functionality, however, limited to a maximum PCB layout size of 180mm * 120mm and a maximum of two signal layers for manual routing and **Autorouter**.

BAE Economy is a low-price BAE configuration for educational purposes and/or small business users, available for PCs with Windows, Linux or DOS operating systems. **BAE Economy** has full **BAE Professional** functionality, however, limited to a maximum PCB layout size of 350mm * 200mm and a maximum of four signal layers to be simultaneously routed by the **Autorouter**.

Bartels AutoEngineer HighEnd is available for workstations and for PC systems (Windows 95/98/ME/NT/2000/XP, Linux). **BAE HighEnd** utilizes special operating system characteristics (multi-tasking, multi-windowing, virtual memory management, etc.) to implement advanced features and functions such as HighSpeed kernel, in-built messaging system to support advanced communication between different BAE modules, in-built multi-tasking to support multiple project views, global net highlight, cross-probing, selective layout short-circuit display, extremely fast Mincon airline calculation, optimized data structures for high **Autorouter** performance, advanced **Neural Rule System** features, rule-driven **Neural Autorouter**, nettype-specific routing area definitions, net-specific maximum via count settings, net-specific maximum connection length settings, etc.

BAE HighEnd is optionally available with **Bartels AutoEngineer IC Design (BAEICD)**. **BAE IC Design** 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 FabView is a low-cost PCB layout viewer with manufacturing data output functions. **BAE FabView** is intended for PCB manufacturing departments and service providers who only have to produce manufacturing data and print/plot outputs but don't have to edit layouts. **BAE FabView** can be used together with **BAE Professional** and/or **BAE HighEnd**. **BAE FabView** provides the same functionality, however, the functions for saving design changes to BAE project files are deactivated.

1.2 System Requirements

General System Requirements

A VGA or higher resolution monitor with a screen resolution of at least 800*600 pixels 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 Schematics, **BAE Light**, **BAE Economy**, **BAE Professional** and **BAE FabView** versions are available for Linux (Kernel 2.0.x and above), Windows XP, Windows 2000, Windows NT 4.0, Windows NT 3.51, Windows ME (Millenium Edition), Windows 98, Windows 95 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 and above), Windows XP, Windows 2000, Windows NT 4.0, Windows NT 3.51, Windows ME (Millenium Edition), Windows 98 and Windows 95 operating systems.

PC System Requirements

PC systems should be equipped with a Pentium (80586, 80686) or at least a 80486DX processor. Any compatible processor such as AMD-K6 or AMD-K7 (Athlon) will also do.

A minimum of 8 Mbytes RAM is required for DOS systems (16 Mbytes RAM recommended). A minimum of 32 Mbytes RAM is required for Windows 95/98/ME/NT/2000/XP and Linux systems (64 Mbytes RAM or more 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 **BAE Economy**, **BAE Professional** and **BAE Fabview** Windows and DOS versions against software piracy. I.e., a printer port (LPT1, LPT2 or LPT3) is required to run these BAE versions under DOS and/or Windows.

On Linux systems, either a printer port (for the hardlock key) or an Ethernet card is required for checking the software authorization of **BAE Economy**, **BAE Professional**, **BAE HighEnd** and **BAE FabView**.

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 and PDF format (in the `baedoc` directory of the BAE CD-ROM).

1.4   Installation Guide

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`, `.def`, `.fnt` and `.ini` when just updating from earlier BAE versions since these files can contain user-defined color tables, layer definitions, Gerber aperture tables and character fonts which are overwritten during update installations.

BAE updates can be installed to new directories. You should then copy the BAE system files with the `.dat`, `.def`, `.fnt` and `.ini` extensions from the old BAE programs directory to the BAE programs directory of the new installation to transfer all user-specific system definitions such as color tables and Gerber aperture tables to the new BAE installation.

The BAE (update) installation procedures always (re-)install the BAE system files ending on `.vdb` to the BAE programs directory. These files contain version-dependent system data such as the compiled **User Language** programs of the BAE software (`ulcprog.vdb`) and the compiled rule definitions of the BAE software (`brules.vdb`). It is therefore not necessary to run the time-consuming batch for compiling the **User Language** sources provided with the BAE software or to compile the rule definition files deliverd with the BAE software. However, customer-specific **User Language** programs and rule definitions developed and compiled under the previously installed BAE version must be re-compiled after performing a BAE Update Installation.

Software Security Module and License Files

The BAE PC software for Windows and DOS (except for **BAE Demo**, **BAE Light** and **BAE Schematics**) 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; otherwise the dangle could 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* to avoid hardlock key check problems.

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`	SCM and Layout; no Hardlock Key, no (CAM) output
BAE Schematics	`schema.cfg`	SCM only; no HardlockKey
BAE Light	*see note*	SCM and Layout; no Hardlock Key, customer-specific CFG file is provided on purchase
BAE Economy	`economy.cfg`	SCM and Layout
BAE Professional	`autoeng.cfg`	SCM and Layout
BAE HighEnd	`highend.cfg`	SCM and Layout
BAE Layout	`layout.cfg`	Layout only; required/provided only for updating from BAE Versions older than **BAE Version 4.6**
BAE IC Design	`icdesign.cfg`	SCM, Layout and IC Design
BAE FabView	`fabview.cfg`	CAM/manufacturing data output; save to DDB file deactivated

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 can also copy the desired CFG file to `router.cfg` in the BAE programs directory instead of selecting the valid BAE configuration during BAE software installation

BAE Demo software is intended for evaluation purposes only. **BAE Demo** cannot produce any CAM or **User Language** output. **BAE Demo** masks Layout board elements 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 Installation

Under Windows 95/98/ME/NT/2000/XP, the BAE setup program for installing **BAE Demo**, **BAE Schematics BAE Light**, **BAE Economy**, **BAE Professional**, **BAE HighEnd**, **BAE IC Design** and/or **BAE FabView** 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.

The setup ends with the BAE software configuration. Please select the BAE configuration which is authorised for your machine (**BAE Demo**, **BAE Schematics**, **BAE Light**, **BAE Economy**, **BAE Professional**, **BAE HighEnd**, **BAE IC Design** oder **BAE FabView**; see also table 1).

MS-DOS Installation

For installing **BAE Schematics**, **BAE Economy**, **BAE Professional**, **BAE HighEnd** or **BAE FabView** under 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: ⏎
> install ⏎
```

The instructions issued on the screen should be followed carefully once the install program is started. First you are asked for the BAE user interface language (e.g., English, German, etc.) and for the operating system host platform (DOS, Windows NT, 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 prevents 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 can 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 are verified with user query before starting the installation process. The destination directories are automatically created if necessary. 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 and/or software authorization file (see table 1).

The DOS versions of the BAE software are shipped with a series of graphic device drivers. During the installation you are asked to select an appropriate BAE graphic device driver. Table 2 lists the DOS graphic device drivers supplied with the **Bartels AutoEngineer** software. Please select the graphic device driver matching the video adapter and/or graphic card installed with your computer. Or simply select standard VGA driver VGA480 if you are not sure about which driver to select. VGA480 is assumed to run on almost any PC system. The selected graphic driver file is copied to the `bae.dev` file in the BAE programs directory. You can manually copy a different driver (e.g., with higher resolution) even after running the BAE DOS installation.

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

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 can also insert the following command at the end of the **autoexec.bat** file to include the BAE programs directory path name with the **PATH** variable:

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

With the PC versions of the BAE software an environment variable called **BAETMP** can be defined for optionally specifying a BAE temporary directory to avoid problems with temporary file generation on network-based PC/MS-DOS systems. To specify the BAE temporary directory the following command must be added to the **autoexec.bat** file:

```
SET BAETMP=<dirpath>\
```

<dirpath> is the path name of the temporary directory (e.g., **d:\baetmp**; the backslash at the end of the path name is required).

The **config.sys** file must contain the following statements:

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

The number **<b>** 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.

The BAE DOS software works in Protected Mode, i.e., there is no 640 Kbytes barrier. **Bartels AutoEngineer** uses the **Phar Lap 386|DOS Extender**, which supports **DPMI**, **VCPI**, **EMM386**, **XMS/HIMEM**, **VDISK** and **INT 15h**. However, in special cases (e.g., with certain third party software configurations) it might be necessary to remove conflicting memory managers. It is possible to reconfigure the BAE programs, if you wish to restrict the way in which BAE uses memory; please contact us for more detailed information in case. With EMM386 installed under MS-DOS 6.x it is strongly recommended to add the NOVCPI switch (and the NOEMS) switch to the corresponding **config.sys** line since otherwise the performance for starting BAE graphic program modules will dramatically slow down.

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

Linux Installation

The `baelinux` directory on the BAE CD-ROM contains the `baelinux.tgz` and `baelinus.tgz` TGZ archive files with different BAE builds 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). The BAE software is supposed to run on all common Linux system with Kernel 2.0.x (S.u.S.E. 6.0 or later, RedHat, etc.). The TGZ files `baelinhe.tgz` and `baelinhs.tgz` contain the binaries for **BAE HighEnd**. An additional file named `baeeng.tgz` including the English BAE user interface setup is also provided.

We strongly recommend that you have a look into the `readme` file from the `baelinux` directory of the BAE CD-ROM before installing the BAE Linux software. The `readme` file contains a list of the provided BAE Linux archive files and latest information and important instructions for installing the BAE Linux software.

`baelinus.tgz` must be installed on Linux systems without Motif. `baelinus.tgz` contains a _statically_ linked BAE version including all system and Motif libraries (libc6/glibc, lesstif/Motif1.2) required to run BAE on any Linux Kernel 2.0.x distribution.

It is recommended to use the more efficient _dynamically_ linked BAE version from `baelinux.tgz` (linked to libc6/glibc and Motif2.0) on Linux systems where Motif is already installed. The statically linked version from `baelinus.tgz` can always be used on Linux systems which fail to run the dynamically linked version.

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 -xzfv /cdrom/baelinux.tgz 🖮
```

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 🖮
> tar -xfv /cdrom/baelinux.tar 🖮
```

To install the dynamically linked **BAE HighEnd** version, simply extract the `baelinhe.tgz` file _after_ installing `baelinux.tgz`. To install the statically linked **BAE HighEnd** version, simply install `baelinhs.tgz` _after_ installing `baelinus.tgz`.

A configuration file is provided with productive BAE Linux versions. This configuration file (`router.cfg`) must be saved to the BAE program directory (`bin`, see above). To activate **BAE Demo**, the `demo.cfg` configuration file must be copied to `router.cfg`, to activate **BAE Schematics**, `schema.cfg` must be copied to `router.cfg` (see also Table 1).

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), **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.

The **BAE HighEnd** archive files for HP workstations are provided in the **baehp** directory on the BAE CD-ROM. Please see the **readme** file in the **baehp** directory for latest information and instructions on how to install the BAE HP software.

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 -xzfv /cdrom/baehp.tgz 🖳
```

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**.

A configuration file is provided with productive BAE UNIX versions. This configuration file (**router.cfg**) must be saved to the BAE program directory (**bin**, see above) To activate **BAE Demo**, the **demo.cfg** configuration file must be copied to **router.cfg**, to activate **BAE Schematics**, **schema.cfg** must be copied to **router.cfg** (see also Table 1).

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 can be set automatically through shell profile execution (shell script **.profile**, **.login**, **.bashrc** or **.cshrc**, according to UNIX derivative, respectively).

1.5   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.

The BAE software comes with a setup definitions file template named `stdset.def` which is 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");
```

`<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 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 ⌨
```

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 7.2 for details on how to use **BSETUP**.

User Language Programs, Menu Assignments, Key Bindings

The BAE software installs many pre-compiled **User Language** programs to the `ulcprog.vdb` file of the BAE programs directory. The corresponding source files are are also provided in the **User Language** directory (`baeulc`). 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 can 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 are installed to the `ulcprog.vdb` 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`) by entering

```
> cplsll ⌨
```

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

```
> cplsll.bat ⌨
```

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

BAE Program Start and DDB File Access

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

```
> bae ⏎
```

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** can also be started by selecting the `bae.exe` file using the Run function from the Windows Start menu. Windows also allows for application startup by double-clicking the application from Windows Explorer, and it is also possible to define an initial working directory for the application to start in. A shortcut to `bae.exe` can be placed on the desktop or the Windows Start menu to provide an even more convenient method of starting up the **Bartels AutoEngineer**.

When installing the BAE software under Windows 95/98/ME/NT/2000/XP, a BAE program group with shortcuts for starting the BAE main menu (BAE Main Menu) and the BAE program modules (BAE Setup, Schematic Editor, Packager, Layout Editor, Autorouter, CAM Processor, CAM View) and for accessing the Bartels AutoEngineer User Manual (BAE User Manual) is added to the Windows start menu.

The BAE DDB File option for creating a new BAE DDB file named `New BAE DDB File` is included with the New function from the Windows 95/98/ME/NT/2000/XP Desktop and Windows Explorer context menus to be activated through the right mouse button. The BAE DDB file context menus provide the BAE Schematic and BAE Layout options for loading the selected BAE file to the **Schematic Editor** and/or the **Layout Editor**. Double-clicking a BAE DDB file automatically loads the DDB file's standard layout element to the **Layout Editor**. The system suggests to create a new layout element if the DDB file does not yet contain a layout element with default name.

Please consult your operating system documentation for more information 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. The environment variables are stored with design files to be transferred to different computers where they can refer to machine-dependent path specifications defined through corresponding environment variables. Environment variable references are preceded with a dollar sign (`$`) and must be either entirely lower-case or entirely upper-case. The `~` character serves as an alias for the `$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`	BAE Configuration/License File
`BAE_BSETUP`	`bsetup.dat`	BAE System Parameters
`BAE_PARLIB`	`baeparam.vdb`	BAE Online Key Assignments
`BAE_ULCLIB`	`ulcprog.vdb`	BAE **User Language** Programs
`BAE_ULCHELP`	`ulchelp.vdb`	BAE **User Language** Help Texts
`BAE_RULELIB`	`brules.vdb`	BAE Rules Database
`BAE_LANG`	`language.vdb`	BAE Menu String Tables (language-specific)
`BAE_FONTLIB`	`ged.fnt`	BAE Graphic Character Fonts
`BAE_SCMLIB`	`scm.dat`	SCM Color Tables
`BAE_GEDLIB`	`ged.dat`	PCB Layout Color Tables
`BAE_RUTLIB`	`rutparam.dat`	Autorouter Parameter
`BAE_CEDLIB`	`ced.dat`	IC Layout Color Tables
`BAE_CAMLIB`	`cam.dat`	CAM Gerber Aperture Tables
`BAE_DCOLLIB`	`bae.col`	BAE Display Color Table
`BAE_PCOLLIB`	`baep.col`	BAE Printer Color Table
`BAE_WINLIB`	`baewin.dat` `baexwin.dat`	BAE Windows Position File
`BAE_CLIPB`	`baeclipb.dat`	BAE Clipboard File

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. The `BAE_PROGDIR` environment variable allows for the specification of an alternative system file directory.

Windows System Font Selection

The `ANSI_FIXED_FONT` system font is used on default for displaying status line and dialog text in BAE Windows versions. Alternatively, `SYSTEM_FIXED_FONT` can be selected by assigning an arbitrary value to the `BAE_OLDFONT` environment variable if `ANSI_FIXED_FONT` isn't suited for the configured screen/monitor resolution.

1.6   User Interface and General Functions

BAE-System Files

The naming conventions for version-dependent BAE system files have been changed. These files are now always installed with file name extension `.vdb` to the BAE programs directory. This includes `ulcprog.vdb` (compiled **User Language** programs of the BAE software; previously in `bsetup.dat`), `ulchelp.vdb` (help texts for the **User Language** programs of the BAE software; new), `brules.vdb` (compiled rule definitions of the BAE software; previously `brules.dat`) and `language.vdb` (menu texts for non-German user interfaces of the BAE software; previously `language.dat`; optionally installed). This simplifies the transfer of existing user-specific system data (such as color tables, Gerber aperture tables, etc.) after BAE update installations to new directories. This can now be accomplished by simply copying the files ending on `.dat`, `.fnt` and `.ini` from the old BAE programs directory to the programs directory of the new BAE installation.

Numerical Value Input

A comma can be used instead of a decimal point when entering numeric values for coordinates, dimensions, angles and scaling factors through dialogs.

Zoom Functions

A mouse pointer memory for restoring the mouse position has been added to the Zoom In and Zoom Out available through the + and - keys. This allows for repeated zoom in/out operations at a specific position without the need to correct the mouse position.

Windows Directory Selection Dialog

The Windows standard dialog for folder selections is now activated for directory selections under Windows.

Screen Redraw under Windows

The Show window contents while dragging screen setting under Windows caused flickering when moving an application window over the BAE window. A 200ms BAE screen redraw delay has been implemented to avoid this problem.

Multi-column Selection Listboxes

A series of element and name selection dialog boxes have been replaced by multi-column selection listboxes with improved selection element overview.

User Language-Programmauswahl

A **User Language** program selection dialog has been implemented for the Run User Script function. The name of the previously called **User Language** program is pre-selected in this dialog.

Mouse Wheel Support under Windows

Mouse wheel support has been added to the BAE Windows versions. Mouse wheel turns cause the BAE screen contents to scroll vertically by a quarter of the BAE display screen height. Pressing the middle mouse button or the mouse wheel prior to the mouse wheel turn sets the scrolling distance to a multiple of five of the subsequent mouse movement. Mouse wheel turns are translated to following key codes if the left or right mouse button is pressed: `'{'` (left mouse button, forward movement), `'}'` (left mouse button, backward movement), `'['` (right mouse button, forward movement) and `']'` (right mouse button, backward movement). With the BAE standard/default key setting, the zoom out/in and rotate left/right functions are assigned to these keys.

Warning

The extended BAE mouse wheel functions are only operational if the installed mouse driver isn't configured for non-standard mouse wheel event handling (such as for scroll movement translations for applications without mouse wheel support).

BAE System Character Font

The special characters ^{2}, ^{3}, µ, € (Euro symbol), § and ° have been added to the `stdwin.fon` vector character font definition file supplied with the BAE software. The modified standard character font has been added to the `ged.fnt` system font file.

1.7 Symbol and Part Libraries

The layout libraries have been completely revised. The layout elements from the `front.ddb` (front panel design elements), `smd.ddb` (SMD part definitions) and `steckver.ddb` (connector part definitions) layout library files have been transferred to the centrla layout library `laylib.ddb`. A series of pad and padstack definitions have been "standardized" using the **GENLMAC** **User Language** program.

PDF files displaying all graphic symbols of the officially released BAE libraries are provided in the `pdflib` directory of the BAE-CD-ROM.

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

2   Schematic Editor

2.1   General

Context Functions

The Element Types function has been added to the toolbar menu for configuring the left mouse button context function. This function is used to restrict context processing to certain element types such as symbols or texts.

Jump Absolute

The Jump Absolute dialogs of the element placement context functions are initialized with the old element coordinates and/or the last corner point coordinates.

2.2   Symbols, Labels

Renaming/Renumbering Symbols

The functions for renaming and/or renumbering symbols from the Other Functions submenu of the Symbols menu have been changed to retain symbol name and attribute text positions previously assigned with the Move Name bzw. Move Attribute functions.

Part Search

Part values are now displayed in the dialog of the Search in list function from the Find Part submenu of the View menu. Plan, Name and Value buttons have been added for sorting the part search selection list.

Symbol Placement

The context menu of the Move Symbol/Label provides the new Jump relative function for moving the selected symbol relative to its old position.

Symbol Name Pattern

The Part Name Pattern function for setting part name patterns for automatic symbol/part naming has been changed to support name patterns with * characters for number fields without fixed field length. On default, this field starts counting from 1.

The Standard and Number Scan options for selecting different part name pattern mode on SCM sheet level have been added to the Part Name Pattern function. Standard is the default mode for creating part names beyond the largest used part number. Number Scan is designed to fill existing part numbering gaps, and it can be used to initiate a name search at a specific start number. Number Scan is specific to the current SCM sheet. allowing for the specification of different symbol name patterns for different SCM sheets of a project.

Label Placement with Net Name Selection

The Macro List button for activating a project/standard library label selection dialog has been added to the net name input window of the Add Label function.

The List button from the Add Label function activates a net name selection dialog with all net names from the current SCM sheet. This dialog also provides a Project Scan button for scanning the net names from other SCM sheets of the project. The net name selection dialog created by Project Scan appends different indicators according to net name scopes. **(lokal)** is used for net names which are only used on the current SCM sheet. **(global)** is used for net names which are used on the current SCM sheet and on other SCM sheets of the project. **(extern)** is used for net names which are only used on other SCM sheets of the project. The system uses a cache for memorizing the net names from other sheets to increase the performance of repeated Add Label calls.

Marker and Label Selection

Browse buttons for project/standard library element selection dialogs have been added to the Select Pin Symbol, Select Junction Point and Select Label Macro options of the Settings dialog.

Attribute Sorting

`ATTR_ORD_*_STD` entries in the `bae.ini` file can be used to set the sort mode for the attribute selection menus of the Assign Value(s) and Attr. Default Val. functions. Previously, the attribute selection menu enties were sorted according to the attribute placement sequence.

2.3   Connections

Bus Taps

The Tap Bus function has been changed to allow for optional, comma-separated step value inputs to bus tap name range specifications. I.e., `d(1-5,2)` input to the Tap Bus function provides the bustaps named `d1`, `d3` and `d5` for placement. Bus taps can also be automatically placed by appending a plus sign `+` to the bus tap name range as in `d(0-7+)` where `d2` through `d7` are automatically placed in a row with its direction and bus tap distances derived from the placement of `d0` and `d1`.

2.4   Graphics

Rotate/Mirror Graphics

New functions for rotating and/or mirroring the selected graphic element have been added to the context menus of the Move Graphic and Copy Graphic functions.

2.5   Text, Attributes

Multi-line Texts

The Multi Line Text submenu with functions for creating and manipulating multi-line texts with more than 40 characters has been added to the Other Functions of the Texts menu. Multi-line texts are internally stored as multiple texts with rule system ids for defining their connectivity. The left bottom corner of the surrounding text rectangle is the reference point for text placement functions. Multi-line texts should only be edited with the Multi Line Text functions to preserve the connectivity and the relative positioning of these texts.

3   Packager

3.1   Report File

Connected and/or joined net indicators have been added to the project-specific `.fre` report file created by the **Packager**. The name of each sub-net of a joined net is listed on a separate line with a `Joined with` indicator. These indicators can be used to search and/or check for unintentionally connected nets.

4   Layout Editor

4.1   General

Context Functions

The Element Types function has been added to the toolbar menu for configuring the left mouse button context function. This function is used to restrict context processing to certain element types such as parts or texts.

Jump Absolute

The Jump Absolute dialogs of the element placement context functions are initialized with the old element coordinates and/or the last corner point coordinates.

Layer Default Mode

The Layer Default Mode parameter for setting a default layer for the placement of traces, polygons and texts has been added to the Settings dialog from the View menu. The No Default standard mode deactivates the default layer for non-trace elements, causing layer specifications prompts as required. The Use Edit Layer mode places new elements onto the currently selected preference layer. The Last Used Layer Default Mode places new elements onto the previously used preference layer. A layer prompt is automatically activated if the default layer mode/selection is not allowed for the new element. The context menus of the functions for placing new elements provide a Change Layer option.

4.2   Display, Design Rule Check

Color Table Selection

The color table name prompt of the Load Colors functions has been changed to display the name of the previously loaded color table as default. This feature can be used to reload standard color setups after manually changing color table entries.

Element Query

The 18 character width restriction of Query Element info popup window has been removed. The info window is now automatically resized to allow for the display of long macro and net names.

DRC Error List

Power layer errors indicated by the Report function are now also included with the DRC Error List output. Any deactivated and/or invisible (black) color settings for layers with DRC errors are automatically activated and/or set to white upon error display requests.

4.3   Parts, Placement

Pin Row Placement

A dialog with controls for specifying the pin placement parameters (pin name prefix, pin name suffix, pin numbering with or without leading zeros, etc.) has been implemented for the Place Pin Row function from the Part Edit Func. submenu of the Parts menu.

Pad Placement Layer Display

The current pad layer is now indicated and/or pre-selected in the layer selection menus and dialogs of the pad placement functions on padstack level. This safeguards against wrong pad selections when editing multipad and/or multilayer padstack definitions such as blind and buried vias.

4.4   Traces, Routing

Airline Display during Manual Routing

A dynamic airline to the closest pin of the currently routed net is displayed whilst adding a new trace or moving a trace corner. The display mode for this airline is selected through the Airlines Display option from the Settings dialog of the Settings menu.

Trace Placement Layer Display

The current trace signal layer is now indicated and/or pre-selected in the layer selection menus and dialogs of the interactive routing function submenus.

4.5   Graphic, Copper Areas

Polygon Layer Change

The Change Layer option has been added to the context menus of the Move Area and Copy Area functions and the functions for placing the first point of new areas and/or lines. Only valid layers for the currently processed polygon type are provided for selection.

4.6   Text, Drill

Text Layer Change

The Change Layer option has been added to the context menus of the Add Text, Move Text and Copy Text functions.

Text Positioning

The context menu of the Move Text function provides the new Jump relative function for moving the selected text relative to its old position.

Multi-line Texts

The Multi Line Text submenu with functions for creating and manipulating multi-line texts with more than 40 characters has been added to the Other Functions of the Texts menu. Multi-line texts are internally stored as multiple texts with rule system ids for defining their connectivity. The left bottom corner of the surrounding text rectangle is the reference point for text placement functions. Multi-line texts should only be edited with the Multi Line Text functions to preserve the connectivity and the relative positioning of these texts.

5   Autorouter

5.1   Parameter Setup

Control and Strategy Parameter Settings

The Save Parameters and Load Parameters functions for saving and loading **Autorouter** Control and Strategy parameter settings have been added to the File menu. Parameter data sets are saved to the `rutparam.dat` file in the BAE programs directory. The `standard` entry set contains the parameters at **Autorouter** startup and can not be modified.

5.2   Autorouter Algorithms

BGA Fanout Routing and Micro Via Support

New **Autorouter** algorithms for internal pattern recognition and pin pattern routing have been implemented. These algorithms are designed to ignore standard design rules in special cases to allow for the placement of vias at or in pins. Pin patterns are used for BGA (ballgrid array) fanout routing and micro via placement on pins ("via-in-pin"). Both options can be activated through the Control dialog. BGA fanout routing and micro via placement are only applied for SMD pins without drill hole and single signal layer assignment. BGA pins are recognized through exact matrix placement patterns. The BGA Fan Out option takes priority over the Micro Via option to ensure that a BGA pin is not connected through a fanout via *and* a micro via at the same time. Micro vias are automatically centered on the connected pin. Micro vias are generated with a pin layer pad and a single inside layer pad. BGA fanout vias are placed at the BGA pin side opposite to the center of the ballgrid array. The BGA Fan Out All option activates BGA fanout routing for all BGA pins. The BGA Fan Out Inner option restricts BGA fanout routing to BGA pins which are not placed at the outside of BGA parts.

Previous BGA routing solutions often featured pre-routed, fixed vias or even pre-placed vias on BGA part symbol definitions. Not only eliminate the BGA Fan Out and Micro Via options the need for such layout preparations, they also avoid redundant vias at non-netlist pins or otherwise connected pins, thus increasing the routing area on inside layers significantly.

Blind and Buried Via Routing

The Via Processing parameter with the Standard, Buried advanced and All advanced options has been added to the Strategy menu. The Standard default option activates the standard via position check. The Buried advanced option activates an enhanced via position check for blind and buried vias. The All advanced option activates an enhanced via position check for all via types. The enhanced via position check increases the routability signifincantly, especially when combinations of small and large via diameters are used for partial and all-layer vias.

Warning

The enhanced via position check can cause a significant increase in memory requirements when applied on printed circuit boards with large free areas.

Via Offset

The new Other Grid w. ofs option for the Routing Grid setting from the Options menu can be used to define via offsets for arbitrary routing grids.

Vias to Split Power Planes

The **Autorouter** is now capable to create via connections to split power planes which are not associated with power layers.

Sub-grid Rip-Up Routing Resolution

The halfgrid Rip-Up routing resolution has been dramatically increased.

Rip-Up and Optimizer Cleanup Routing

New data structures have been introduced to increase the efficiency of Rip-Up and Optimizer Cleanup routing. Rip-Up and Optimizer Cleanup routing procedure CPU time requirements for large PCB boards with a high number of pins and vias have been reduced by several factors.

Dealing with Internal Router Errors

Internal router errors should be reported to Bartels System. In the rare case of an internal error, the **Autorouter** tries to save the current routing result in main memory and to a `.bak` file. A `ruterr.log` error log file is also generated if the error occurred at a specific routing matrix position. This error log file is intended to assist Bartels System in locating and fixing the bug.

5.3   Autorouter Batches

Batch Setup

The maximum number of **Autorouter** batch procedures to be defined with Batch Setup has been increased to 20.

Router Batch Parameter Settings

The Load Settings function has been added to the Batch Setup function. Load Settings loads **Autorouter** control and strategy parameter sets previously saved with Save Parameters function from the File menu. Thus it is possible to set special predefined routing parameters for different routing procedures of the router batch.

Saving and Loading Router Batches

The Save and Load buttons for saving and loading router batches have been added to the Batch Setup dialog can. Router batches are stored to the `rutparam.dat` file in the BAE programs directory. The `rutparam.dat` file provided with the BAE software contains the `diagonal` example router batch for diagonal routing. `diagonal` consists of a Full Autorouter run with standard settings and subsequent Optimizer runs for diagonal routing with deactivated Optimizer Cleanup.

6   CAM Processor

6.1   Gerber Output

Aperture Table Definition

The Edit Apert. Table function activates a dialog with aperture parameter input fields. This allows for aperture parameter modifications without having to enter complete aperture definitions. The dialog provides buttons for sorting the aperture table by D-Code, type or size. The List Apertures button lists all aperture table entries in a window with copy/paste functionality.

6.2   Drilling Data Output

Tool Tolerance

Positive and negative rule system drill tool tolerance value assignments are now considered by all drilling data output functions. I.e., drill tools are generated for each drill tool diameter and tolerance value combination, thus allowing for the distinction of drill holes with identical diameters and different drill tool tolerances.

7   CAM View

7.1   Parameter Setup

Gerber Aperture Table Definition

The Edit Apert. Table function activates a dialog with aperture parameter input fields. This allows for aperture parameter modifications without having to enter complete aperture definitions. The dialog provides buttons for sorting the aperture table by D-Code, type or size. The List Apertures button lists all aperture table entries in a window with copy/paste functionality.

7.2   Gerber Data

G36/G37 Areas

The Create Layout function from the File menu is now capable of generating layout areas from Gerber G36/G37 codes.

The Report function displayed arbitrary values for G36/G37 codes with zero line lengths. This problem has been solved.

Layout Generation

The Create Layout function from the File menu is now using aperture size definitions from the Gerber input file when creating documentary lines.

8   Bartels User Language

8.1   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 6.0 User Language** has been changed. All **User Language** programs compiled under earlier BAE versions won't execute in the **BAE Version 6.0 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 6.0** to regain compatibility.

8.2   User Language Compiler

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

Preprocessor Statements

A series of possible caller type specifications have been added to the `#pragma` preprocessor statement for setting the caller type of the compiled **User Language** program. The following table lists the valid `#pragma` caller type specifications:

Caller Type	Valid Interpreter Environment(s)
`ULCALLERSTD`	all BAE program modules
`ULCALLERCAP`	all Schematic Capture program modules
`ULCALLERSCM`	**Schematic Editor**
`ULCALLERLAY`	all Layout program modules
`ULCALLERGED`	**Layout Editor**
`ULCALLERAR`	**Autorouter**
`ULCALLERCAM`	**CAM Processor**
`ULCALLERCV`	**CAM View**
`ULCALLERICD`	all IC Design program modules
`ULCALLERCED`	**Chip Editor**

8.3   System Functions

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

New System Functions

The following new **User Language** system functions have been implemented for **BAE Version 6.0**:

IP	System Function	Short Description
STD	**bae_getpolyrange**	Get internal BAE polygon range
	strextractfilepath	Extract directory name from a file path name string
	strgetvarfilename	Get environment variable expanded file name string
	strgetpurefilename	Extract file name from file path name string
SCM	**scm_askrefname**	SCM reference name selection
	scm_asktreename	SCM net name selection
LAY	**lay_getpowpolystat**	Layout power layer polygon status query
GED	**ged_getlaydefmode**	Get GED default layer mode
	ged_getlayerdefault	Get GED default layer
	ged_powlayerrcnt	Get GED power layer error count
	ged_setlaydefmode	Set GED default layer mode
	ged_setlayerdefault	Set GED default layer mode

Changed System Functions

A new layer query type for power layer selection has been added to the **ged_asklayer** function.

A new parameter for returning the net name and a mode for displaying the No Net Assignment button in the net selection menu have been added to the **ged_asktreeidx** function.

8.4   BAE User Language Programs

BAE installs some 200 pre-compiled **User Language** programs to the `ulcprog.vdb` file of the BAE programs directory. Additionally, the **User Language** *source* files (more than 3.5 Mbytes; more than 120,000 lines) are installed to a special directory (`baeulc`). See Bartels User Language Programmer's Guide - Chapter 4 for a complete listing and short descriptions of the BAE **User Language** programs.

Include Files

The **User Language** include files already delivered with the previous BAE Version have been 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 6.0**:

IP	Program Name	Short Description
SCM	**SSYMPATT**	SCM Symbol Name Pattern Setting

Changed User Language Programs

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