

Chapter 3

HDL Editor

Introduction

The HDL editor is used for entering and editing designs expressed by ABEL and VHDL program statements. The HDL editor is invoked by clicking on the **HDL Editor**  icon in the **Project Manager**.

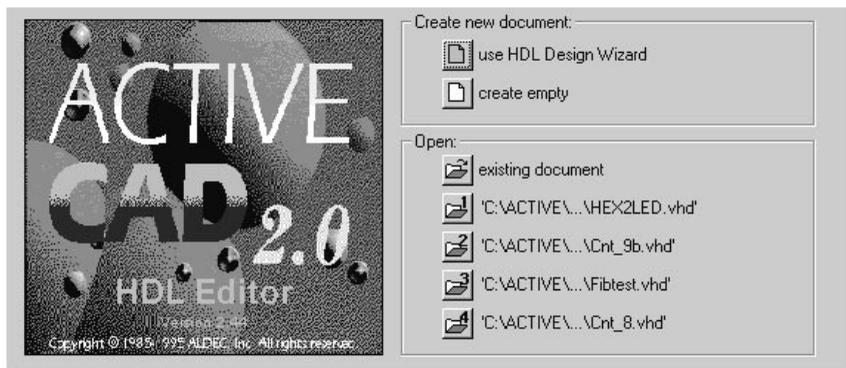


Figure 3-1. HDL Editor Welcome Screen.

The welcome screen (Figure 3-1) that appears after invoking the HDL Editor allows:

- creating new document using the **HDL Design Wizard** (please refer to the **File | New** option description in this manual),
- creating empty document,
- opening existing document,

- selecting one of the recently opened documents.

After selecting one of those options the HDL editor main window is displayed (Figure 3-2).

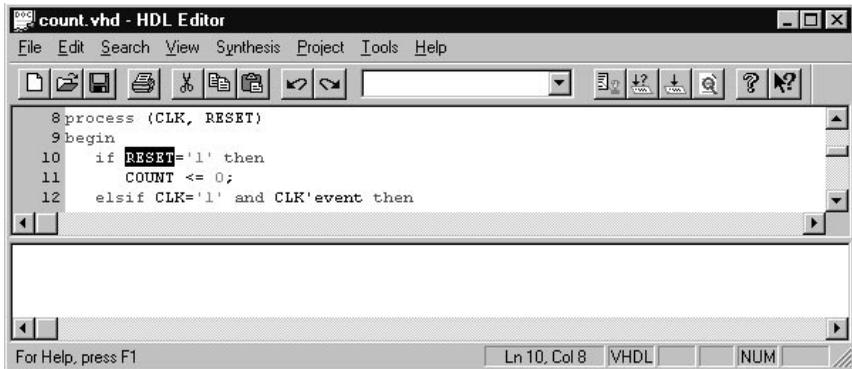


Figure 3-2. HDL Editor Main Window.

A set of menus at the top of the window allows for detailed design manipulations and processing. For speedy access, the HDL editor provides a set of icons, which are grouped according to their operational functions.

Toolbar Icons

Project Control Icons

The  **New** icon starts Design Wizard. Upon entering I/O ports for the new design, HDL editor opens a blank file for entering an HDL design.

The  **Open** icon activates the **Open** window which allows selecting one of the existing HDL files. The **Open** window (Figure 3-3) is typical of Windows applications and no details on its operation are offered here.

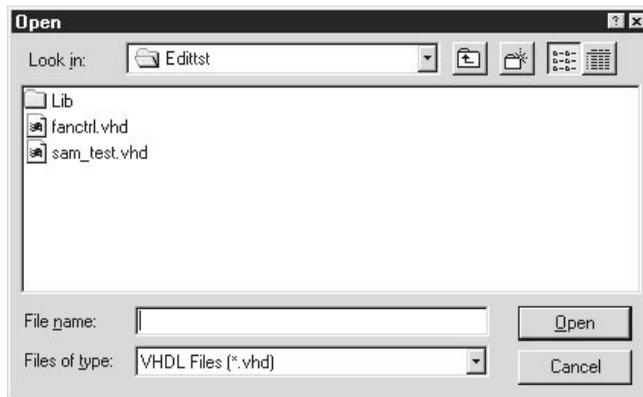


Figure 3-4. Opening An Existing HDL Project.

The  **Save** icon saves the current HDL file on hard disk.

Print Icon

Clicking on the  **Print** icon displays the typical Windows print screen. The printer setup window (Figure 3-4) allows setting the print range and selecting the printer and the number of printed copies. Checking off the **Print to file** box, will generate a file instead of printout.

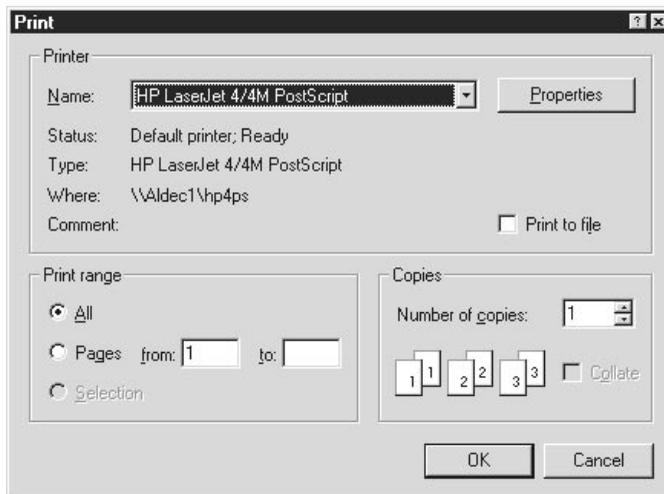


Figure 3-3. The Printing Options.

Clicking on the **Properties** button activates the **Printer Properties** window (Figure 3-5), which allows an advanced setup of the page format:

- Paper size and orientation
- Layout of the pages
- Unprintable areas
- Paper tray

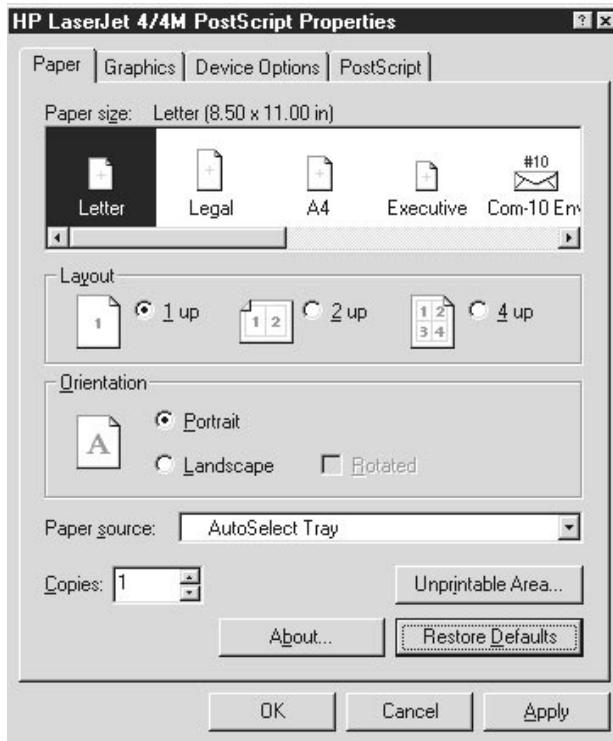


Figure 3-5. Advanced Printing Options.

Copy, Cut And Paste Icons

These operations are typical Windows copy, cut and paste operations, such as found in many text editors. Since there are no exceptions to the commonly accepted rules and procedures, description of these features is cursory. All characters are copied into the clipboard, without any exception.

Clicking on the  **Cut** icon cuts the selected area off the screen and saves it to a software clipboard.

Clicking on the  **Copy** icon copies the selected screen area into the clipboard but does not delete the selected area from the screen.

Clicking on the  **Paste** icon places the contents of the clipboard at the current cursor location.

Undo & Redo Icons

Clicking on the  **Undo** icon reverses previous operations performed in the HDL Editor.

Clicking on the  **Redo** icon restores the state preceding the last Undo operation.

Find Combo Box

Entering a text in the  **Find** combo box and pressing **Enter** finds the text in the HDL Editor window.

Previously entered texts can be recalled to the Find combo box by clicking on the “down arrow” button and selecting them with the mouse. Double clicking on the text finds its first occurrence in the HDL Editor window. Successive double clicking on the text finds its next occurrences.

Creating VHDL File - Language Assistant

The VHDL language is considered verbose by some because it requires many statements that are not typical of other software programs. However, with the help of a language assistant, all you need to enter is the design-specific information, such as port names, generics, etc. Because of this simplification introduced by the Language Assistant utility, VHDL code is easy to write and maintain.

If you try to learn VHDL from books, you may find it too complex and difficult. And if you write a VHDL code totally from scratch, you may find it cumbersome and prone to syntax errors. However, writing VHDL code with the language assistant is an easy and efficient way to describe physical phenomena in electronics, hydraulics and pneumatics. Becoming familiar with the language assistant speeds learning of the VHDL language.

Clicking on the  **Language Assistant** icon activates the **Language Assistant** window (Figure 3-9), which allows selection of the language templates and logic synthesis templates.

Some turn-key solutions have the HDL editor preset for a specific HDL logic synthesis configuration, and no setup of the HDL environment is

needed. However, as a general rule, select the desired HDL design environment before using the language assistant.

To set the HDL design environment, click on the **Synthesis | Configuration** menu. When the **Configuration** window (Figure 3-6) is displayed,

- select **VHDL** in the *Language* field,
- select the HDL compiler from the drop-down list in the *Tool* field,
- select internal (performed by the HDL Editor) or external (performed by the selected synthesis tool) syntax checking.

NOTE: Because none of the logic synthesis tools can work directly with the 1076 VHDL code, HDL compilers need to be especially matched for the selected logic synthesis tool.

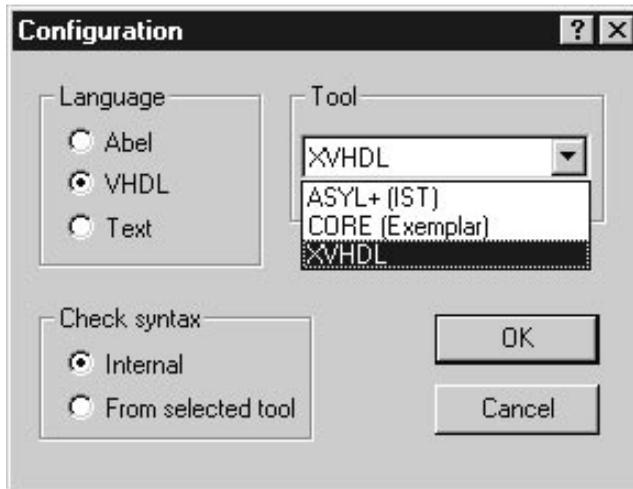


Figure 3-6. Selecting HDL Environment.

Selecting the **Colors** tab in the **Tools | Preferences** window (Figure 3-7), displays a list of items which color can be set from that folder:

- Normal text
- Comments
- Keywords of the HDL language
- Program Constants
- Meta Symbols

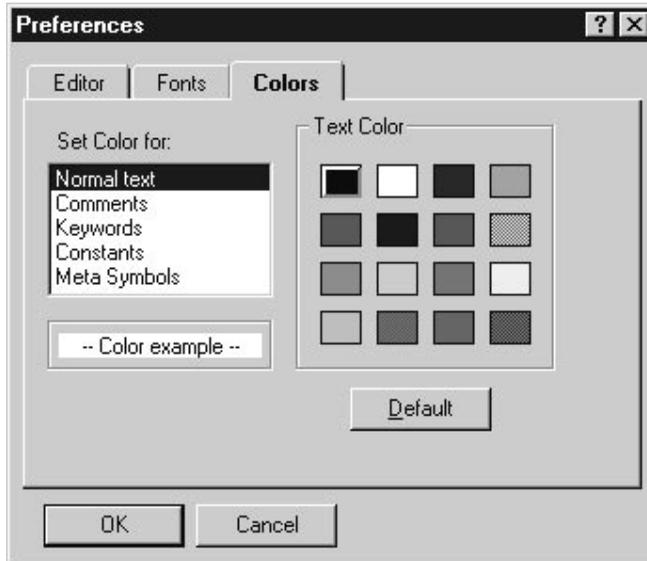


Figure 3-7. The HDL Program Colors Card.

Clicking on the **Editor** tab in the **Tools | Preferences** window displays a card (Figure 3-8) that allows setting **Enable highlighting**, **Show margin**, and **Auto indent** options . The card also enables changing the tabulation size and error description length.

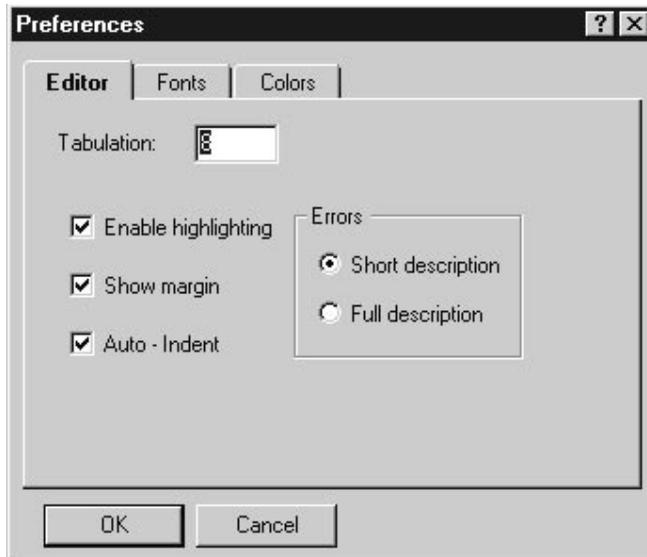


Figure 3-8. Editor Preferences Card.

After the HDL environment has been selected, click on the **Language Assistant** icon. In response, the **Language Assistant** window (Figure 3-9) will appear, and offer three main choices:

- Language Templates**; used for writing general VHDL statements such as *architecture*, *block statement*, *signal declaration*, etc.
- Synthesis Templates**; providing complete hardware description blocks such as *D Flip-flop*, *asynchronous counter*, *multiplexer*, *shift register*, etc.
- Synthesis Templates**; enabling the user to store frequently used fragments of code for the quick retrieval.



Figure 3-9. Language Assistant Options.

Clicking on the '+' sign by the **Language Templates** option in the **Language Assistant** window will display a list of language templates. Selecting the template and clicking on the **Show preview>>** button will display the template (Figure 3-10).

Clicking with the right mouse button on the template name displays a local menu with five options: **Use**, **Edit**, **New**, **Delete** and **Read Only**.

- Use** transfers template text to the editor.
- Edit** enables template name change.
- New** allows creating new templates; the text of the new template can be entered in the preview section of the Language Assistant window.
- Delete** removes template from the list
- Read Only** - when checked, makes template protected, i.e. disables any changes to the template name and text (Language and Synthesis templates have the Read Only options checked to prevent entering accidental changes).

Note:

Any changes can be made to the unprotected template text in the Preview section of the Language Assistant window. A prompt for saving template changes is displayed during the exit from HDL Editor.

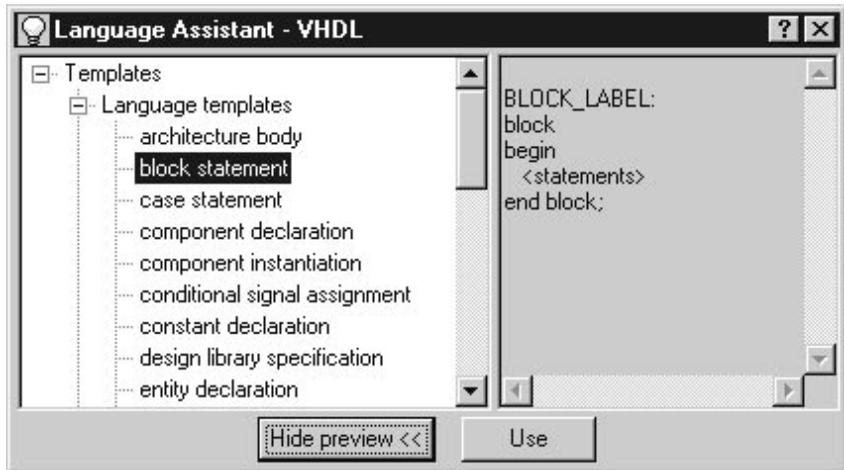


Figure 3-10. Language Assistant With Template Preview.

Language assistant allows the following transfers of templates into HDL editor:

- unaltered* - by clicking on the **Use** button transfers the original template into HDL editor
- partial* - by selecting an area of the template and clicking on the **Use** button.

The design data can be entered into any template that has been transferred into the HDL editor program.

Check Syntax Icon

The  **Check Syntax** icon activates the 1076 IEEE VHDL analyzer and checks for syntax errors.

Note: If the title bar of the HDE shows “untitled.vhd” design file name, standard **Save As** window (Figure 3-11) will be displayed to enable saving of the edited file.

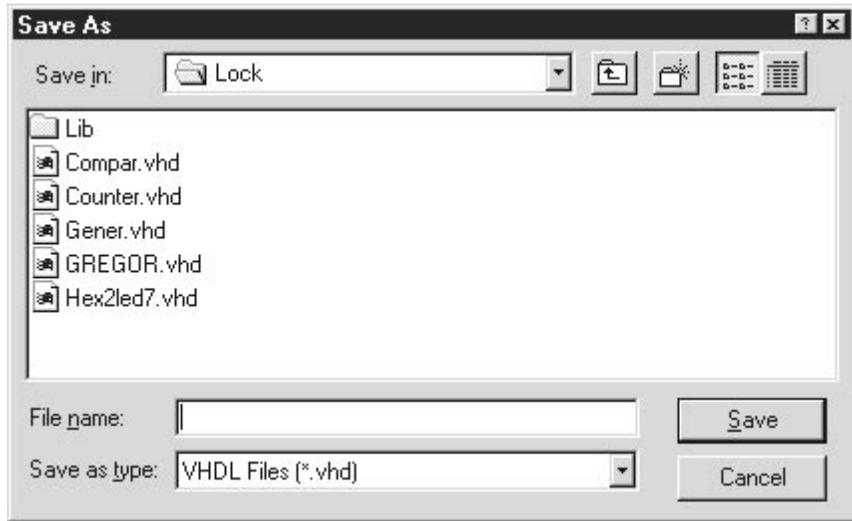


Figure 3-11. Standard Save As Window.

Compile Icon

The  **Compile** icon, activates the logic synthesis tool that has been selected in the **Synthesis | Configuration** menu. The logic synthesis tool must be present and active to run this option. Otherwise, the HDL editor will produce a warning about the missing logic synthesis tool and will discontinue compilation.

Since logic synthesis tools can only work with their proprietary subsets of the 1076 IEEE VHDL language, the source code displayed in the HDL editor is compiled according to the setups that are required by the selected logic synthesis tool. To simplify user interface, these setups are factory made and are hidden from the user. Selecting the desired logic synthesis tool automatically forces certain established setups in the HDL editor and compiler.

The compilation error report produced by the logic synthesis tool is displayed at the bottom of the screen in Figure 3-1.

View Report Icon

Clicking on the  **View Report** icon invokes Report Browser with the synthesis report generated by the selected synthesis tool.

About Icon

The  **About** icon displays the current version of the HDL Editor and the copyright notice.



Figure 3-12. Displaying 'About HDL Editor' Window.

Help Icon

Clicking on the  **Help** icon produces the “question mark” cursor. Clicking with this cursor over an HDL Editor interface element (toolbar button, menu option etc.) , will display a brief description of that element.

HDL Editor Main Menu

The editor operations are grouped into five menus, listed in the HDL Editor window (Figure 3-13).

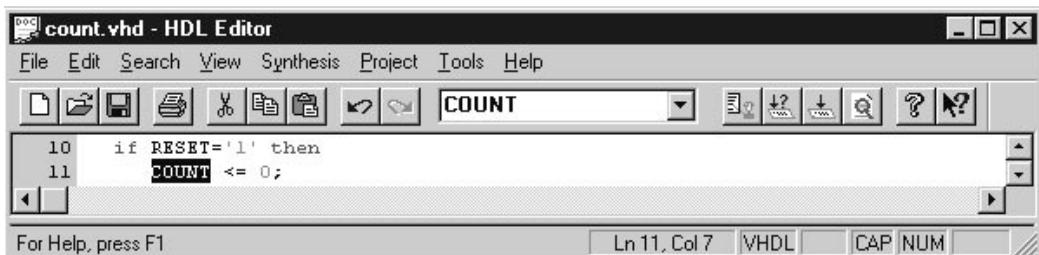


Figure 3-13. HDL Editor Menus.

File menu

The **File** menu (Figure 3-14) includes typical Windows operations, such as New, Open, Save, Save As, Print, etc. These items are similar to the ones described in reference to the schematic editor and state machine editor **File** menus.



Figure 3-14. File Menu.

File|New

The **File | New** option starts HDE Design Wizard. Select the HDL language (ABEL or VHDL) in the **Language** window (Figure 3-15) and click on the **Next** button.

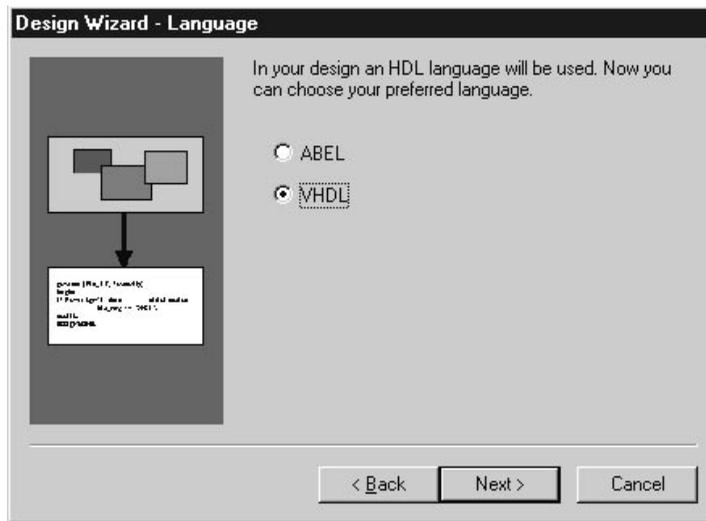


Figure 3-16. Design Wizard - Language Screen.

Enter the HDL design name in the **Name** window (Figure 3-16) and click on the **Next** button.

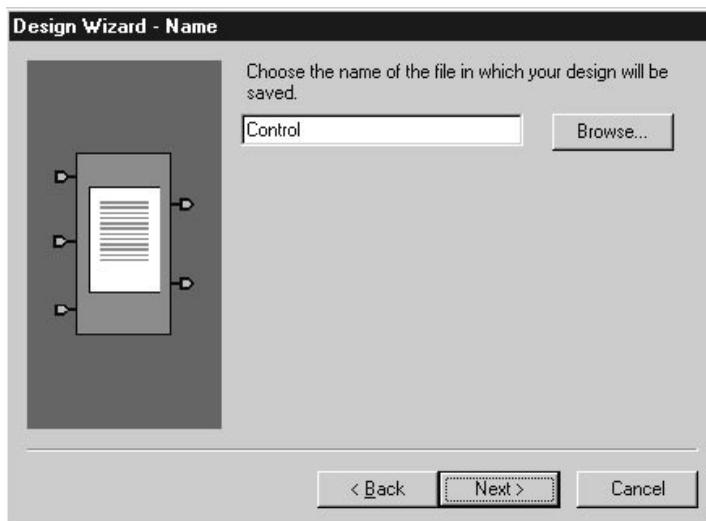


Figure 3-15. Design Wizard - Name Screen.

Clicking on the **New** button in the **Ports** window activates the port entry fields in the figure 3-17. Enter the port name into the **Name** field. Select its direction from the **Direction** field, and choose the port Type by click-

ing on the **Advanced** button and making appropriate selections from the new window.

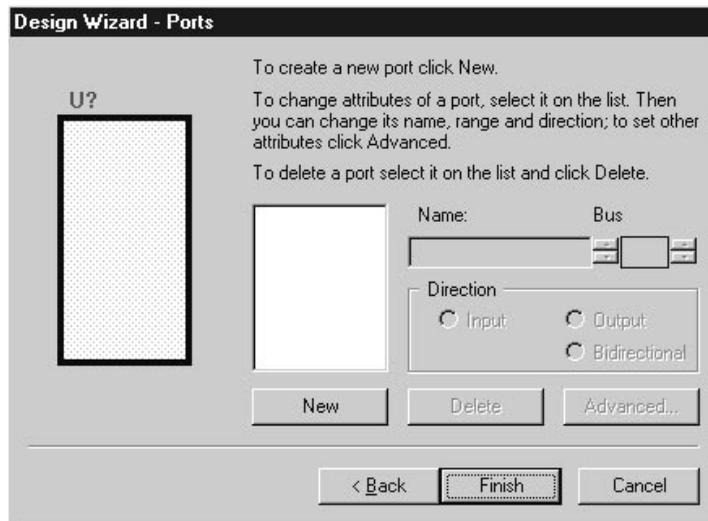


Figure 3-17. Design Wizard - Ports Screen.

Entering the CLOCK input port will display the figure 3-18 shown below.

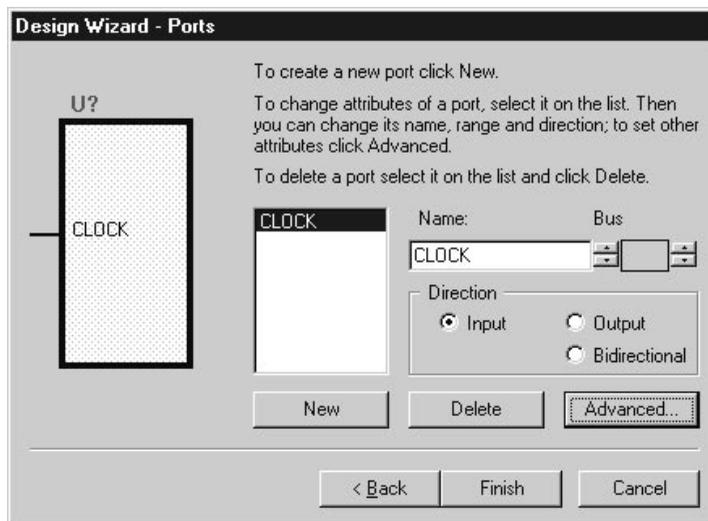


Figure 3-18. Design Wizard With CLOCK Input Entry.

HDL Editor assigns by default the *std_logic* type to each single line ports. However, if a different port type is required, click on the **Advanced** but-

ton which will display the **Advanced Port Settings** window. This window allows setting other VHDL allowable port types.

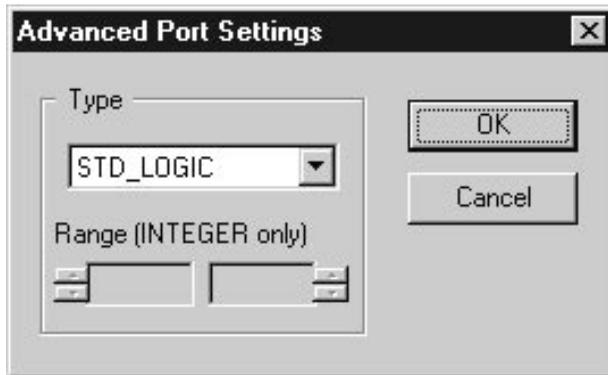


Figure 3-19. Advanced Port Settings Window.

Clicking on the **New** button transfers the entered port (Name, Direction, Type) into the port listing field.

Port Types

If the VHDL option has been selected, then the HDL editor will automatically set single line inputs and outputs to the `STD_LOGIC` Type, and buses will be set to the `STD_LOGIC_VECTOR` Type. If other types are required, select the port type from **Advanced Port Settings** window. This window allows setting other VHDL allowable port types

Editing Ports

To edit a port, click on it in the listing of ports. It will automatically be copied into the **Name** field. Then you can edit it in the **Name**, **Port Type** and **Advanced Port Settings** window. The changes are applied to the selected port as long as it remains selected in the listing.

When entering of ports has been completed, click on the **Finish** button. HDL Editor automatically displays the entity section of the VHDL code, based on the declared input ports. Using language assistant, you can add to this code some other VHDL constructs.

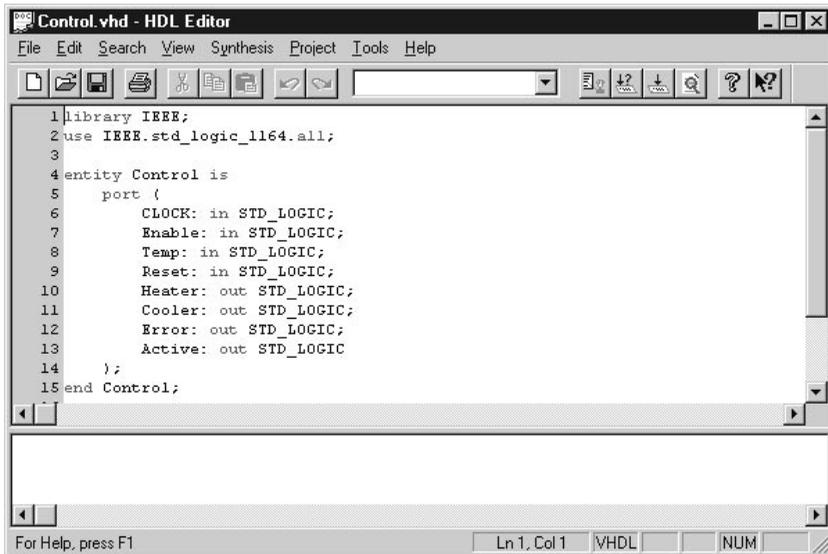


Figure 3-20. Entity Section Created by Design Wizard.

File|Open

The **File | Open** option allows to open one of the existing HDL projects. The operation of this option is similar to the **File | Open** option in other Windows programs. A sample of the **Open** window is shown below.

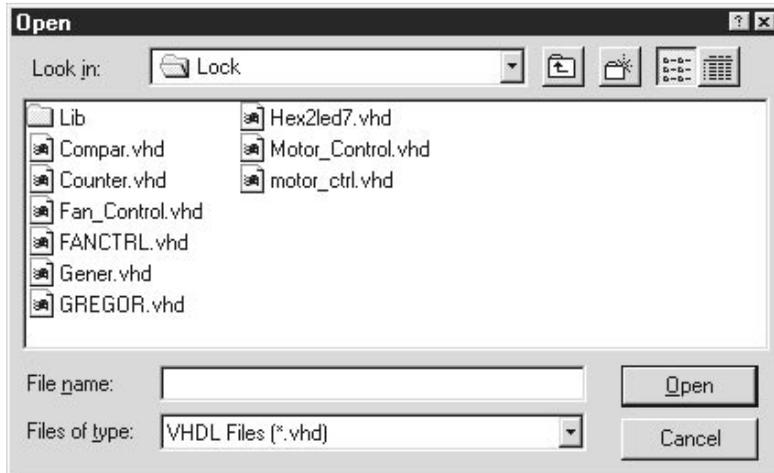


Figure 3-21. Open File Window.

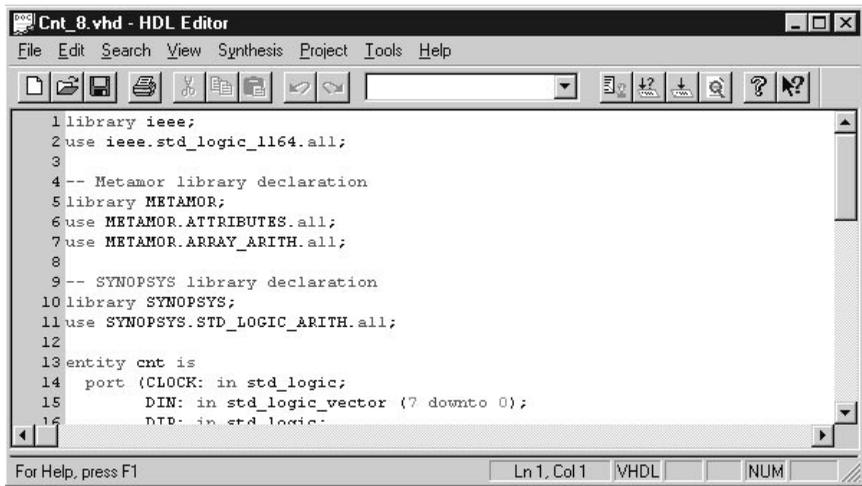


Figure 3-22. Editor Window After File Open Operation.

File|Print

This option operates same as in other Windows products.

File|Print Preview

This option operates same as in other Windows products.

File|Print Setup

This option operates same as in other Windows products.

Edit menu

The **Edit** menu options are listed in figure 3-23.

Options **Undo**, **Redo**, **Cut**, **Copy**, **Paste** are described in the *Toolbar Icons* section.

Delete and **Select All** operate similarly to equivalent options in such text editors as Microsoft Word and others.



Figure 3-23. Edit Menu.

Edit|Symbol

This option allows making changes to the symbol that will be generated during the macro creation or update. To edit port name, direction or type click on it in the View Symbol window (figure 3-24) and enter changes.

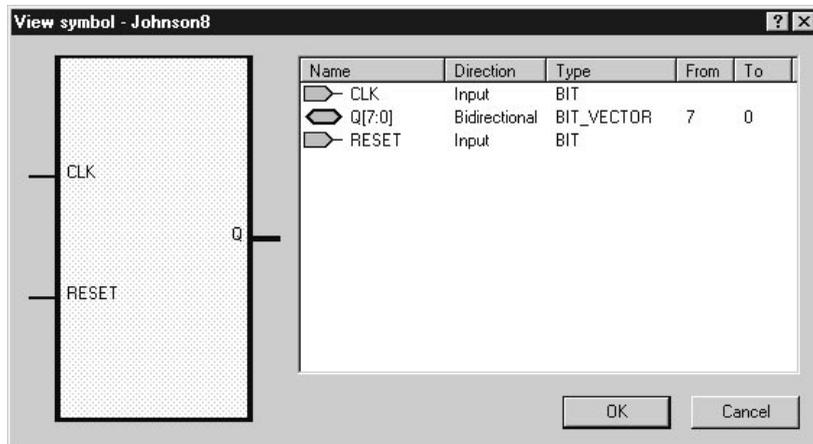


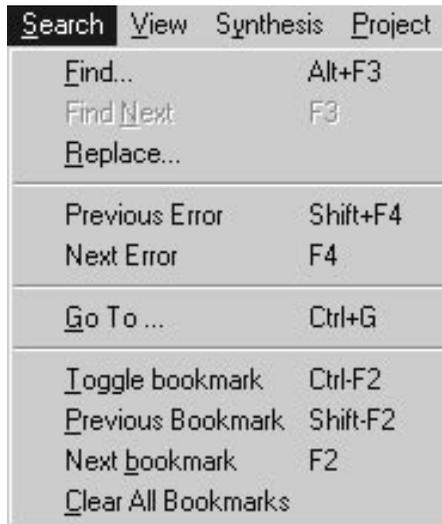
Figure 3-24. View Symbol Window.

Edit|Read Only

This option, when checked, switches the editor to Read Only mode. In this mode no changes in the edited file are allowed.

Search Menu

The **Search** menu options are shown on figure 3-25.



Search	View	Synthesis	Project
<u>F</u> ind...			Alt+F3
F <u>i</u> nd <u>N</u> ext...			F3
<u>R</u> eplace...			
Previous <u>E</u> rror			Shift+F4
Next <u>E</u> rror			F4
<u>G</u> o To ...			Ctrl+G
<u>T</u> oggle bookmark			Ctrl-F2
<u>P</u> revious <u>B</u> ookmark			Shift-F2
Next <u>b</u> ookmark			F2
<u>C</u> lear All Bookmarks			

Figure 3-25. Search Menu.

Find, **Find Next** and **Replace** operate similarly to equivalent options in other text editors.

The **Search | Previous Error** option underlines the line where the previous compilation error occurred. The line is also marked with the red tab on the left gray margin.

The **Search | Next Error** option underlines the line where the next compilation error occurred. The line is also marked with the red tab on the left gray margin.

The **Search | Go To** option allows moving of the cursor to the specified line number.

The **Search | Toggle bookmark** option sets the blue tab on the left margin of the current line. Jumping from one line marked this way to the other is available by selecting **Search | Previous Bookmark** or **Search | Next Bookmark** options. All bookmarks can be removed by choosing **Search | Clear All Bookmarks** option.

View Menu

The **View** menu options are shown on figure 3-26.

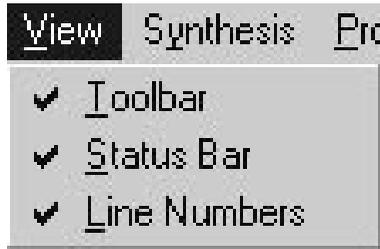


Figure 3-26. View Menu.

The **View | Toolbar** option activates the toolbar with icons for direct control of the most popular option. These icons are located at the top of the display screen.

The **View | Status Bar** option activates the message bar at the bottom of the screen. The message bar lists warnings advisory notes, etc.

The **View | Line Numbers** option activates numbering of lines in the HDL code.

Synthesis Menu

The **Synthesis** menu options are shown on figure 3-27.



Figure 3-27. Synthesis Menu.

Synthesis|Configuration

This option displays the window shown on figure 3-6 that allows synthesis tool selection. This option is described in the *Toolbar Icons* section.

Synthesis|Check Syntax

The HDL Editor comes with a 1076 IEEE VHDL compiler, which operates as a spell checker of the edited VHDL code. This option invokes the VHDL compiler, which verifies the HDL constructs with the VHDL standard and restrictions imposed by the selected logic synthesis tool.

Errors detected during the syntax checking are listed in the special section at the bottom of the HDL Editor window. The line containing first error is underlined and marked with the red tab on the left margin (Figure 3-28). Lines that contain other errors can be marked by double clicking on the error description in the error list or by using **Search | Next Error** or **Search | Previous Error** options.

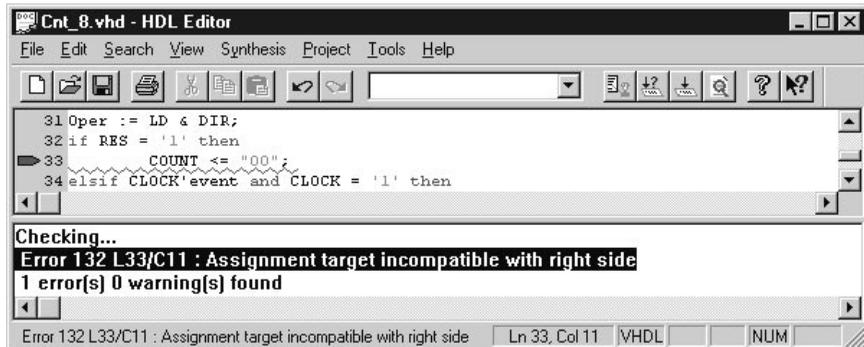


Figure 3-28. Syntax Checking Results.

Synthesis|Options

This option allows you to set the compilation parameters of the selected logic synthesis tool. (If XVHDL is selected this option displays the window shown in figure 3-29).

The compilation parameters may include:

Optimize field

- Optimization for area and speed (a compromise solution)
- Optimize for speed
- Optimize for the best use of silicon area

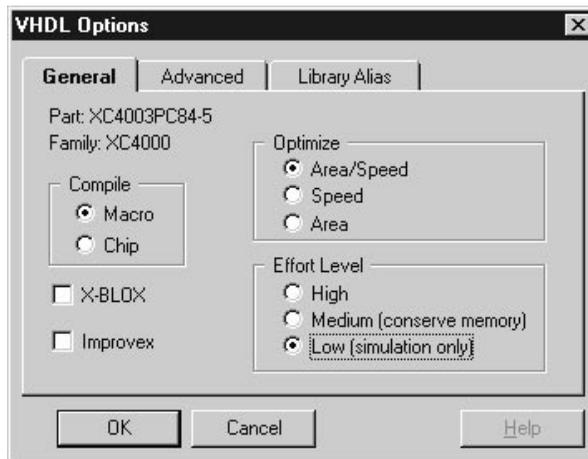


Figure 3-29. VHDL Options Window.

The **Effort Level** options determines how much time the processing should take:

- High*; take as much time as required to do a high performance layout
- Medium*; conserve computer RAM memory
- Low*; just provide an information for simulation.

NOTES:

1. Generally, you should uncheck **X-BLOX** option, if not in use.
2. Use **Improvex** software for higher conversion optimization.
3. If the design is for a macro, select the **Macro** option. If compilation of the entire device should take place, select **Chip** option from the **Compile** field.

The **Advanced** card from the VHDL options window allows selecting VHDL entity and architecture that will be synthesized.

The **Library Alias** card allows attaching additional VHDL files to the standard libraries.

Synthesis|Synthesize

This option invokes the logic synthesis tool software which compiles the HDL Editor code into a target FPGA device. All errors produced by the logic synthesis tool are listed at the bottom of the HDL Editor screen.

Line containing the first error on the list is underlined and marked with the red tab on the left margin (Figure 3-30). Using **Search | Next Error** op-

tion or double clicking on the error description moves the red tab to the appropriate line.

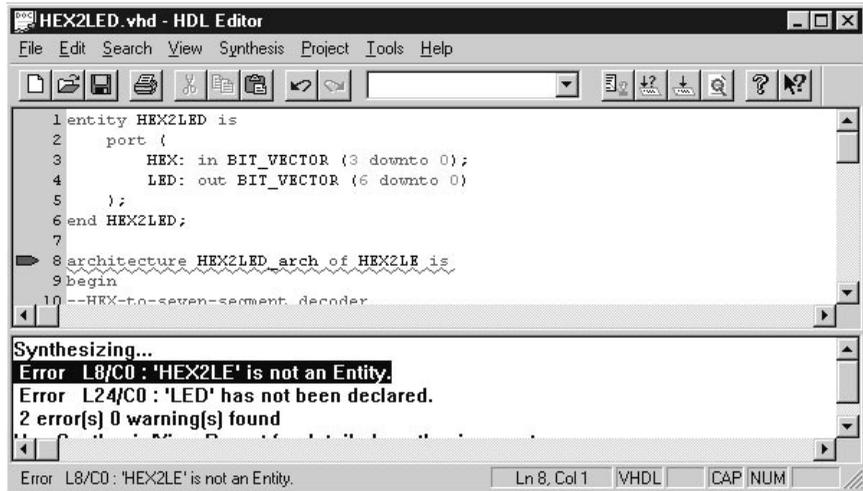


Figure 3-30. Compilation Error Messages.

Synthesis|View Report

Lists all messages generated by logic synthesis tools and the HDL compilers checking for syntax errors. This option can also be invoked from the toolbar.

Project Menu

The **Project** menu options are shown in figure 3-31.

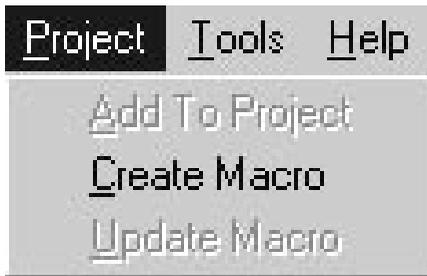


Figure 3-31. Project Menu.

The **Project | Add To Project** option registers the edited file as the current project resource.

The **Project | Create Macro** option creates ACTIVE-CAD macro from the current HDL code. This option is inactive when the macro has already been created.

The **Project | Update Macro** option updates the ACTIVE-CAD macro after the changes in the HDL source code. This option is inactive when the macro has not been created.

Tools Menu

The **Tools** menu options are shown in figure 3-32.



Figure 3-32. Tools Menu.

Tools|Preferences

The HDL Editor features such as fonts and colors used in the editing window or editor options may be customized by selecting **Tools | Preferences** option. The **Preferences** window allows changing settings on three cards: **Editor**, **Font** and **Colors**. The Editor and Color cards are described in the *Toolbar Icons* section and shown in figures 3-7 and 3-8.

The **Fonts** card (Figure 3-33) allows selecting name, size and style of the font used in the editing window. Deselecting **Show Proportional** check box limits the list of names displayed in **Font** list box. to fixed width fonts only. Using fixed width fonts is suggested to preserve clear indenting of the edited text.

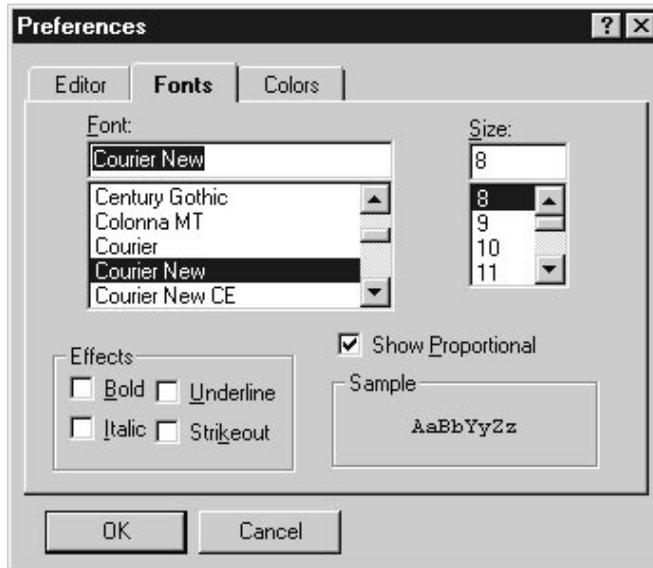


Figure 3-33. Preferences Window - Fonts Card.

Tools|Language Assistant

Refer to the *Language Assistant Icon* section for details.

Tools|Project Manager

This option brings on top the **Project Manager** window.

Help Menu

The **Help** menu options are shown in figure 3-34.



Figure 3-34. Help Menu Options.

The **Help | Help Topics** option displays the list of subjects covered by the HDL Editor help system.

The **Help | Using Help** option displays essential information on using Windows help.

The **Help | About HDL Editor...** option displays the version number and copyright notice shown on figure 3-12.