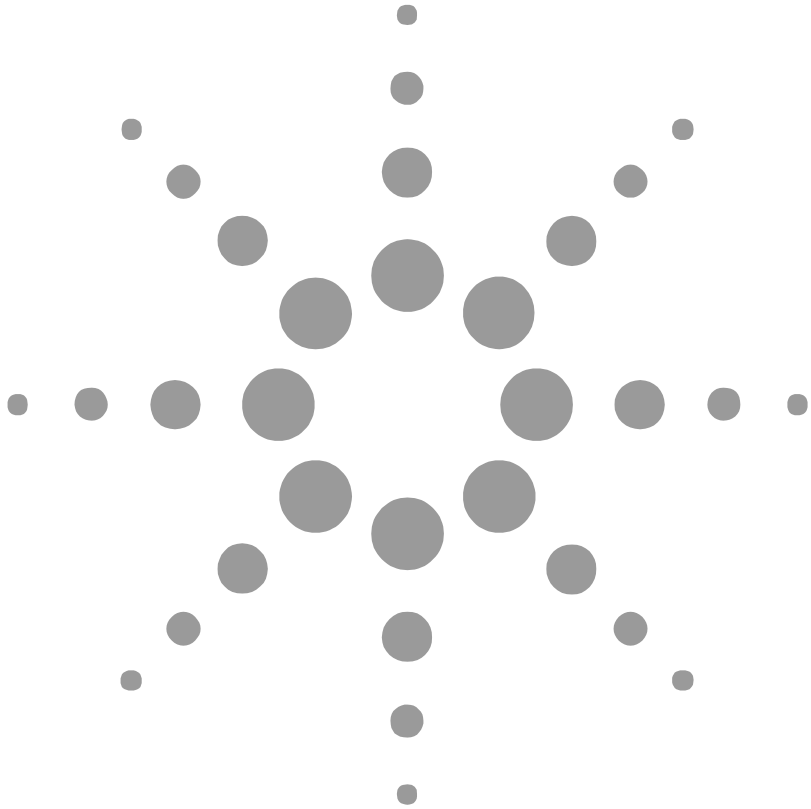
Agilent Versatest Series Integrated Development Environment User's Guide



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Agilent Technologies

Notice

The information contained in this document is subject to change without notice.

CAUTION The Agilent Versatest Series Test System Software loaded on the test system and provided on a CD-ROM is supported for use only as documented in the system manuals and training classes. Use of the system software and files not documented in the manuals or training is not supported and may cause damage to the system and is not covered by warranty.

Trademark Acknowledgements:

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Windows XP® and Windows NT® are registered trademarks of Microsoft Corporation

Safety Considerations

Introductions

The following general safety precautions must be observed during all phases of operation, service, and repair of the system. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the system. Agilent Technologies assumes no liability for customer's failure to comply with these requirements.

Ground the System

To minimize shock hazard, the system must be connected to an electrical ground. The power terminal and the power cable must meet International Electotechnical Commission (IEC) safety standards.

Keep Away From Live Circuits

Operation personnel must not open doors or remove covers. Replacement of field replaceable units (FRU) and internal adjustments must be made by qualified maintenance personnel. Do not replace any FRUs, cables, or other components with power applied to the system. Under certain conditions dangerous voltages can exist even with power removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Service or Adjust Alone

Do not attempt internal service or adjustments unless another person (capable of rendering first aid and resuscitation) is present.

Do Not Substitute Parts or Modify System Instruments

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the system.

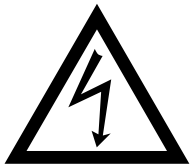
Do Not Defeat Interlocks

Defeating interlocks can cause hazardous conditions when servicing the system.

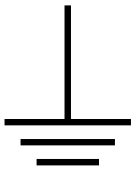
Safety Symbols

The general definitions for safety symbols used on equipment or in manuals are listed below.

Instruction manual symbol. The system is marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the system.



Indicates hazardous voltages.



Indicates earth ground.

Warning **THE WARNING SIGN DENOTES A HAZARD TO PERSONNEL. IT CALLS ATTENTION TO A PROCEDURE, PRACTICE, CONDITION OR THE LIKE, WHICH, IF NOT CORRECTLY PERFORMED OR ADHERED TO, COULD RESULT IN INJURY OR DEATH TO PERSONNEL**

CAUTION The caution sign denotes a hazard to equipment. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage or destruction of part or all of the system.

NOTE The note sign denotes important information. It calls attention to a procedure, practice, condition or the like, which is essential to highlight.

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Introduction

Welcome

Welcome to the *Versatest Series Integrated Development Environment User's Guide*. Integrated Development Environment (IDE) refers to a unified collection of software development and debug tools that operate together. This manual contains information required by Agilent Versatest test system programmers to use the IDE tools to develop debug test programs.

NOTE

The IDE tools support versions of V4K software ≥ B.02.04. The version of software a system is running can be displayed from the VK Test main window by selecting `Help > About VK Test Station`.

Manual Contents

The following information is contained in this manual:

- Chapter 1, "Introduction," provides in the remainder of this chapter the following information:
  - How to use this manual on page 25.
  - What this manual assumes on page 25.
- Chapter 2, "Integrated Development Environment," describes the IDE, its tools, and capabilities.
- Chapter 3, "Pin Tool," provides information about its interface, capabilities, and a "Getting Started" that describes how to display the Pin Tool document window, configure tester resources on its General tab, assign pins to tester resources on its Pin Mapping tab, and define pin groups on its Pin Groups tab.
- Chapter 4, "C Program Debugger," provides information about its interface, capabilities, and a "Getting Started" that describes how to perform several tasks using the tool such as setting break points and stepping through a test program.
- Chapter 5, "Pattern Tool," describes its interface, capabilities, and a "Getting Started" that describes how to retrieve pattern information and view and debug failures.
- Chapter 6, "Waveform Tool," provides information about its interface, and a "Getting Started" that describes how to setup, capture, and display waveforms for analysis.
- Chapter 7, "Timing Tool," provides an overview of the tool, description of its interface, capabilities, and a "Getting Started"

that describes how to load and display the timing data in the Timing Tool graphical and tabular views. It also describes how to run the Timing Tool in offline mode.

- Chapter 8, "Bitmap Tool," provides an overview of the tool, a description of its interface, a "Getting Started" that describes how to create and load DUT definition files, and load and view bitmap files. It also has a section that provides detailed information about how to create DUT definition files.

NOTE

The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Online Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

How to Use This Manual

The best place to start is chapter 2, "Integrated Development Environment." Chapter 2 will familiarize you with the IDE, its tools, and capabilities. A complete description of each tool can be found in their respective chapters in this manual.

Assumptions

This manual assumes the following:

- That you have a basic understanding of computer operation and the Windows XP Professional interface. If you are new to Windows XP, it is recommended that you see the start > `Help and Support` > Help and Support Center window.
- That you are familiar with C language programming and programming of Versatest Series test systems. If you need to learn more about the test systems, there are manuals and classes available to learn about how to program and maintain the systems. All of the manuals and programming training can be found on the Versatest Series Manuals CD-ROM. The latest version of the Manuals CD is shipped with each system.
- That you have a working knowledge of IC or wafer testing.

Use of System Software

CAUTION

The Agilent Versatest Series Test System Software loaded on the test system and provided on a CD-ROM is supported for use only as documented in the system manuals and training classes. Use of the system software and files not documented in the manuals or training is not supported and may cause damage to the system and is not covered by warranty.

2

Integrated Development Environment

Introduction

Integrated Development Environment (IDE) refers to a unified collection of software development and debug tools that operate together. For the Versatest Series software, the IDE is a central application which manages all test program components. It provides a central application with a common graphical user interface (GUI) that manages the Pin Tool, C Program Debugger, Pattern Tool, Waveform Tool, Timing Tool, and Bitmap Tool (Figure 2-1). Each tool is a plug-in to the IDE. And any tool can be more aware of the test program and other tools. The tools' operations can then be synchronized if needed.

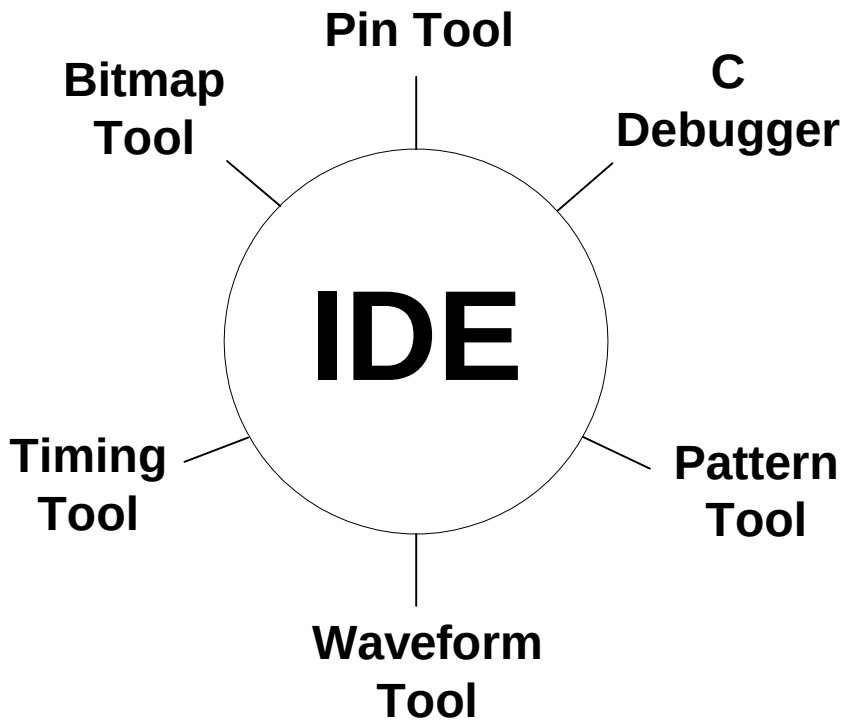

Figure 2-1. IDE Tools

The IDE consists of the following tools:

- Pin Tool: Provides the capability to map tester resources to DUT pins for both test program .c and pattern .apg files. It also allows the user to add, delete, or modify pin definitions through its interface.

- C Program Debugger: Provides the capability to debug test program C code using the IDE GUI with standard windows conventions.
- Pattern Tool: Provides the capability within the IDE to debug patterns that have been loaded into hardware.
- Waveform Tool: Displays within the IDE GUI the actual and expected waveforms that are output to the DUT. This tool acts as an oscilloscope and logic analyzer that is automatically configured for the test system.
- Timing Tool: Displays within the IDE GUI global time set (GTS), local time set (LTS), and timing edge information in a graphical and tabular format, and checks for APG rules violations.
- Bitmap Tool: Allows you to view and compare multiple failed bitmap files within the IDE GUI. Using the Bitmap Tool, you can pinpoint specific locations where memory bits pass and fail tests, create overlays of bitmaps, and create bitmap logical operations.

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Online and Offline Modes

The following tools currently support online mode:

- C Program Debugger (currently has no offline capability)
- Pattern Tool (currently has no offline capability)
- Waveform Tool
- Timing Tool

The following tools currently support offline mode:

- Pin Tool (currently has no online capability other than to customize pin sets from the Waveformsetup Tool and Pattern Tool)
- Waveform Tool (viewing saved files only)
- Timing Tool (viewing saved files only)
- Bitmap Tool (currently has no online capability)

IDE Benefits

The IDE provides multiple benefits with a more cohesive development and debug environment. These benefits include the following:

- Unified management of windows: Tools are no longer just a collection of independent windows.
- Reduce visual clutter: Tools and objects can now be grouped or categorized appropriately.
- Faster learning curve can now be achieved because the single IDE GUI environment now has a common look and feel with similar windows, menus, and toolbars.

All of these IDE benefits result in faster test program development and debug using the tools.

IDE Overview

The IDE consists of the following seven functional areas (Figure 2-2):

- Menu bar
- Toolbar
- Navigator pane
- Tool Document window
- Document Tabs (one for each corresponding Tool Document window)
- Output pane
- Status bar

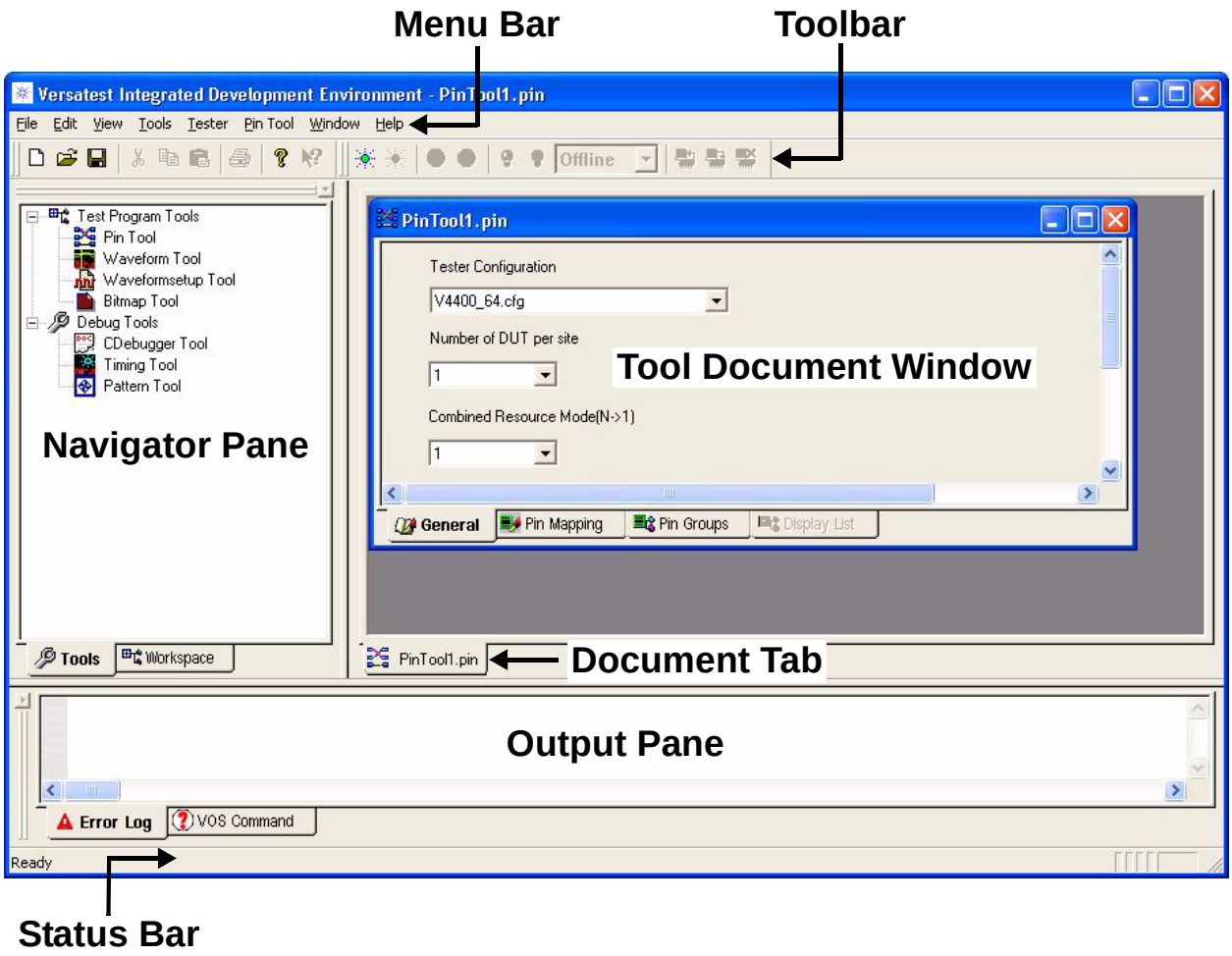

Figure 2-2. IDE Main Window

Each of these components (except the Menu bar) can be displayed or hidden by going to the View menu (Figure 2-3), and checking or unchecking the component you wish to change.

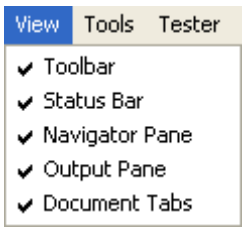

Figure 2-3. View Menu

The Menu bar and Toolbar are context-sensitive and change as the active document changes. The Menu bar and Toolbar only display or enable menus and toolbar buttons that are relevant to the tool or document you have selected.

The Navigator pane presents the test program components in logical, hierarchical groupings. It allows any test program component to be edited and provides visual feedback as to which test program elements are currently active. Tools can also add special navigation panes for their needs.

The IDE is designed on a docking window paradigm. It has the ability for you to move and resize windows or toolbars.

After configuring the position and look of the IDE, you can easily save that configuration for future retrieval. This capability is called saving your Workspace. The Workspace consists of the tools, layout, and open documents. Selecting the `File > Save Workspace` command displays a Save Workspace dialog box from which you can save the workspace with a workspace .wsp extension. The previously saved workspace can be displayed by selecting the `File > Open Workspace` command to display an Open Workspace dialog box from which you can select and open the workspace.

3

Pin Tool

Introduction

This chapter provides information about the Versatest Series Pin Tool. The Pin Tool's graphical interface provides the capability to map tester resources to DUT pins for both test program .c and pattern .apg files. It also allows the user to add, delete, or modify pin definitions through its interface.

Without the Pin Tool, the user's only option is to manually map tester resources to DUT pins for both test program .c and pattern .apg files. This is done by creating a pin list that is a data structure consisting of a one-dimensional four-integer array for each DUT pin in a project .c file. Data structures called pin and pin groups also have to be created for use in pattern files. The Pin Tool provides an alternative to the arduous and overlapping task of manually mapping tester resources to DUT pins for test program and pattern files with error checking capability.

Chapter Contents

This chapter contains the following information about the Timing Tool:

- "Pin Tool Main Window" on page 35: Provides descriptions of the application interface functional areas, menus, menu commands, and dialog boxes.
- "Pin Tool Getting Started" on page 55: Describes how to display the Pin Tool document window, configure tester resources on the General tab, assign pins to tester resources on the Pin Mapping tab, and define pin groups on the Pin Groups tab.

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Pin Tool Main Window

The Pin Tool main window shown in Figure 3-1 is the tool's interface. The interface is composed of the following functional areas:

- Navigator Pane: See the `View > Navigator Pane` command on page 47
- Menu bar on page 36
  - File menu on page 37
  - Edit menu on page 43
  - View menu on page 45
  - Tools menu on page 48
  - Tester menu on page 49
  - Pin Tool menu on page 51
  - Window menu on page 52
  - Help menu on page 53
- Toolbar: See the `View > Toolbar` command on page 46
- Tool Document Window: Consists of the following Pin Tool document window tabs:
  - General tab: See "Configuring Tester Resources on the General Tab" on page 58.
  - Pin Mapping tab: See "Assigning Pins to Tester Resources on the Pin Mapping Tab" on page 61.
  - Pin Groups tab: See "Defining Pin Groups Using the Pin Groups Tab" on page 68.
  - Display List tab: Used to customize pin sets from the Waveformsetup Tool > Custom > Display List tab and the Pattern Tool's > Edit Vector Pane > Format tab > Custom > Display List tab.
- Output Pane: See the `View > Output Pane` command on page 48
- Status Bar: See the `View > Status Bar` command on page 47

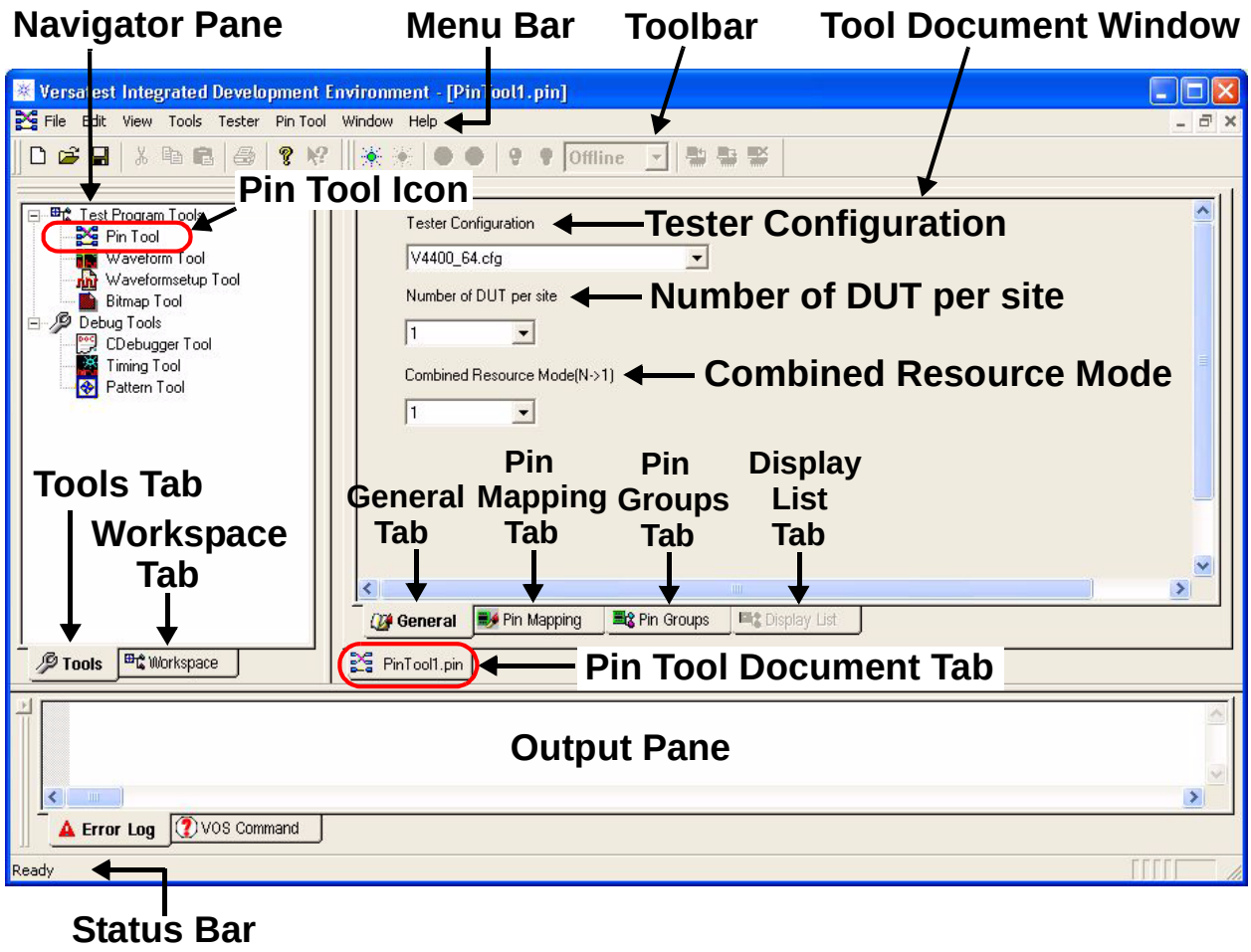


Figure 3-1. Pin Tool Main Window General Tab

Menu Bar

The menu bar at the top of the Timing Tool main window (Figure 3-1 on page 36) contains the following eight pull-down menus from which you can select commands:

- File menu on page 37
- Edit menu on page 43
- View menu on page 45
- Tools menu on page 48
- Tester menu on page 49
- Pin Tool menu on page 51
- Window menu on page 52

- Help menu on page 53

File Menu

Selecting File in the menu bar opens the menu in Figure 3-2.

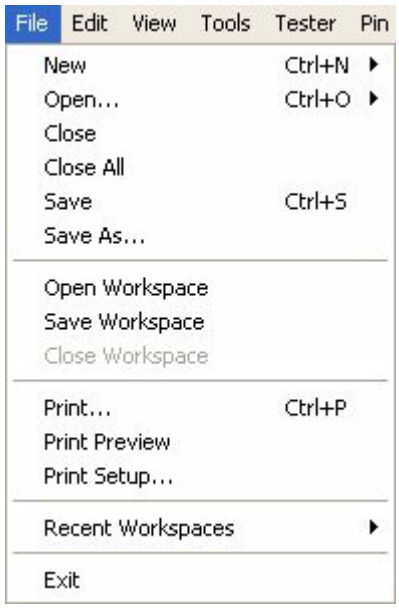


Figure 3-2. File Menu

The File menu contains the following commands:

- New command on page 38
- Open command on page 39
- Close command on page 41
- Close All command on page 41
- Save command on page 41
- Save As command on page 42
- Open Workspace command on page 42
- Save Workspace command on page 42
- Close Workspace Command on page 42
- Print command on page 42
- Print Preview command on page 42
- Print Setup command on page 43
- Recent Workspaces on page 43

- Exit command on page 43

New Command (File Menu)

Displays the New command submenu (Figure 3-3) that allows you to display a new Workspace or create new IDE documents. The New toolbar button displays a New dialog box that lists the same items to select as the submenu.

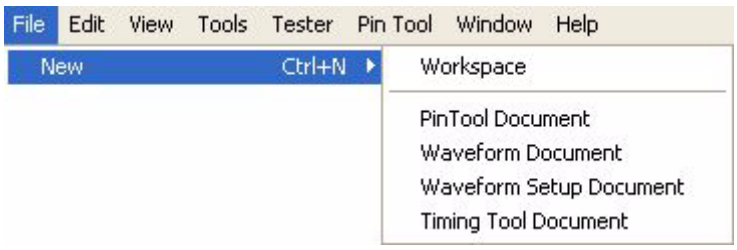


Figure 3-3. File > New Command Submenu

The New command submenu contains the following commands:

- Workspace command on page 38
- PinTool Document command on page 38
- Waveform Document command on page 38
- Waveform Setup Document command on page 39
- Timing Tool Document command on page 39

Workspace Command (New Command Submenu)

Displays as the active Workspace its default with its corresponding Menu bar, Toolbar, Navigator pane, Output pane, and Status bar.

PinTool Document Command (New Command Submenu)

Displays as the active document a blank PinTool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Document Command (New Command Submenu)

Displays as the active document a blank Waveform Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Setup Document Command (New Command Submenu)

Displays as the active document the default Waveform Setup Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Timing Tool Document Command (New Command Submenu)

Displays as the active document a blank Timing Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and graphical display window), Output pane, and Status bar.

Open Command (File Menu)

 Displays the Open command submenu (Figure 3-4) that allows you to open a Workspace or IDE documents from the submenu list. The Open  toolbar button displays a generic Open dialog box from which you can open a selection listed in the submenu.

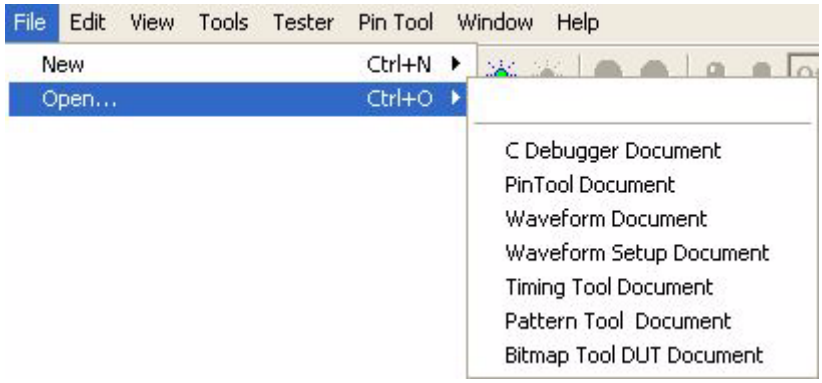


Figure 3-4. Open Command Submenu

The Open command submenu contains the following commands that display an Open dialog box similar to Figure 3-5:

- C Debugger Document command on page 40
- PinTool Document command on page 40
- Waveform Document command on page 40
- Waveform Setup Document command on page 41
- Timing Tool Document command on page 41
- Pattern Tool Document command on page 41
- Bitmap Tool DUT Document command on page 41

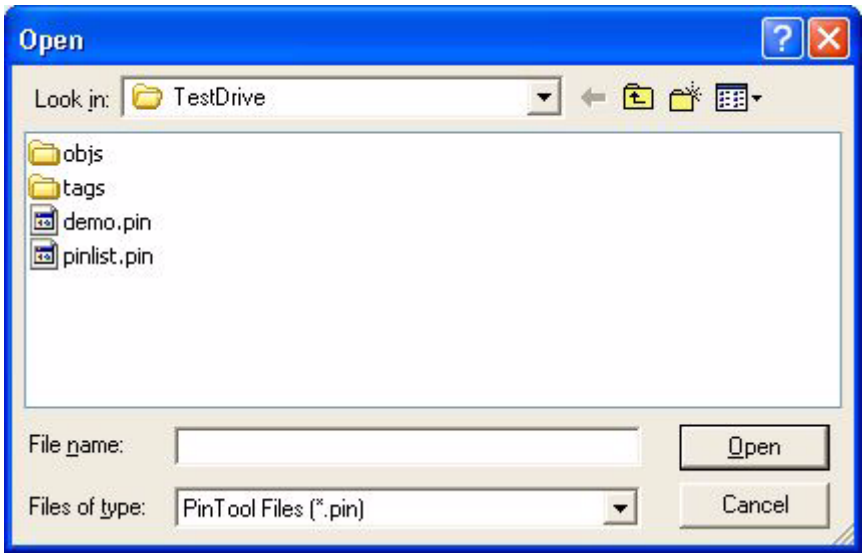


Figure 3-5. File > Open Dialog Box

C Debugger Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 3-5) to select a previously saved C Debugger Tool document file with a *.cof extension.

PinTool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 3-5) to select a previously saved PinTool document file with a *.pin file extension. After selecting a .pin file the dialog box shown in Figure 3-6 displays. This dialog box is for when the IDE is set online and you have a test program loaded and want to ensure that the Pin Tool .pin file you are loading is compatible with the test program for debugging purposes.

Figure 3-6. Versatest IDE Dialog Box

Waveform Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 3-5) to select a previously saved Waveform document file with a *.dnc file extension.

Waveform Setup Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 3-5) to select a previously saved Waveform Setup document file with a *.stp file extension.

Timing Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 3-5) to select a previously saved Timing Tool document file with a *.vtt file extension.

Pattern Tool Document Command (Open Command Submenu)

Displays an Open dialog box (Figure 3-5) to select a previously saved Pattern Tool document file with an *.apg2 file extension.

Bitmap Tool DUT Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 3-5) to select a previously saved Bitmap Tool DUT definition document file with a *.dut file extension.

Close Command (File Menu)

Closes the active tool document.

Close All Command (File Menu)

Closes all tool documents and displays the default IDE main window.

Save Command (File Menu)

 Saves the active document file. Saving a Pin Tool document file saves the Pin Tool .pin file and also generates *.c and *.h files. You should not edit the generated .c and .h files. The .pin file is only for use with the IDE Pin Tool. Include the generated *.c and *.h files as follows before compiling using the “make” command:

- Include the generated .h file in your test program .c file.
- Include the generated .h file in your .apg file.
- Include the generated .c file in your makefile.

When saving a Pin Tool file, the system first validates all the pin/cam settings. If there are any errors, it will print the error message to the Error Log tab on the Output Window. Once the setting passes the validation, it then saves the three files: *.pin, *.c, and *.h.

Save As Command (File Menu)

Displays the Save As dialog box to save the active tool document file. When saving a Pin Tool document file, typing a filename with a *.pin extension in the dialog box and then selecting the Save button saves the Pin Tool .pin file and also generates *.c and *.h files. You should not edit the generated .c and .h files. The .pin file is only for use with the IDE Pin Tool. Include the generated *.c and *.h files as follows before compiling using the “make” command:

- Include the generated .h file in your test program .c file.
- Include the generated .h file in your .apg file.
- Include the generated .c file in your makefile.

When saving a Pin Tool file, the system first validates all the pin/cam settings. If there are any errors, it will print the error message to the Error Log tab on the Output Window. Once the setting passes the validation, it then saves the three files: *.pin, *.c, and *.h.

Open Workspace Command (File Menu)

Displays an Open Workspace dialog box with a *.wsp extension. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace and opening another. The Workspace consists of the tools, layout, and open documents.

Save Workspace Command (File Menu)

Saves the current workspace with a *.wsp extension. The Workspace consists of the tools, layout, and open documents.

Close Workspace Command (File Menu)

Closes the current workspace. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace.

Print Command (File Menu)

 Prints the contents of the Pin Mapping tab in the active Pin Tool document window.

Print Preview Command (File Menu)

Displays a print preview window of the Pin Mapping tab in the active Pin Tool document window.

Print Setup Command (File Menu)

Displays a printer setup dialog box that allows you to select and configure a printer.

Recent Workspaces Command (File Menu)

Displays a Recent Workspaces submenu from which you can select a workspace.

Exit Command (File Menu)

Closes the IDE. If the workspace or any other tool document files have changed, you will be asked if you would like to save them.

Edit Menu

Selecting Edit in the menu bar opens the menu in Figure 3-2.

Figure 3-7. Edit Menu

The Edit menu contains the following commands:

- Undo command below on page 44
- Redo command on page 44
- Cut command on page 44
- Copy command below on page 44
- Paste command on page 44
- Find command on page 44
- Replace command on page 45
- Find in Workspace on page 45

Undo Command (Edit Menu)

Not supported by the Pin Tool.

Redo Command (Edit Menu)

Not supported by the Pin Tool.

Cut Command (Edit Menu)

 Cuts the currently selected contents on the Pin Tool's Pin Mapping tab for insertion elsewhere on the tab. Rows are selected by placing the mouse cursor over a numbered column on the left side of the tab at the beginning of a row until a black right arrow appears and selecting the left mouse button. Multiple selections are made using the black arrow in combination with the Shift key for range selections or with the Ctrl to select rows individually. Column selections are made by clicking and dragging the mouse over the desired area in the column.

Copy Command (Edit Menu)

 Copies the currently selected contents on the Pin Tool's Pin Mapping tab for insertion elsewhere on the tab. Rows are selected by placing the mouse cursor over a numbered column on the left side of the tab at the beginning of a row until a black right arrow appears and selecting the left mouse button. Multiple selections are made using the black arrow in combination with the Shift key for range selections or with the Ctrl to select rows individually. Column selections are made by clicking and dragging the mouse over the desired area in the column.

Paste Command (Edit Menu)

 Inserts the last copied/cut contents on the Pin Tool's Pin Mapping tab to the cursor location on the tab.

Find Command (Edit Menu)

On the Pin Tool's Pin Mapping tab, finds the specified device pin name in the Device Pin Name column (Figure 3-8).

Figure 3-8. Find Command Dialog Box

Replace Command (Edit Menu)

On the Pin Tool's Pin Mapping tab does a find and replace on the selected column (Figure 3-9).

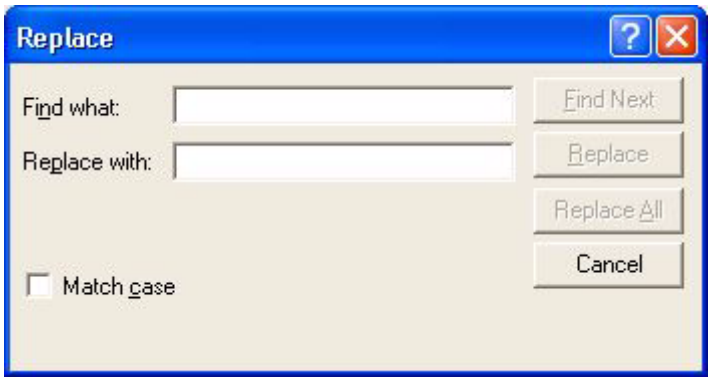


Figure 3-9. Replace Dialog Box

Find in Workspace Command (Edit Menu)

Not currently supported by the IDE.

View Menu

Selecting View in the menu bar opens the menu in Figure 3-10.

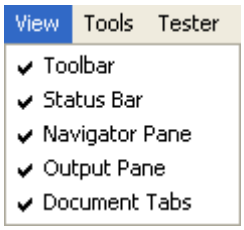


Figure 3-10. View Menu

The View menu contains the following commands:

- Toolbar command on page 46
- Status Bar command on page 47
- Navigator Pane command on page 47
- Output Pane command on page 48
- Document Tabs command on page 48

Toolbar Command (View Menu)

Displays or hides the toolbar shown in Figure 3-11. The toolbar displays at the top of the Timing Tool main window when a ✓ displays in front of its command in the View menu. Clicking on the buttons in the toolbar give you quick access to many of the menu bar commands. Positioning the mouse cursor over a toolbar button displays tooltip text with the corresponding command description.

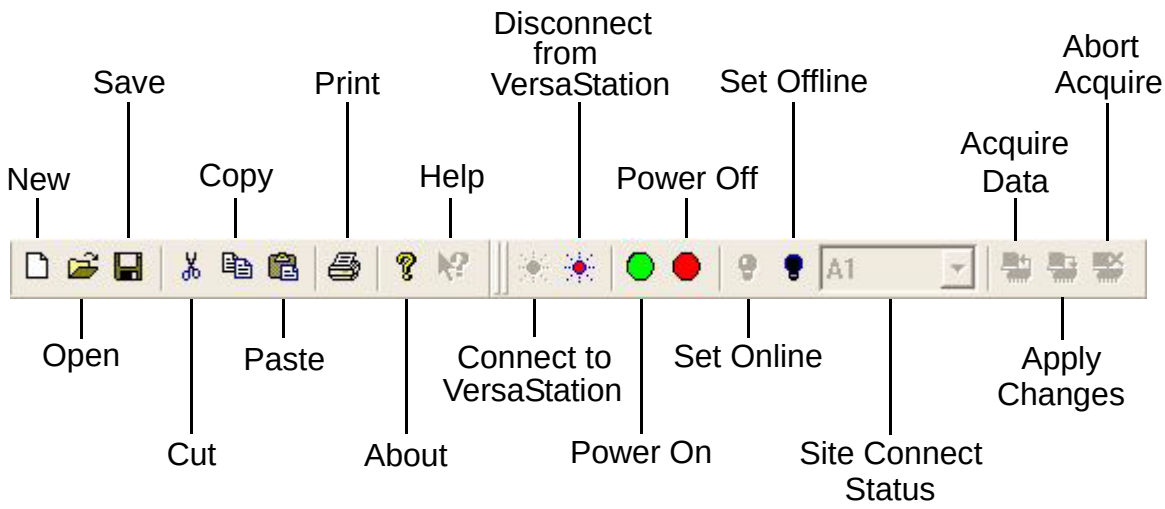


Figure 3-11. Pin Tool Toolbar

 File > New on page 38

 File > Open on page 39

 File > Save on page 41

 Edit > Cut on page 44

 Edit > Copy on page 44

 Edit > Paste on page 44

 File > Print on page 42

 Help > About on page 53

 Help > Help on page 53

 Tester > Connect to VersaStation on page 50

 Tester > Disconnect from VersaStation on page 50

 Tester > Power On on page 51

 Tester > Power Off on page 51

 Tester > Set Online on page 50

 Tester > Set Offline on page 50

 IDE Site Connect Status

 Tester > Acquire Data on page 51 (not supported by Pin Tool)

 Tester > Apply Changes on page 51 (not supported by Pin Tool)

 Tester > Abort Acquire on page 51 (not supported by Pin Tool)

Status Bar Command (View Menu)

Displays or hides the Status Bar (Figure 3-1 on page 36). The Status Bar displays at the bottom of the Pin Tool main window when a ✓ displays in front of its command in the View menu. The Status Bar provides information about the current state of what you are viewing in the window and any other status-oriented information.

Navigator Pane Command (View Menu)

Displays the Navigator Pane (similar to Figure 3-1 on page 36) when a ✓ displays in front of its command in the View menu.

The Pin Tool is associated with the `Pin Tool` icon on the Tools Tab  in the Navigator Pane.

Output Pane Command (View Menu)

Displays the Output Pane (similar to Figure 3-1 on page 36) when a ✓ displays in front of its command in the View menu.

The Pin Tool is associated with the `VOS Command` tab in the Output Pane. The `VOS Command` tab is enabled when the IDE is set online by the selecting the yellow Set Online toolbar button or the corresponding `Tester > Set Online` command. The VOS Command tab allows you to enter VOS terminal commands and display the results on the tab and in the corresponding test site window in the VK Test Station main window. See the "VOS Terminal Commands" chapter in the *Command Reference Volume 2* for the available commands.

Document Tabs Command (View Menu)

Displays the Document Tabs at the bottom of the Tool Document Window (similar to Figure 3-1 on page 36) when a ✓ displays in front of its command in the View menu.

Tools Menu

Selecting Tools in the menu bar opens the menu in Figure 3-12.

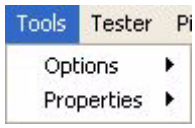


Figure 3-12. Tools Menu

The Tools menu contains the following commands:

- Options command on page 48
- Properties command on page 49

Options Command (Tools Menu)

Displays the Options submenu shown in Figure 3-13.

Figure 3-13. Options Submenu

The Options command submenu contains the following command:

- PinTool Options command on page 49

PinTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

Properties Command (Tools Menu)

Displays the Properties submenu shown in Figure 3-14.

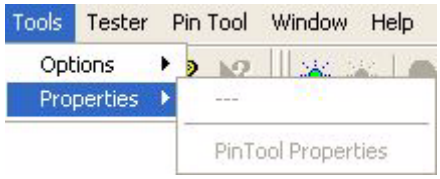


Figure 3-14. Properties Submenu

The Properties command submenu contains the following command:

- PinTool Properties command on page 49

PinTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

Tester Menu

Selecting Tester in the menu bar opens the menu in Figure 3-15.

Figure 3-15. Tester Menu

The Tester menu contains the following commands:

-  Connect to VersaStation on page 50
-  Disconnect from VersaStation on page 50
-  Set Online command on page 50
-  Set Offline command on page 50
-  Acquire Data command on page 51
-  Apply Changes command on page 51
-  Abort Acquire command on page 51
-  Tester Power On command on page 51
-  Tester Power Off command on page 51

Connect to VersaStation Command (Tester Menu)

 Connects the IDE to VersaStation (formerly called PCM). The IDE must be connected to VersaStation (PCM) before it can be connected to a specific tester test site.

Disconnect from VersaStation Command (Tester Menu)

 Disconnects the IDE from VersaStation (formerly called PCM).

Set Online Command (Tester Menu)

 Connects the IDE to the tester for the following tools that support online mode. The IDE must be connected to VersaStation (formerly PCM) before it can be connected to a specific test site.

- C Program Debugger (currently has no offline capability)
- Pattern Tool (currently has no offline capability)
- Waveform Tool
- Timing Tool

Set Offline Command (Tester Menu)

 Disconnects the IDE from the tester. The following tools support offline mode:

- Pin Tool (currently has no online capability)
- Waveform Tool (viewing saved files only)
- Timing Tool (viewing saved files only)
- Bitmap Tool (currently has no online capability)

Select the Open toolbar button or the `File > Open PinTool Document` command to display an open dialog box from which a Pin Tool file with a .pin extension is opened. The .pin file is created by selecting `File > Save` after configuring a Pin Tool document.

Acquire Data Command (Tester Menu)

Not currently supported by the Pin Tool. The Timing Tool supports this command.

Apply Changes Command (Tester Menu)

Not currently supported by the Pin Tool. The Timing Tool supports this command.

Abort Acquire Command (Tester Menu)

Not currently supported by the Pin Tool. The Timing Tool supports this command.

Tester Power On Command (Tester Menu)

Same as the VK Test Station main window `Utilities > Power On` command and its corresponding toolbar button. Resets and powers up the test sites (Test Head).

Tester Power Off Command (Tester Menu)

Same as the VK Test Station main window `Utilities > Power Off` command and its corresponding toolbar button. Turns off power to the test sites (Test Head).

Pin Tool Menu

Selecting Pin Tool in the menu bar opens the menu in Figure 3-17.

Figure 3-16. Pin Tool Menu

The Pin Tool menu contains the following commands:

- Increasing pin numbering on page 52
- Decreasing pin numbering on page 52

Increasing pin numbering Command (Window Menu)

In the Pin Tool's Pin Mapping tab, causes entry values to increase in numbering as you click and drag to add to the initial entry in the columns on the tab:

- Device Pin Name
- Socket Pin Out
- DUT Tester Channel

Decreasing pin numbering Command (Window Menu)

In the Pin Tool's Pin Mapping tab, causes entry values to decrease in numbering as you click and drag to add to the initial entry in the columns on the tab:

- Device Pin Name
- Socket Pin Out
- DUT Tester Channel

Window Menu

Selecting Window in the menu bar opens the menu in Figure 3-17.

Figure 3-17. Window Menu

The Window menu contains the following commands:

- New Window command on page 53
- Close command on page 53
- Close All command on page 53
- Cascade command on page 53
- Tile command on page 53
- Minimize All command on page 53

New Window Command (Window Menu)

Displays a duplicate of the active Pin Tool document window.

Close Command (Window Menu)

Closes the active tool document window.

Close All Command (Window Menu)

Closes all tool document windows with their corresponding tabs.

Cascade Command (Window Menu)

Cascades all open tool document windows in an overlapping fashion one on top of another with the title bar of each visible.

Tile Command (Window Menu)

Tiles all open tool document windows in a non-overlapping fashion.

Minimize All Command (Window Menu)

Not currently supported.

Help Menu

Selecting Help in the menu bar opens the menu in Figure 3-18.

Figure 3-18. Help Menu

The Help menu contains the following two commands:

Help Topics Command (Help Menu)

 Not currently supported.

About Versatest Integrated Development Environment Command (Help Menu)

 Displays the About Versatest Integrated Development Environment dialog box that contains software component version and copyright information (similar to Figure 3-19).

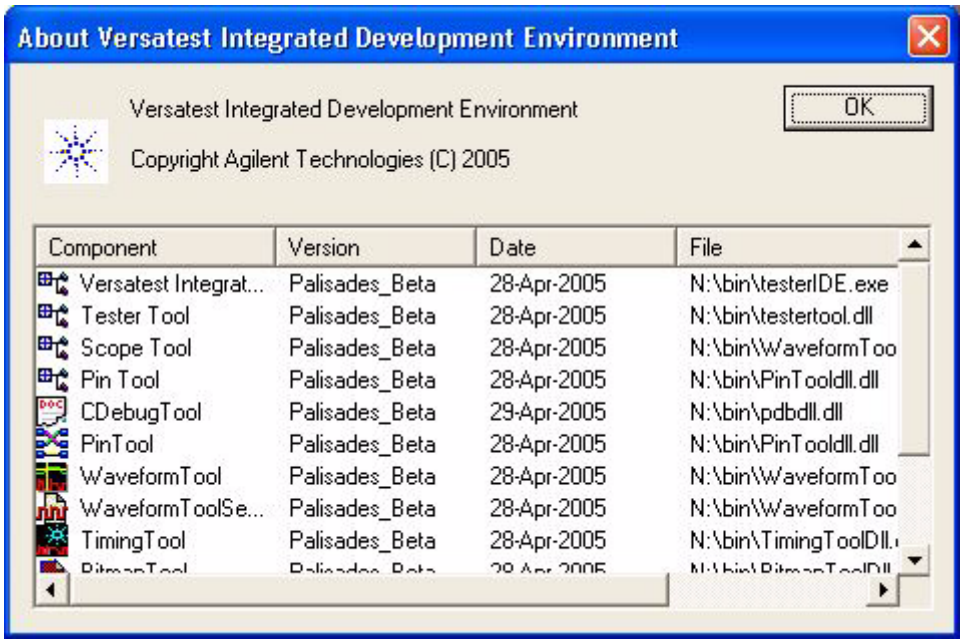


Figure 3-19. About Versatest Integrated Development Environment

Pin Tool Getting Started

This Getting Started demonstrates how use the Pin Tool to create pin lists and groups from scratch before you develop your test program.

The Pin Tool's graphical interface provides the capability to map tester resources to DUT pins for both test program .c and pattern .apg files. It also allows the user to add, delete, or modify pin definitions through its interface. Without the Pin Tool, the user's only option is to manually map tester resources to DUT pins for both test program .c and pattern .apg files. This is done by creating a pin list that is a data structure consisting of a one-dimensional four-integer array for each DUT pin in a project .c file. Data structures called pin and pin groups also have to be created for use in pattern files. The Pin Tool provides an alternative to the arduous and overlapping task of manually mapping tester resources to DUT pins for test program and pattern files.

For additional information about the Timing Too, see the "Pin Tool Main Window" section on page 35 that provides descriptions of all the menus, menu commands, and dialog boxes that make up the tool's interface.

Getting Started Contents

This Getting Started contains the following examples:

NOTE The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

Launching the IDE and Displaying the Pin Tool Document Window

This section demonstrates how to launch IDE and display the Pin Tool Document Window in preparation to create a Pin Tool document.

1 Selecting start > `Programs` > `Versatest Test System Software` > `Integrated Development Environment` displays its default main window (Figure 3-20).

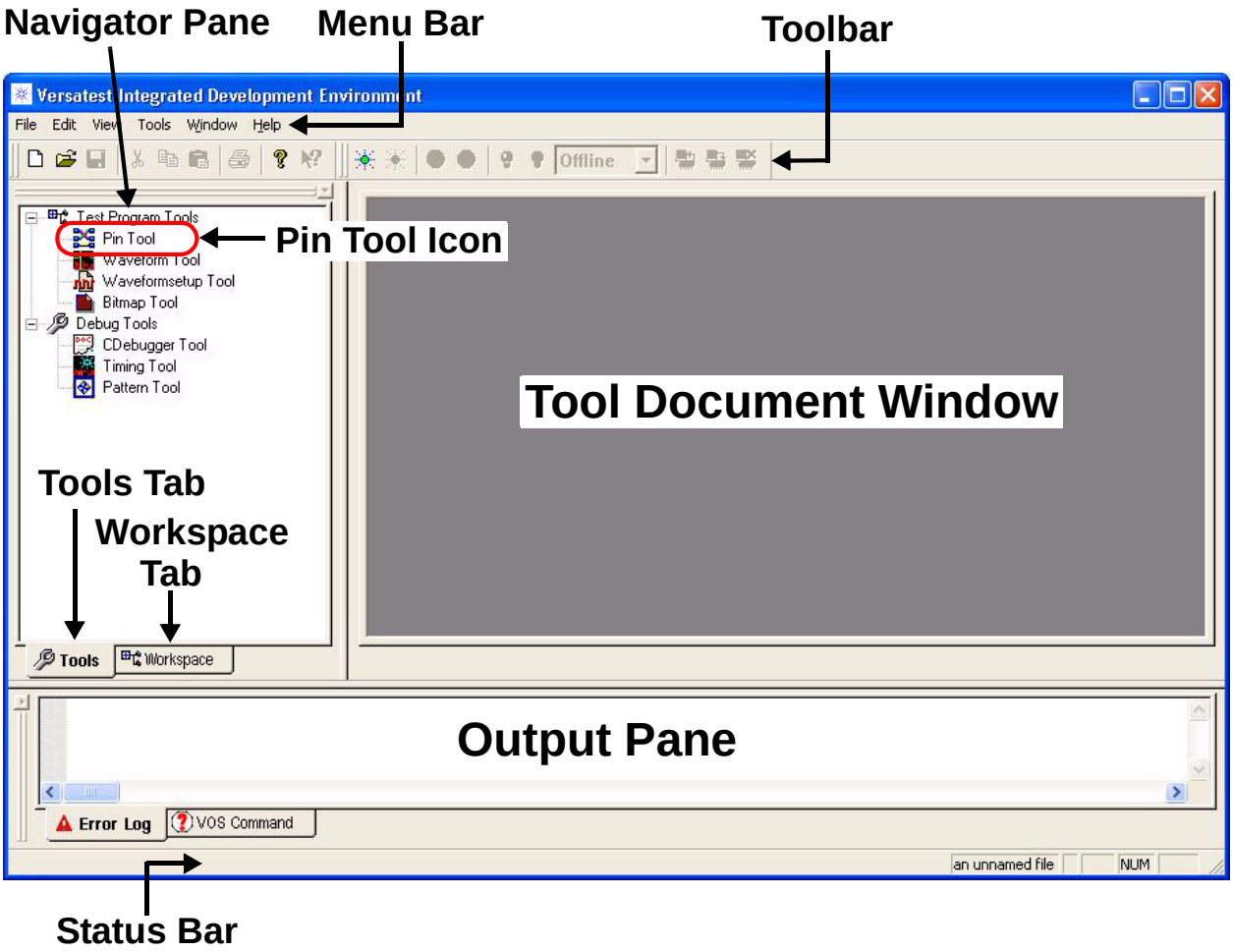


Figure 3-20. Versatest Integrated Development Environment Main Window

2 Double-clicking the `Pin Tool` icon on the Tools Tab in the Navigator Pane(Figure 3-20) displays the Pin Tool as the active tool in the Tool Document window (Figure 3-21). This also adds the Pin Tool Document PinTool1.pin tab at the bottom of the Pin Tool Document window, and its menu bar and toolbar.

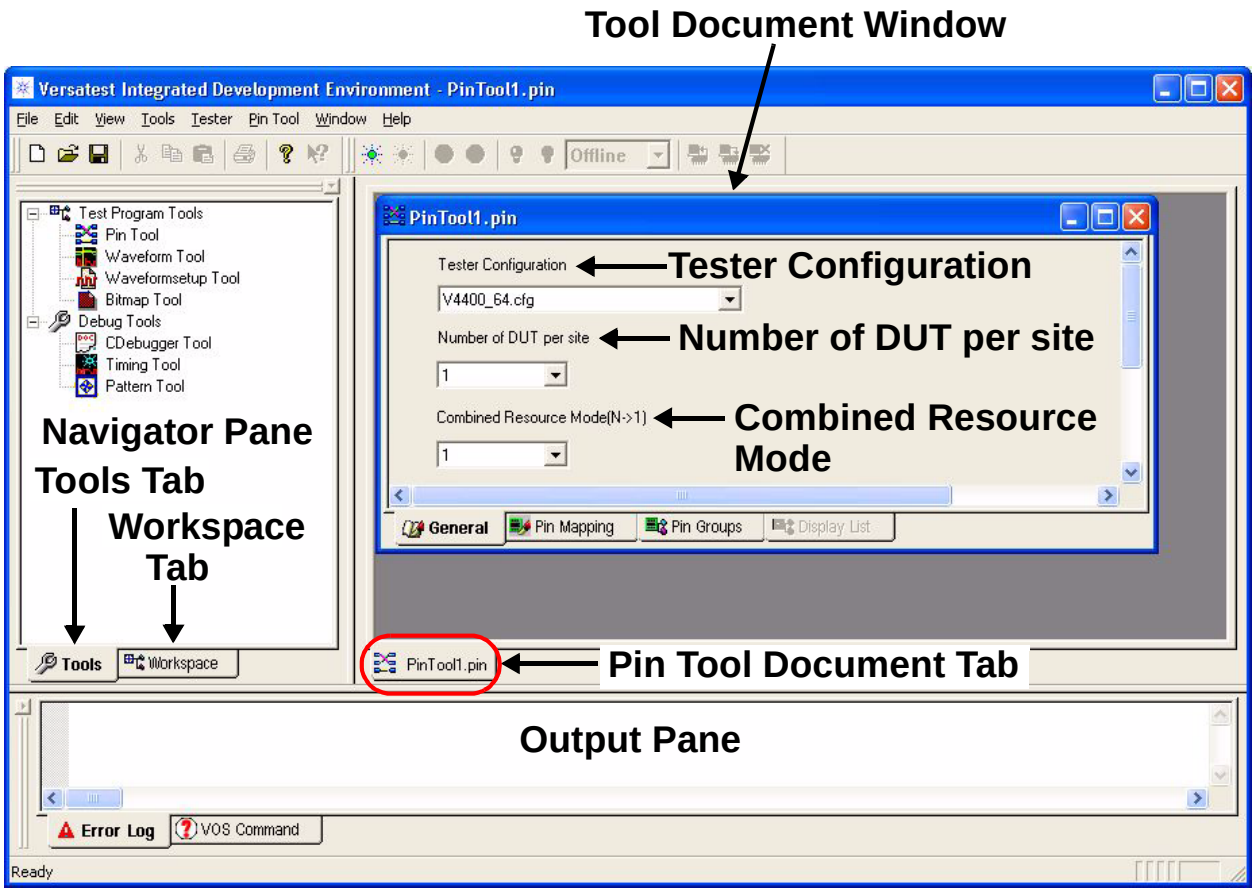


Figure 3-21. Pin Tool Default Main Window

Configuring Tester Resources on the General Tab

This section demonstrates how to select the test system you want to create the pin lists for and configure its resources on the General tab. This includes selecting the tester configuration, number of DUTs per site, and the combined-resource mode (CRM).

1 Selecting the down-arrow button on the right side of the `Tester Configuration` field displays a drop-down list box of the available test system configurations.

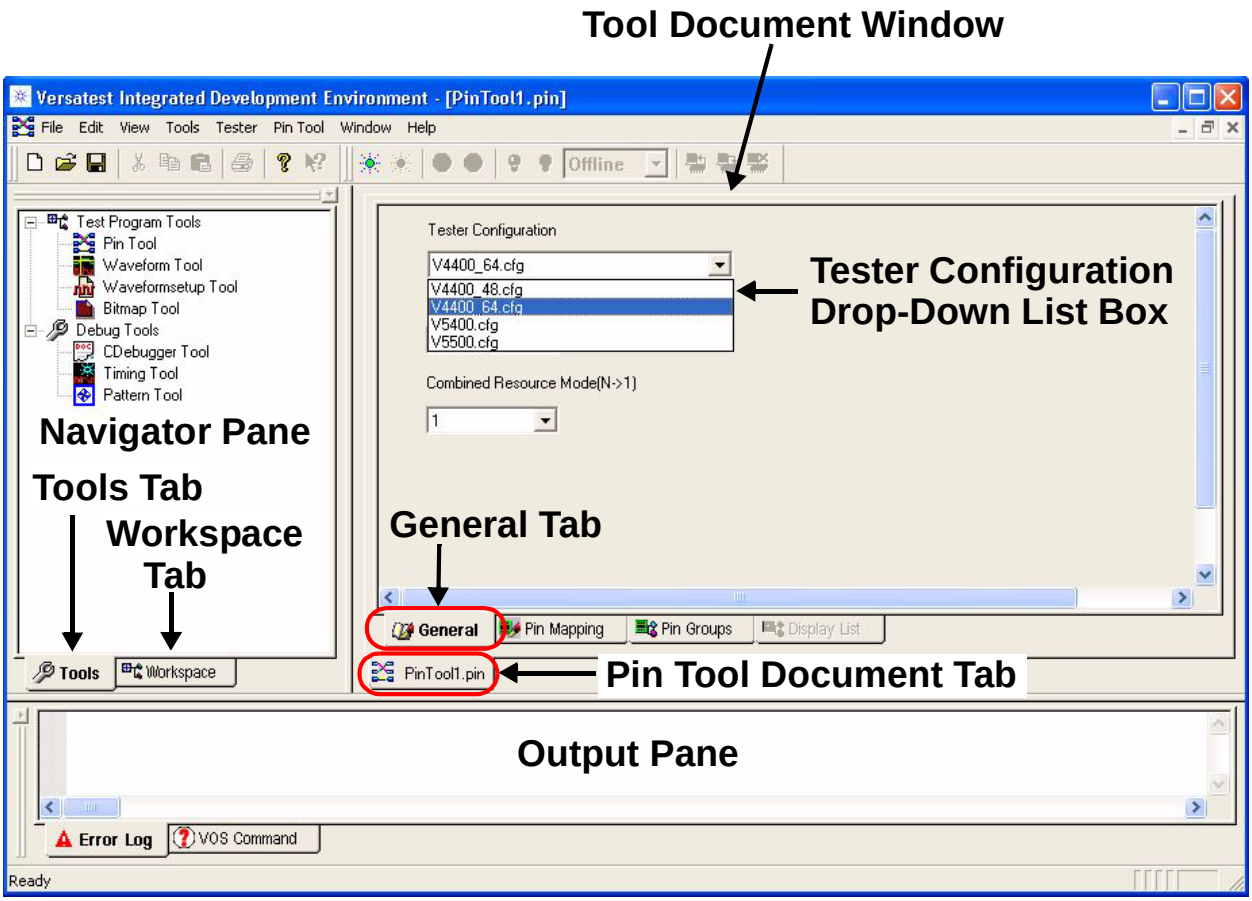


Figure 3-22. Tester Configuration Drop-Down List Box

2 For this example, we will select the `V5400.cfg` configuration (Figure 3-23) that has the following configuration resources:

- Four test sites per site module.
- Thirty-two PE channels per test site (128 per site module).

- Supports single-site mode (CRM-1 with 32 PE channels), CRM-2 (with 64 PE channels), or CRM-4 (with 128 PE channels) on each test site module.

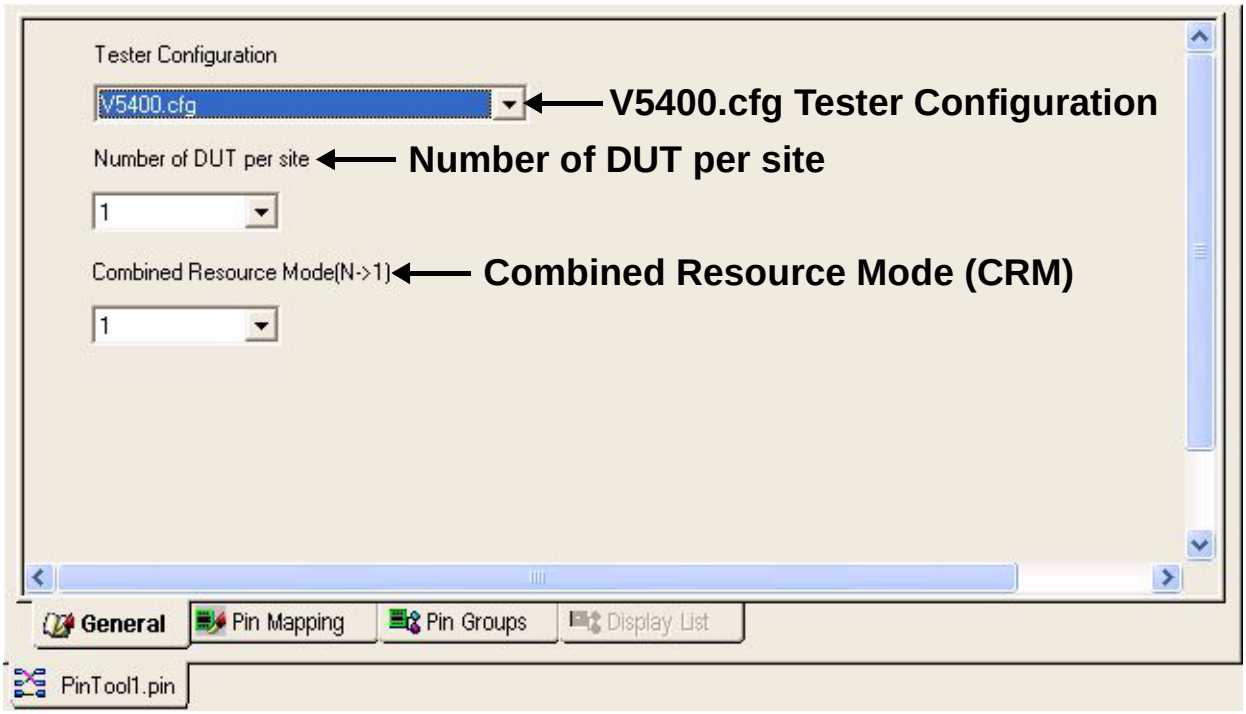


Figure 3-23. Tester Configuration Set to V5400.cfg

3 Selecting the down-arrow button on the right side of the `Number of DUT per site` field displays a drop-down list box that allows you to select the number of DUTs per site (Figure 3-24).

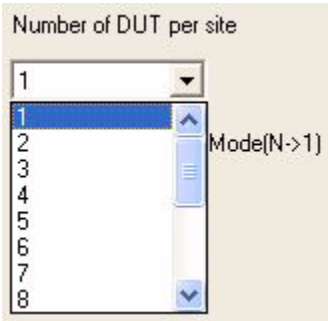


Figure 3-24. Number of DUT Per Site Drop-Down List Box

4 Selecting 2 closes the list box, and then selecting the Combined Resource Mode drop-down button displays the V5400.cfg supported CRM modes (Figure 3-25).

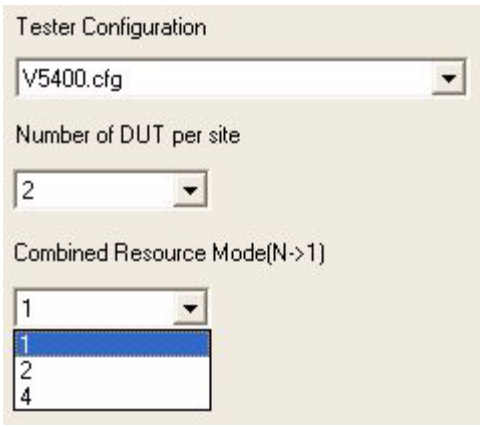


Figure 3-25. Combined Resource Mode Drop-Down List Box

5 Selecting 2 specifies CRM-2 and displays the configured General tab (Figure 3-26).

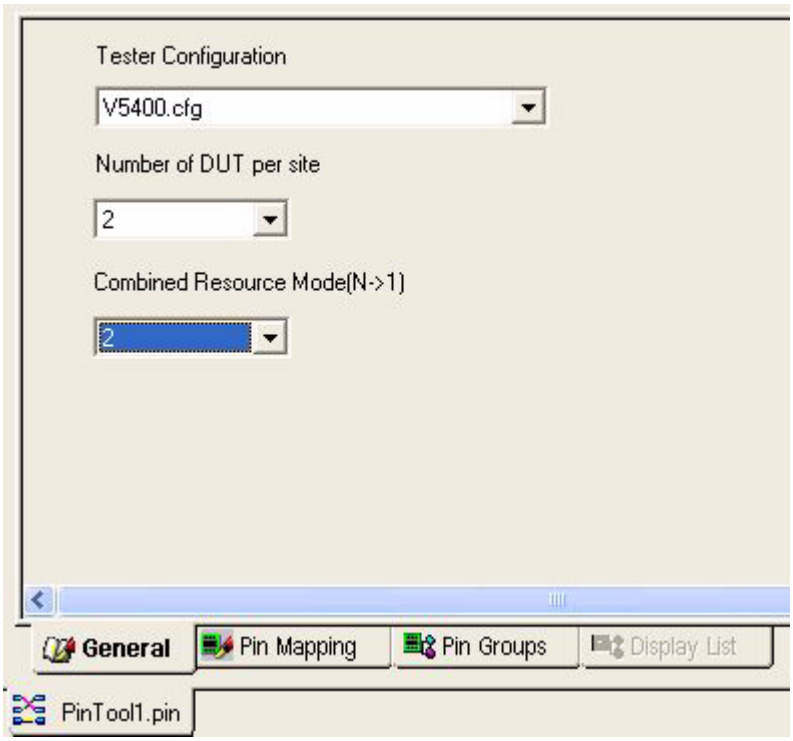


Figure 3-26. Configured General Tab

Assigning Pins to Tester Resources on the Pin Mapping Tab

This section demonstrates how to use the Pin Mapping tab to assign pins to tester resources. This includes defining pin names, and mapping DUT pins and PE or PPS resources to those names.

1 Selecting the Pin Mapping tab (Figure 3-27) displays how it was configured on the General tab. For example, it was previously configured with two DUTs.

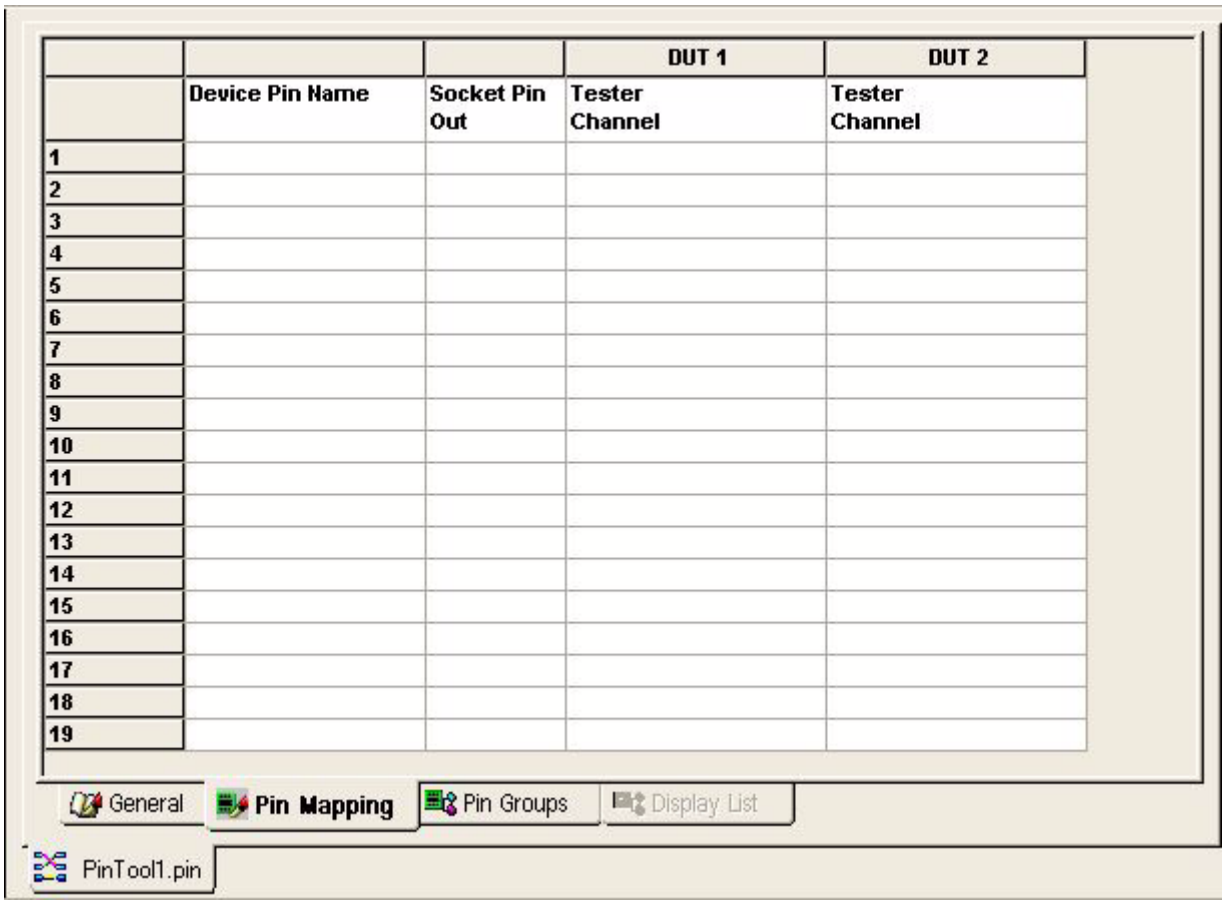


Figure 3-27. Pin Tool's Pin Mapping Tab

2 Selecting the cell in row `1` under the `Device Pin Name` column and typing `addr0` defines the first pin name (Figure 3-28).

			DUT 1	DUT 2
	Device Pin Name	Socket Pin Out	Tester Channel	Tester Channel
1	addr0			
2				
3				

Figure 3-28. Pin Mapping's Tab Defined Pin Name

3 Shift + left-clicking the mouse cursor on the `addr0` cell and dragging the cursor down to row 8 highlights the cells and assigns pin names `addr1` through `addr7` to the selected cells (Figure 3-29). Note that whether a selection increases or decreases its numbering is determined by selecting either the `Pin Tool > ✓Increasing pin number` command or `Pin Tool > ✓Decrease pin numbering` command in the menu bar.

			DUT 1	DUT 2
	Device Pin Name	Socket Pin Out	Tester Channel	Tester Channel
1	addr0			
2	addr1			
3	addr2			
4	addr3			
5	addr4			
6	addr5			
7	addr6			
8	addr7			
9				
10				
11				
12				

Figure 3-29. Clicking and Dragging to Assign Additional Pin Names

4 Selecting the cell in row `9` and typing `data0` defines that row's pin name, and the repeating the process of clicking and dragging down to row `16` assigns `data1` through `data7` to the corresponding cells (Figure 3-30). An additional pin name is assigned by typing `VCC` in row `17`.

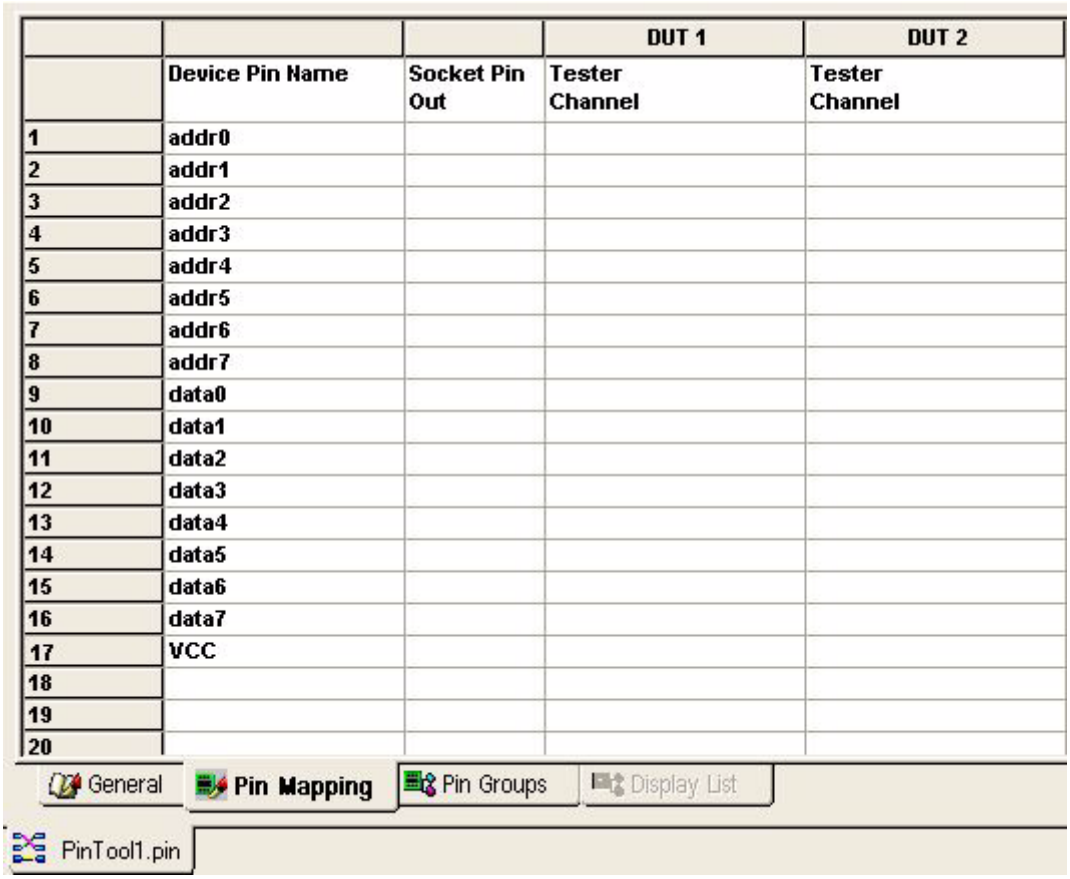
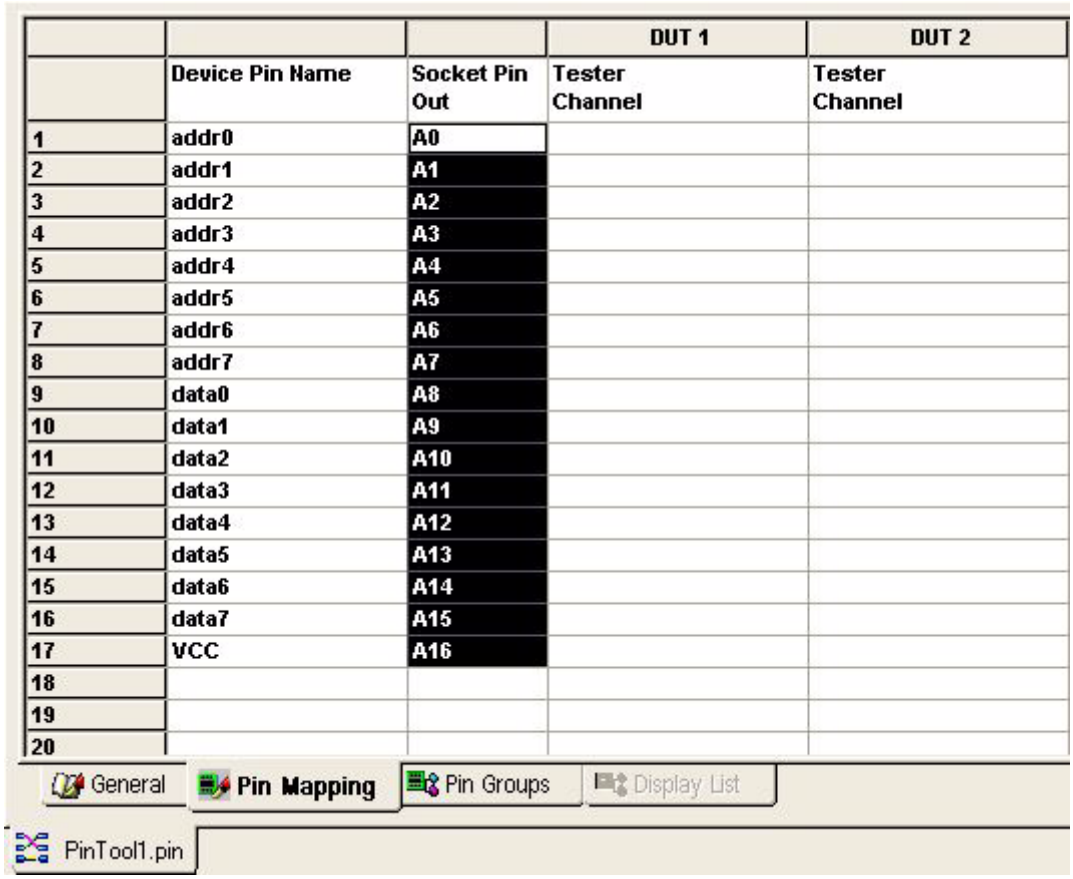


Figure 3-30. Assigning Additional Pin Names

5 Selecting the cell in row `1` under the `Socket Pin Out` column and typing `A0` maps it to the `Addr0` Device Pin Name, and then Shift + clicking and dragging down to row `17` in the column assigns `A1` through `A16` (Figure 3-31). Again, note that whether a selection increases or decreases its numbering is determined by selecting either the `Pin Tool > ✓Increasing pin number` command or `Pin Tool > ✓Decrease pin numbering` command in the menu bar.



			DUT 1	DUT 2
	Device Pin Name	Socket Pin Out	Tester Channel	Tester Channel
1	addr0	A0		
2	addr1	A1		
3	addr2	A2		
4	addr3	A3		
5	addr4	A4		
6	addr5	A5		
7	addr6	A6		
8	addr7	A7		
9	data0	A8		
10	data1	A9		
11	data2	A10		
12	data3	A11		
13	data4	A12		
14	data5	A13		
15	data6	A14		
16	data7	A15		
17	VCC	A16		
18				
19				
20				

Figure 3-31. Mapping Pins to Pin Names

6 Selecting the cell in row `1` in the `DUT 1 Tester Channel` column enables a drop-down list box that displays the available channels when you select the drop-down ▼ button (Figure 3-32)

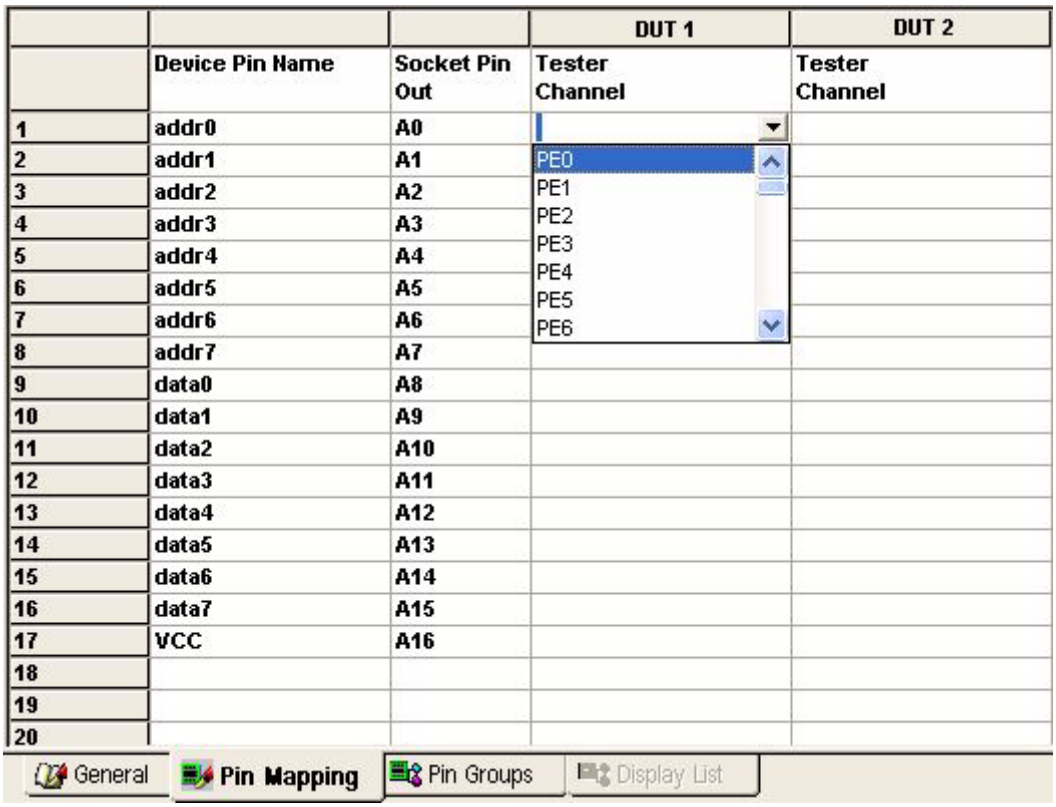
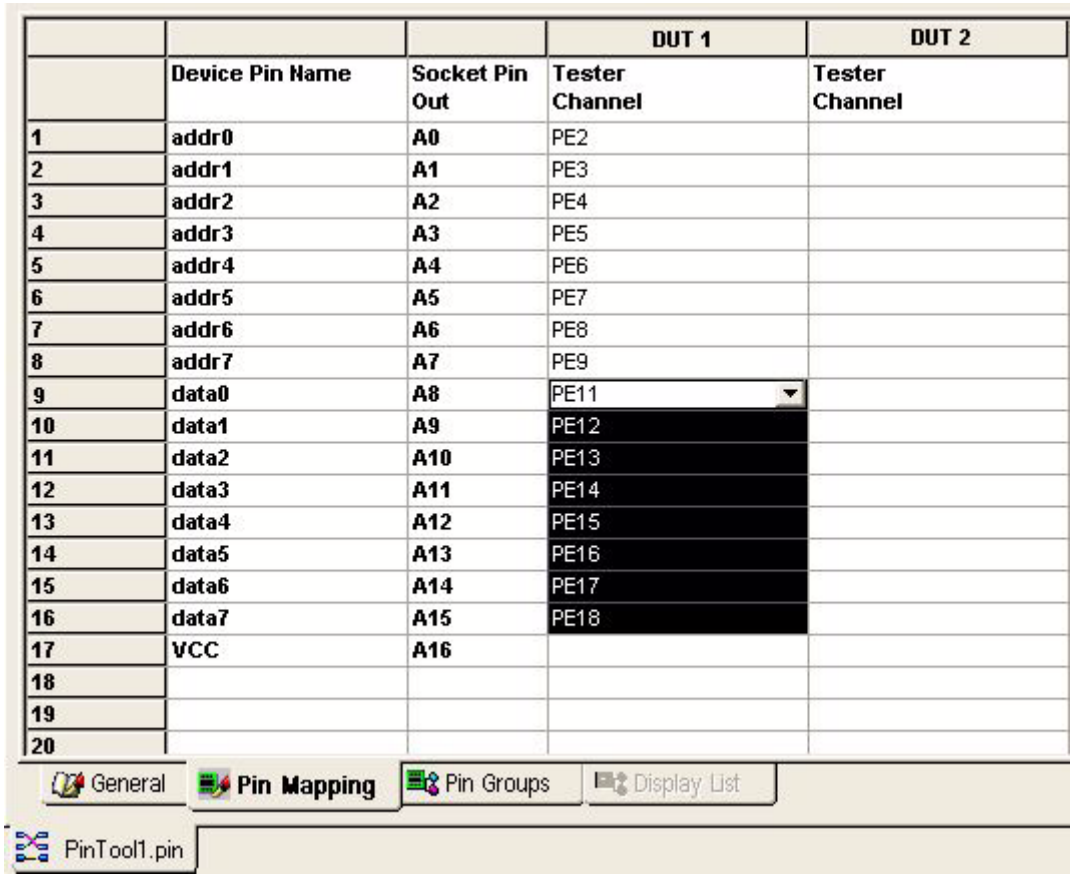


Figure 3-32. Displaying Tester PE Channels

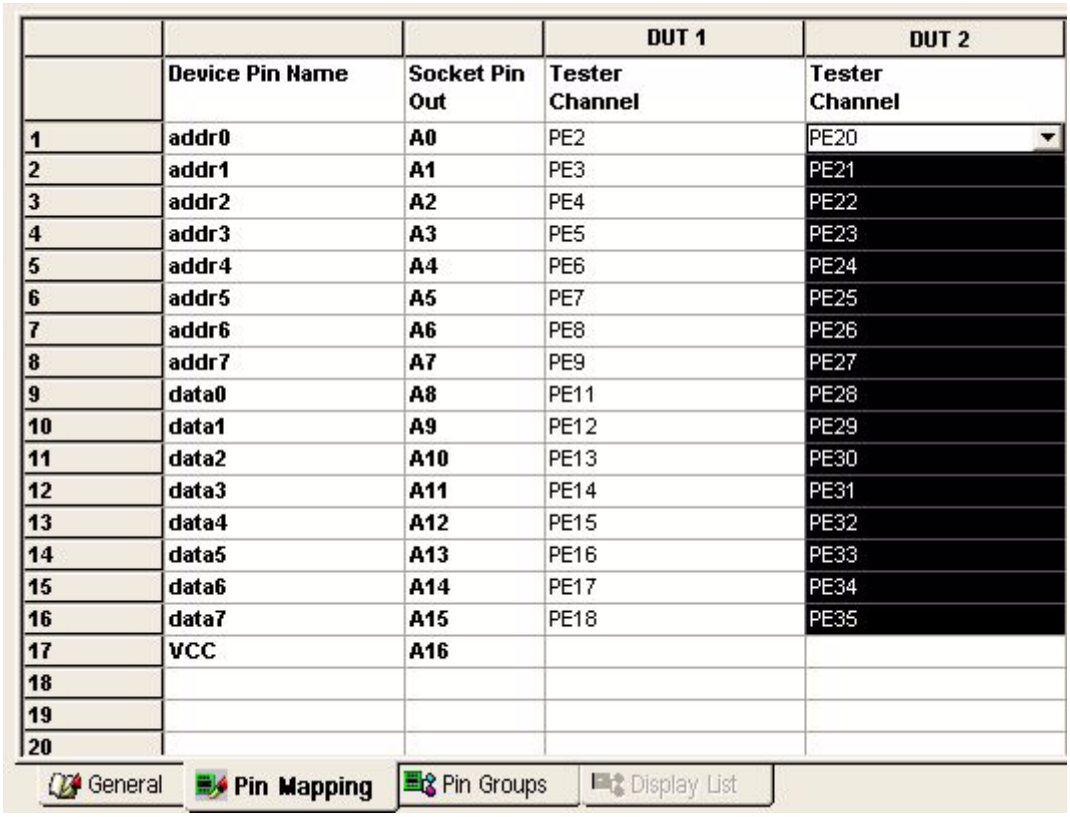
7 Selecting PE2 and then Shift + clicking and dragging down to row 8 (A7) maps PE2 to A0 through PE9 to A7 (similar to Figure 3-33). The mapping of PE11 through PE18 is done similarly.



			DUT 1	DUT 2
	Device Pin Name	Socket Pin Out	Tester Channel	Tester Channel
1	addr0	A0	PE2	
2	addr1	A1	PE3	
3	addr2	A2	PE4	
4	addr3	A3	PE5	
5	addr4	A4	PE6	
6	addr5	A5	PE7	
7	addr6	A6	PE8	
8	addr7	A7	PE9	
9	data0	A8	PE11	
10	data1	A9	PE12	
11	data2	A10	PE13	
12	data3	A11	PE14	
13	data4	A12	PE15	
14	data5	A13	PE16	
15	data6	A14	PE17	
16	data7	A15	PE18	
17	VCC	A16		
18				
19				
20				

Figure 3-33. Mapping DUT 1 PE Channels

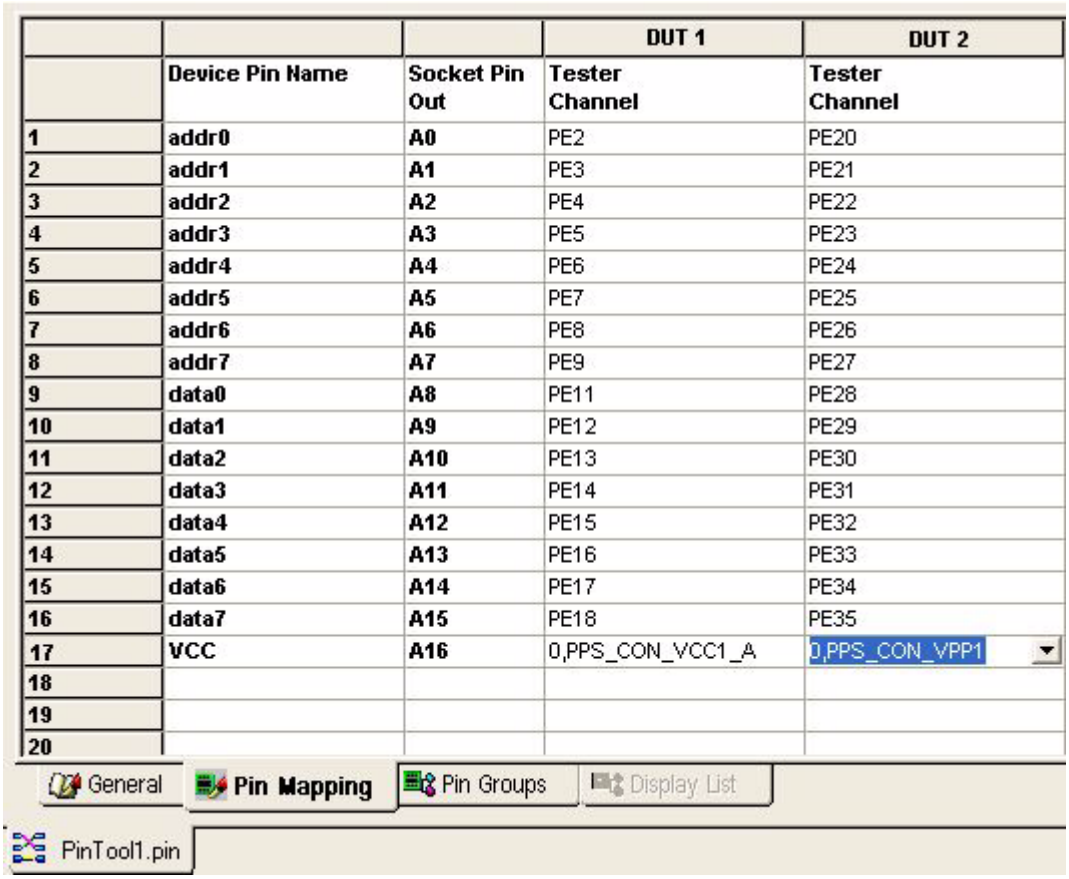
8 Mapping PE channels for the `DUT 2 Tester Channel` column is done the same way as for DUT 1 (Figure 3-34).



			DUT 1	DUT 2
	Device Pin Name	Socket Pin Out	Tester Channel	Tester Channel
1	addr0	A0	PE2	PE20
2	addr1	A1	PE3	PE21
3	addr2	A2	PE4	PE22
4	addr3	A3	PE5	PE23
5	addr4	A4	PE6	PE24
6	addr5	A5	PE7	PE25
7	addr6	A6	PE8	PE26
8	addr7	A7	PE9	PE27
9	data0	A8	PE11	PE28
10	data1	A9	PE12	PE29
11	data2	A10	PE13	PE30
12	data3	A11	PE14	PE31
13	data4	A12	PE15	PE32
14	data5	A13	PE16	PE33
15	data6	A14	PE17	PE34
16	data7	A15	PE18	PE35
17	VCC	A16		
18				
19				
20				

Figure 3-34. Mapping DUT 2 PE Channels

9 Mapping of PPS resources for the VCC pin name for DUT 1 and DUT 2 in row 17 is done using the same process (Figure 3-35).



			DUT 1	DUT 2
	Device Pin Name	Socket Pin Out	Tester Channel	Tester Channel
1	addr0	A0	PE2	PE20
2	addr1	A1	PE3	PE21
3	addr2	A2	PE4	PE22
4	addr3	A3	PE5	PE23
5	addr4	A4	PE6	PE24
6	addr5	A5	PE7	PE25
7	addr6	A6	PE8	PE26
8	addr7	A7	PE9	PE27
9	data0	A8	PE11	PE28
10	data1	A9	PE12	PE29
11	data2	A10	PE13	PE30
12	data3	A11	PE14	PE31
13	data4	A12	PE15	PE32
14	data5	A13	PE16	PE33
15	data6	A14	PE17	PE34
16	data7	A15	PE18	PE35
17	VCC	A16	0,PPS_CON_VCC1_A	0,PPS_CON_VPP1
18				
19				
20				

Figure 3-35. Mapping VCC PPS Resources

Defining Pin Groups Using the Pin Groups Tab

This section demonstrates how to define pin groups on the Pin Groups Pin Groups tab using the pins that were mapped in the previous section using the Pin Mapping Pin Mapping tab, clone and edit pin those pin groups, and save the .pin Pin Tool file. Information is also included about the .c and .h files that are generated by the Pin Tool and where these files should be included before compiling.

1 Selecting the Pin Group Pin Groups tab displays its tab (similar to Figure 3-36) configured using the mapping that was done on the Pin Mapping Pin Mapping tab.

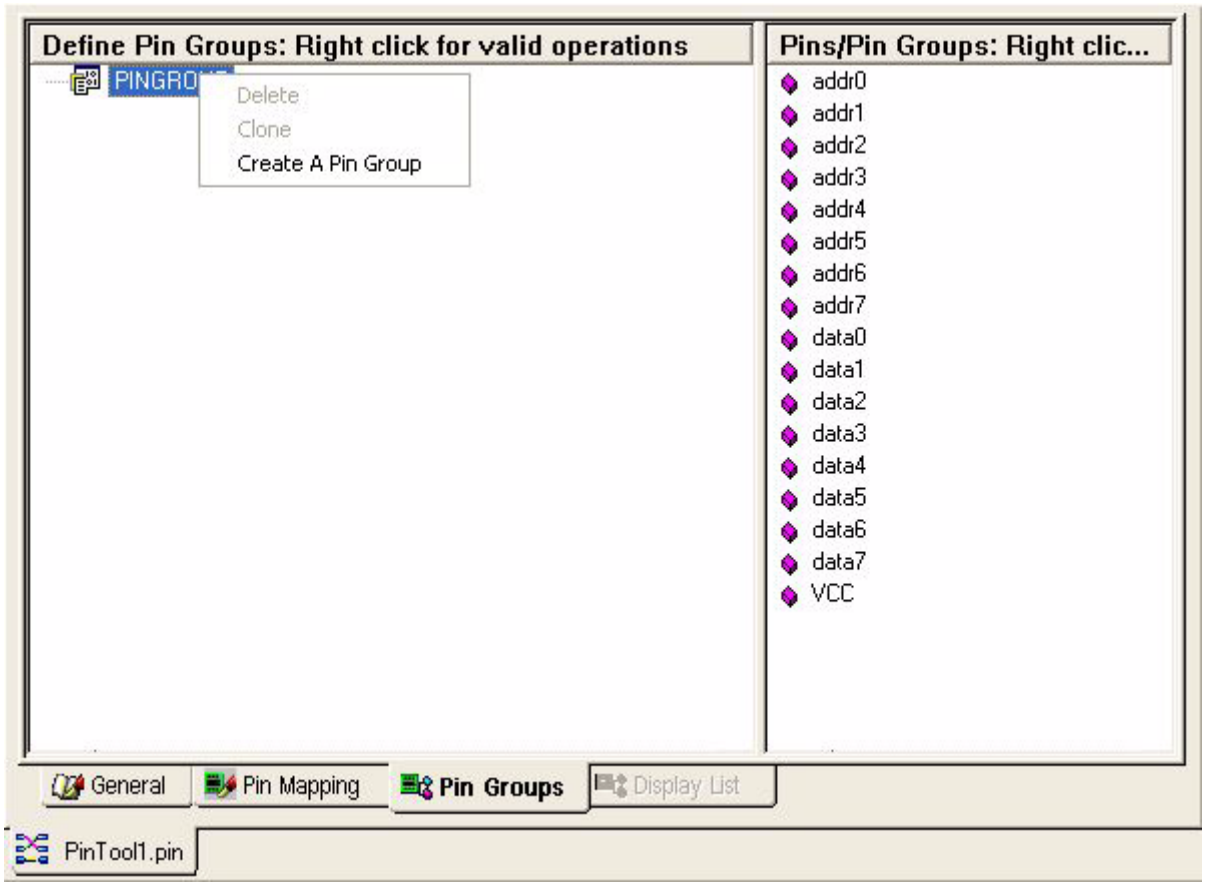


Figure 3-36. Pin Groups Tab

2 Right-clicking the `PINGROUP` icon in the `Define Pin Groups` panel on the left displays a pop-up menu, and selecting the `Create A Pin Group` command displays a `NewPinGrp` icon (Figure 3-37).

Figure 3-37. NewPinGrp Icon

3 Selecting the `NewPinGrp` icon and typing `addr` changes its group name (Figure 3-38).

Figure 3-38. Changing NewPinGrp Icon to Addr Group Name

4 Selecting `addr0` through `addr7` on the right side in the `Pins/Pins Group` panel and right clicking displays a pop-up menu that contains a `Add Pins/Sub Pins To Pin Group` command (Figure 3-39) that adds them to the `addr` group on the left side in the `Define Pin Groups` panel.

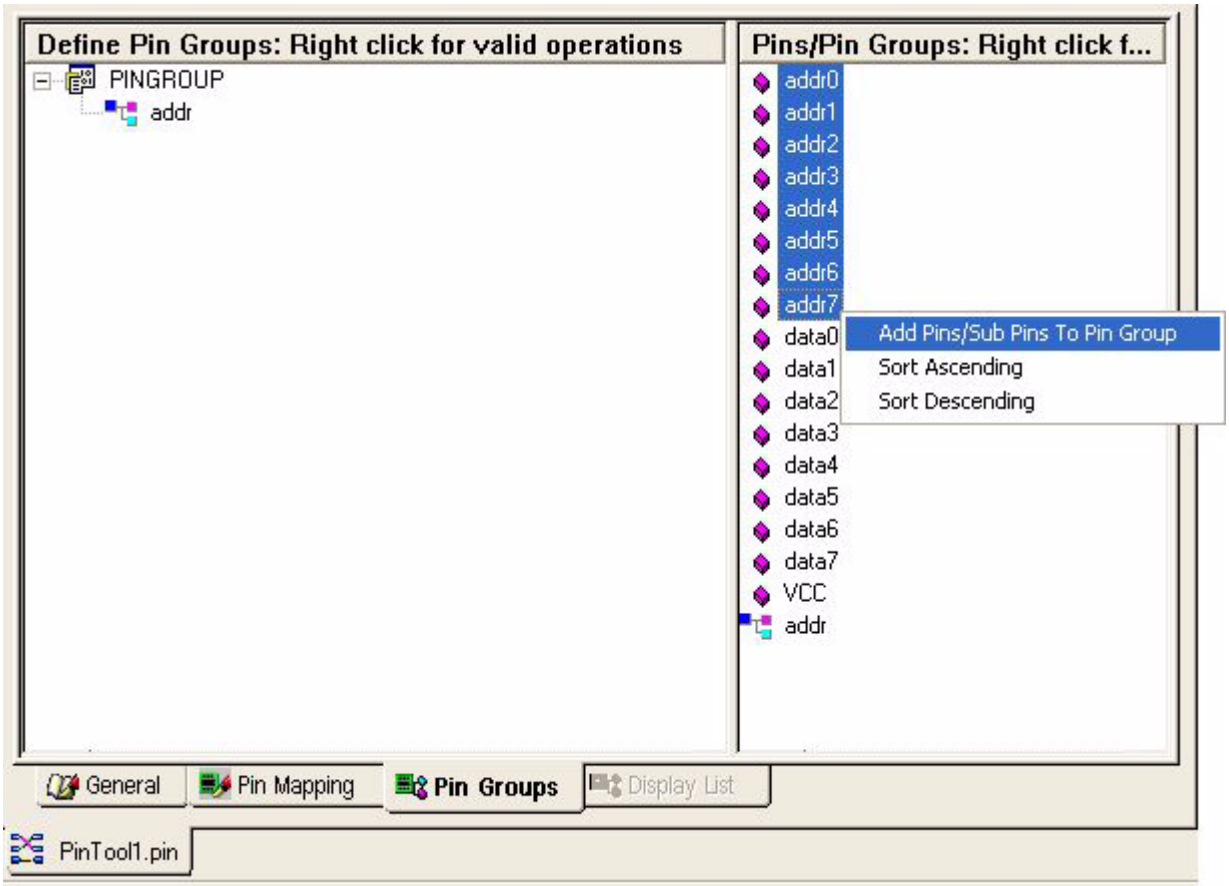


Figure 3-39. Adding Pins to the addr Group Name

5 Selecting the `PINGROUP` icon again on the right in the `Define Pin Groups` pane, right-clicking to display the pop menu (Figure 3-26 on page 60), selecting the `Create A Pin Group` command, and

changing the `NewPinGrp1` name to `data` creates a second pin group name (Figure 3-40).

Figure 3-40. Second Pin Group Named data

6 Selecting `data0` through `data7` on the right side in the `Pins/Pins Group` panel and right clicking to display the pop-up menu with the `Add Pins/Sub Pins To Pin Group` command (Figure 3-41) adds those pins to the `data` group on the left side in the `Define Pin Groups` panel.

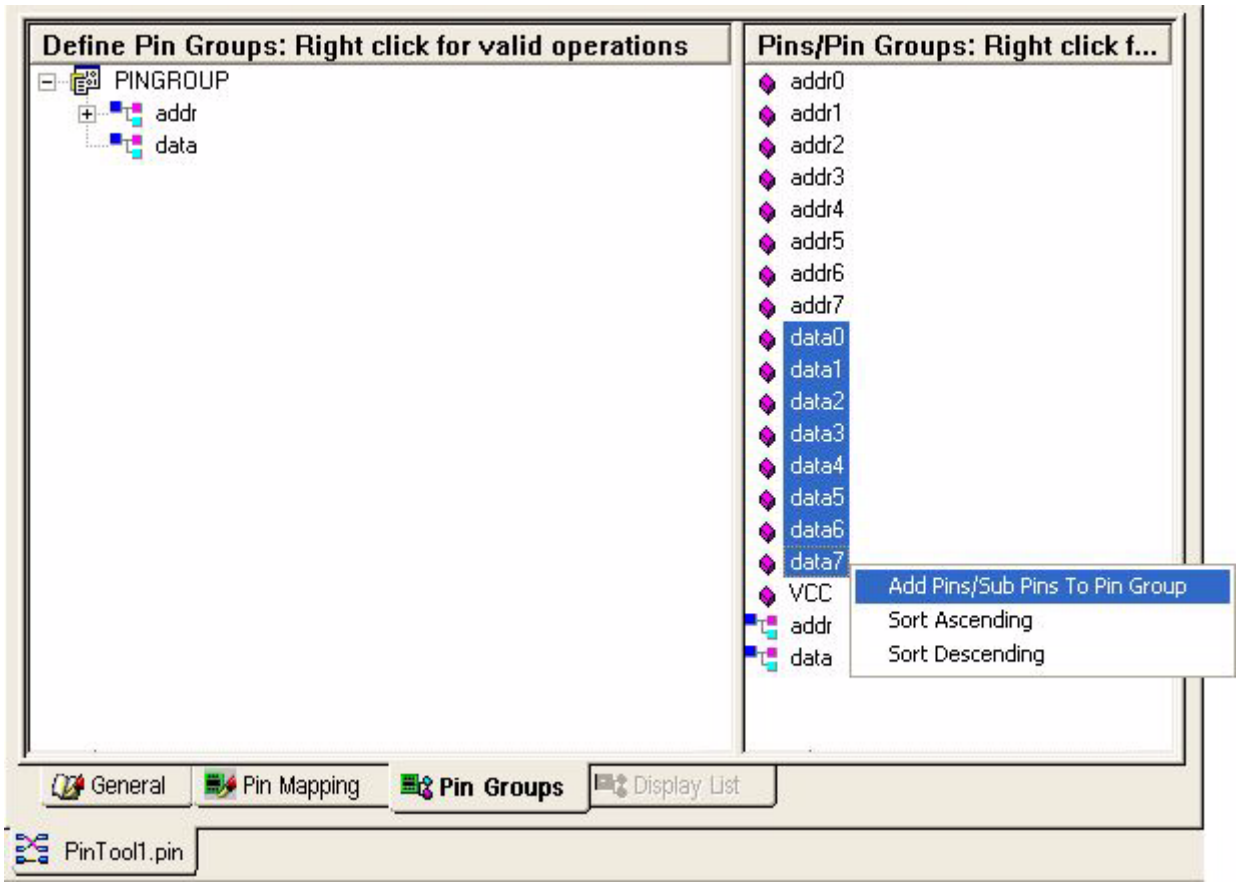


Figure 3-41. Adding Pins to the data Group Name

7 Selecting the `addr` pin group to highlight it in the `Define Pin Groups` panel on the left displays a pop-up menu that contains the `Clone` command (Figure 3-42).

Figure 3-42. Define Pin Groups addr Pop-Up Menu

8 Selecting the `Clone` command in the pop-up menu creates and displays an `addr_0` pin group (Figure 3-43).

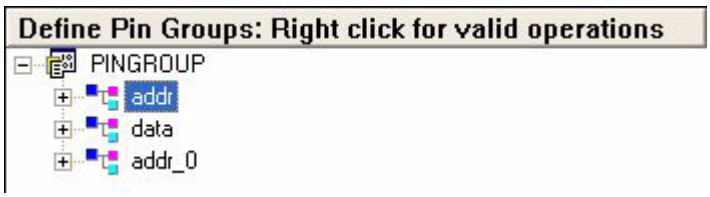


Figure 3-43. Cloning a Pin Group

9 Selecting the `addr_0` pin group and typing `addr_even` changes the cloned pin group name (Figure 3-44).

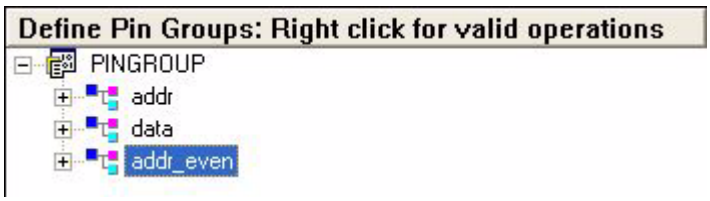


Figure 3-44. Changing Cloned Pin Group Name

10 Selecting the `addr_even` pin group expand ⊞ button opens the tree to display the component pins. Selecting the odd numbered channels and right-clicking displays a pop-up menu that contains a `Delete` command (Figure 3-45).

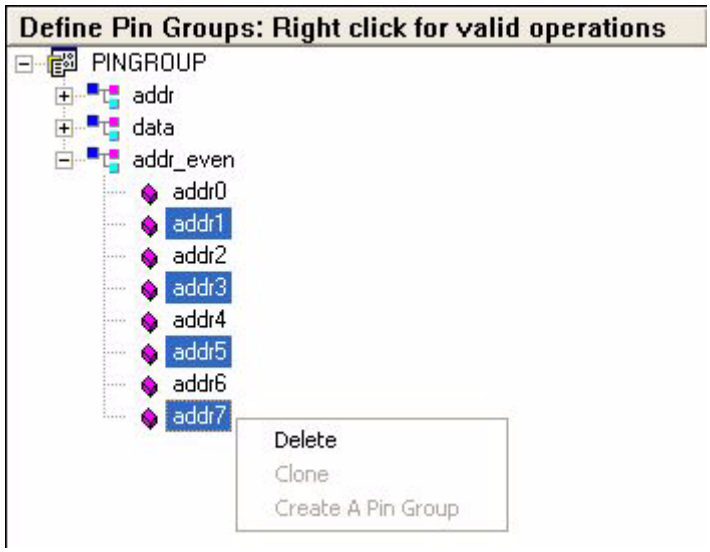


Figure 3-45. Deleting Pins from a Pin Group

11 Selecting the `Delete` command in the pop-up menu deletes the selected pins (Figure 3-46).

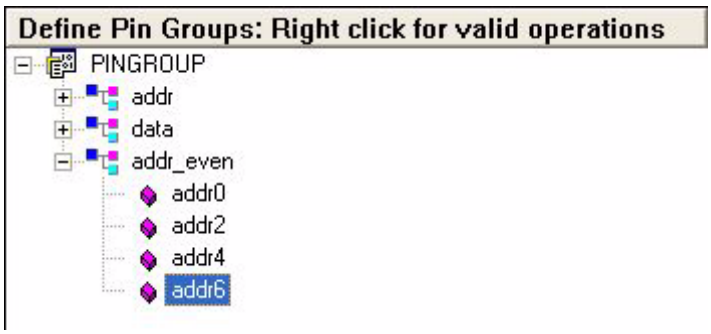


Figure 3-46. Modified addr_even Pin Group

12 This completes the definition of the pin groups that can be used in your test program .C and .APG files to compile. Selecting the `File > Save As` command displays the Save As dialog box (similar to Figure 3-47).

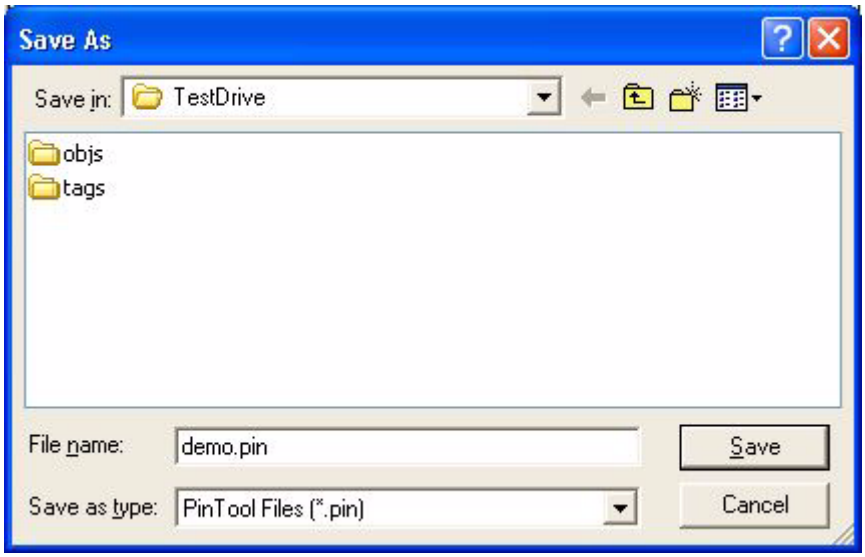


Figure 3-47. Pin Tool Save As Dialog Box

13 Typing the file name `demo.pin` in the dialog box and then selecting the Save button saves the Pin Tool .pin file and also generates demo.c and demo.h files. You should not edit the generated .c and .h files. The .pin file is only for use with the IDE Pin Tool. Include the generated demo.c and demo.h files as follows before compiling using the "make" command:

- Include the generated .h file in your test program .c file.
- Include the generated .h file in your .apg file.
- Include the generated .c file in your makefile.

When saving a Pin Tool file, the system first validates all the pin/cam settings. If there are any errors, it will print the error message to the Error Log tab on the Output Window. Once the setting passes the validation, it then saves the three files: *.pin, *.c, and *.h.

4

C Program Debugger

Introduction

This chapter provides information for the Versatest Series C Program Debugger. The debugger presents you the high-level language source code that is executed directly by the CPU on the Test Site Controller. You are able to control the execution and inspect the status of the debugger at the source code C language level.

The Agilent Versatest Series test systems use VxWorks as the operating system to run VOS (Versatest Operating System) and the device test program. The C Debugger supports only test programs compiled with the GCC (GNU C Compiler) compiler provided with the system software.

Chapter Contents

This chapter contains the following information about the C Program Debugger:

- "C Program Debugger Overview" on page 77: Provides a description of what a debugging tool does and its purpose, how this debugger interacts with the system, the software and compiler that support the debugger, and a list of the tasks that this debugger supports.
- "C Program Debugger Main Window" on page 78: Provides descriptions of the main window's functional areas, menus, menu commands, and dialog boxes.
- "C Program Debugger Getting Started" on page 114: Demonstrates how to load and run a test program on the system and the C Program Debugger and use many of the debugger's features.

NOTE

The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Online Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

C Program Debugger Overview

A debugger is a tool used to help track down, isolate, and remove bugs from software programs. Also, debuggers are tools to illuminate the dynamic nature of a program. It aids a programmer in understanding a program and then finding the cause of any discrepancy. A typical debugger is able to control the application being debugged so that it allows the programmer to follow the flow of program execution, and at any desired point, stop the program, and inspect the state of the program to verify its correctness.

Debugging is the process of correcting or modifying the code in your project so that you can “make” and run your project smoothly, it will act as you expect, and be easy to maintain later. The device test program debugger is a tool that provides the test program developer the capability to interactively develop a test program.

The C Program Debugger can load a test program from the disk and download it to the target CPU on the Test Site Controller. The C Debugger also allows the you to control the execution of the program, that is, launching the program, suspending the program at a desired place, or stepping through the program. The debugger also provides the capability to watch and set the values of variables.

The Agilent Versatest Series test systems use VxWorks as the operating system to run VOS (Versatest Operating System) and the device test program. The C Debugger supports only test programs compiled with the GCC (GNU C Compiler) compiler provided with the system software.

The device test program debugger is able to debug C programs but not APG vectors.

You can use the debugger to do the following:

- Download a device test program
- Browse through the source code
- Set break points
- Run/terminate a device test program
- Single step
- Monitor/modify variable values
- Monitor/modify certain memory area
- Monitor calling stacks

C Program Debugger Main Window

The C Program Debugger main window shown in Figure 4-1 is the debugger interface. The interface is composed of the following functional areas:

- Navigator Pane: See the `View > Navigator Pane` command on page 94.
- Menu Bar on page 79.
- Tool Document Window: Consists of the following C Debugger components:
  - Source Code Browser Pane: Displays the source code for the selected file or function in the C Debugger Tab Cdeb (Cdeb) in the Navigator Pane.
  - Stack Pane: See the `View > Stack` command on page 98.
  - Memory Pane: See the `View > Memory` command on page 97.
  - General Variables Watcher Pane: See the `View > Watch` command on page 97.
  - Local Variables Pane: See the `View > Variable` command on page 96.
  - Document Tabs: See the `View > Document Tabs` command on page 96.
- Toolbar: See the `View > Toolbar` command on page 92.
- Output Pane: See the `View > Output Pane` command on page 95.
- Status Bar: See the `View > Status Bar` command page 93.

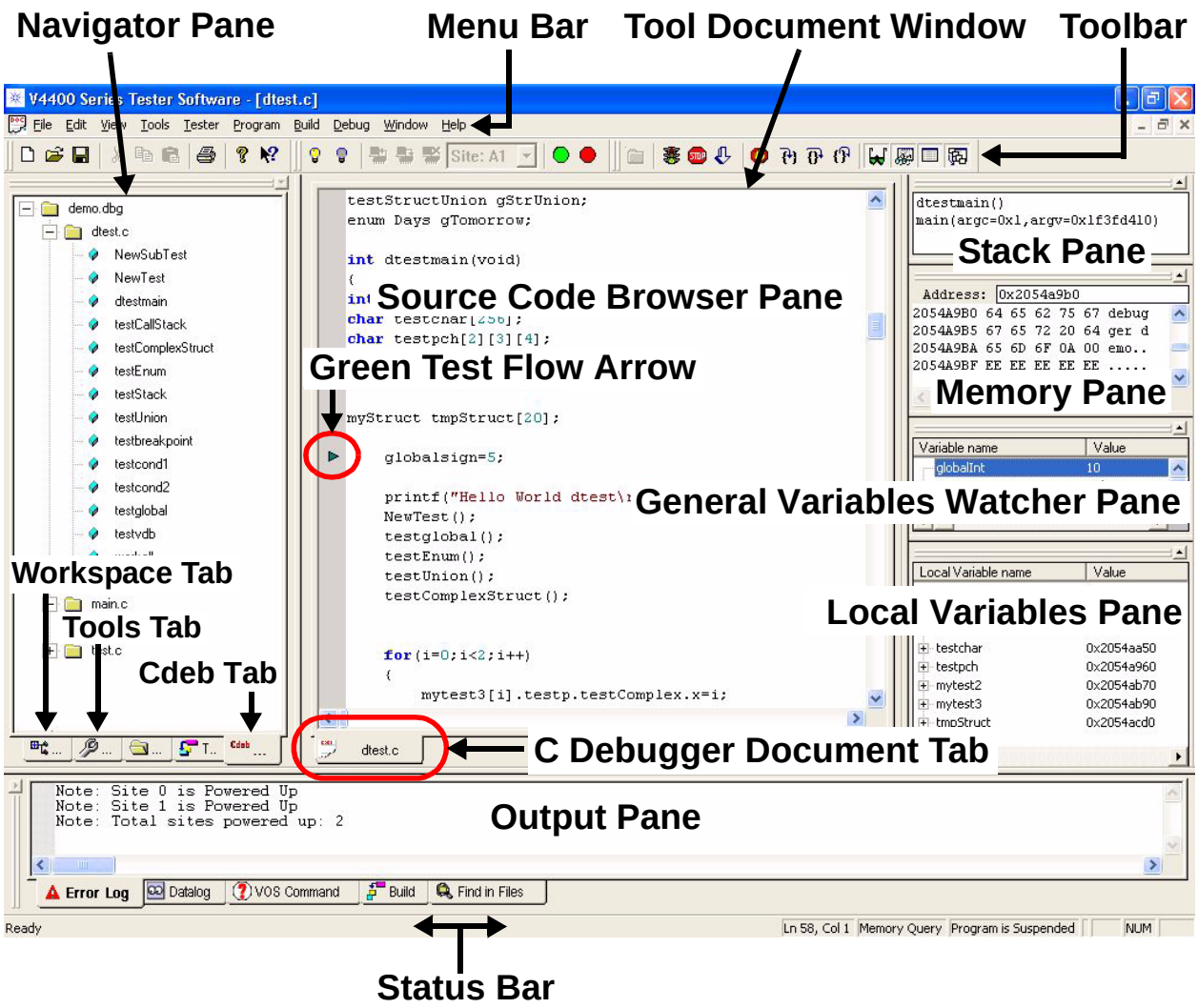


Figure 4-1. C Program Debugger Main Window

Menu Bar

The menu bar at the top of the C Program Debugger main window (Figure 4-1) contains the following 10 pull-down menus from which you can select commands. The C Debugger menu bar and toolbar buttons are enabled when a C Debugger Tool Document Window is the active document and a test program .COF file is finished loading.

- File menu on page 80
- Edit menu on page 88
- View menu on page 91
- Tools menu on page 99

- Tester menu on page 102
- Program menu on page 104
- Build menu on page 104
- Debug menu on page 105
- Window menu on page 110
- Help menu on page 112

File Menu

Selecting File in the menu bar opens the menu in Figure 4-2.

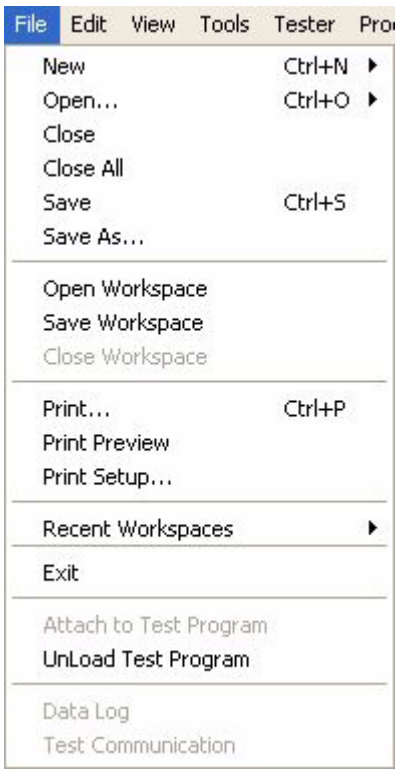


Figure 4-2. File Menu

The File menu contains the following commands:

- New command on page 81
- Open command on page 83
- Close command on page 85
- Close All command on page 85
- Save command on page 85

- Save As command on page 86
- Open Workspace command on page 86
- Save Workspace command on page 86
- Close Workspace Command on page 86
- Print command on page 87
- Print Preview command on page 87
- Print Setup command on page 87
- Recent Workspaces command on page 87
- Exit command on page 87
- Attach to Test Program on page 87
- Unload Test Program on page 87
- Data Log command on page 87
- Test Communication command on page 87

New Command (File Menu)

Displays the New command submenu (Figure 4-3) that allows you to display a new Workspace or create new IDE documents. The New toolbar button displays a New dialog box that lists the same items to select as the submenu.

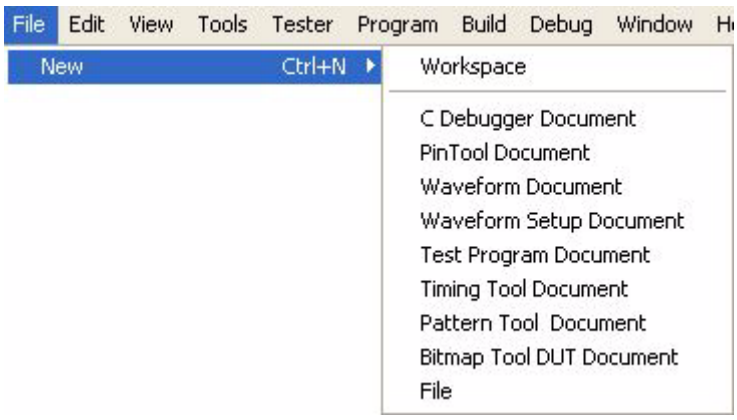


Figure 4-3. File > New Command Submenu

The New command submenu contains the following commands:

- Workspace command on page 82
- C Debugger Document command on page 82
- PinTool Document command on page 82

Workspace Command (New Command Submenu)

Displays as the active Workspace its default with its corresponding Menu bar, Toolbar, Navigator pane, Output pane, and Status bar.

C Debugger Document Command (New Command Submenu)

Displays as the active document a blank C Debugger document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

PinTool Document Command (New Command Submenu)

Displays as the active document a blank PinTool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Document Command (New Command Submenu)

Displays as the active document a blank Waveform Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Setup Document Command (New Command Submenu)

Displays as the active document a blank Waveform Setup Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Test Program Document Command (New Command Submenu)

Note currently supported by the IDE.

Timing Tool Document Command (New Command Submenu)

Displays as the active document a blank Timing Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and graphical display window), Output pane, and Status bar.

Pattern Tool Document Command (New Command Submenu)

Displays as the active document a blank Pattern Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Bitmap Tool DUT Document Command (New Command Submenu)

Displays an Open dialog box from which you open a DUT Description file (.dut) to display a blank Bitmap Tool document with the loaded DUT file and corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

File Command (New Command Submenu)

Not currently supported by the IDE.

Open Command (File Menu)

 Displays the Open command submenu (Figure 4-4) that allows you to open a Workspace or IDE documents from the submenu list. The Open  toolbar button displays a generic Open dialog box from which you can open a selection listed in the submenu.

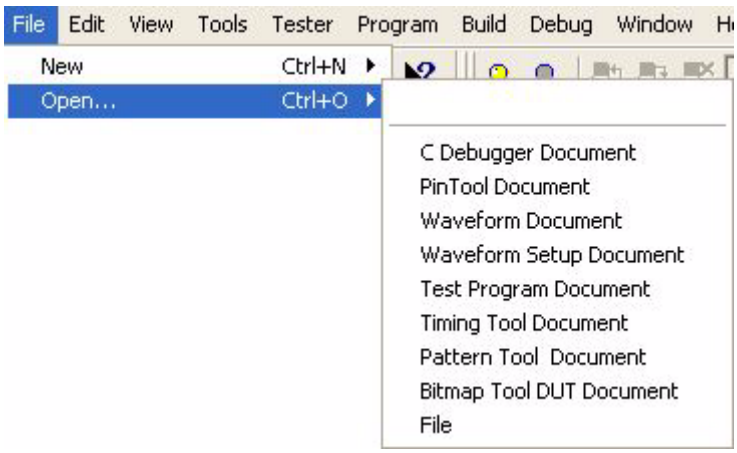


Figure 4-4. Open Command Submenu

The Open command submenu contains the following commands that display an Open dialog box similar to Figure 4-5:

- C Debugger Document command on page 84
- PinTool Document command on page 84
- Waveform Document command on page 85
- Waveform Setup Document command on page 85

- Test Program Document command on page 85
- Timing Tool Document command on page 85
- Pattern Tool Document command on page 85
- Bitmap Tool DUT Document command on page 85
- File command on page 85

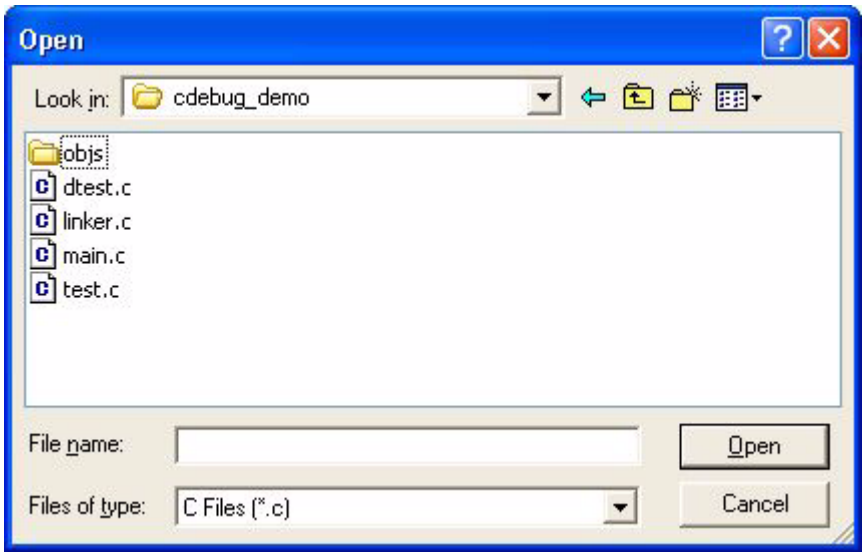


Figure 4-5. File > Open Dialog Box

C Debugger Document Command (Open Command Submenu)

Displays an Open dialog box (Figure 4-5) to select a previously saved C Debugger Tool document file with a *.COF extension. Typically the .COF for the test program is located in the P:\SRC folder.

The C Program Debugger loads a test program via loading the .COF file format compiled by the GCC (GNU C Compiler). The .COF file is the C language test program object code file that is created by the GNU compiler when you “make” your test program. It is the object code file that is downloaded to the test sites. During the loading of the test program, the debugger extracts debug information that is put into the .COF file by the compiler. Thus the debugger knows the source code files for the loaded test program.

PinTool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a previously saved PinTool document file with a *.pin file extension.

Waveform Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a previously saved Waveform document file with a *.dnc file extension.

Waveform Setup Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a previously saved Waveform Setup document file with a *.stp file extension.

Test Program Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a previously saved Test Program Tool document file with a *.tpg file extension.

Timing Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a previously saved Timing Tool document file with a *.vtt file extension.

Pattern Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a previously saved Pattern Tool document file with an *.apg2 file extension.

Bitmap Tool DUT Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a previously saved Bitmap Tool DUT definition document file with a *.dut file extension.

File Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 4-5) to select a file for display.

Close Command (File Menu)

Closes the active tool document.

Close All Command (File Menu)

Closes all tool documents.

Save Command (File Menu)

 Saves the active document file.

Save As Command (File Menu)

Displays the Save As dialog box to save the active tool document file (similar to Figure 4-6).

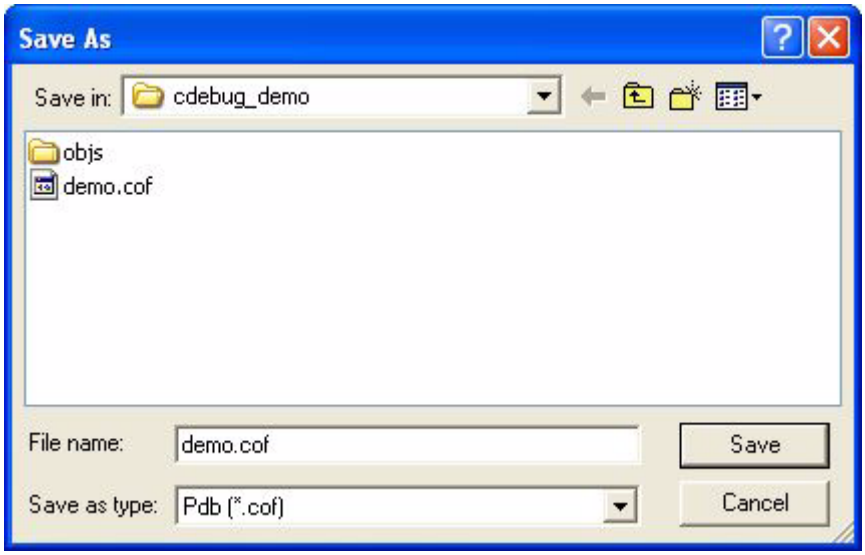


Figure 4-6. Save As Dialog Box

Open Workspace Command (File Menu)

Displays an Open Workspace dialog box with a *.wsp extension. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace and opening another. The Workspace consists of the tools, layout, and open documents.

Save Workspace Command (File Menu)

Saves the current workspace with a *.wsp extension. The Workspace consists of the tools, layout, and open documents. This command enables you to save the tools, layout, and open documents' current state, and later resume with the same Workspace by using the `File > Open Workspace` command.

Close Workspace Command (File Menu)

Closes the current workspace. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace.

Print Command (File Menu)

 Prints the source code of the function currently displaying in the Source Code Browser Pane.

Print Preview Command (File Menu)

Displays a Print Preview window that allows you to view the source code in Source Code Browser window before printing. Pressing the Esc key returns to the C Program Debugger main window.

Print Setup Command (File Menu)

Displays a printer setup dialog box that allows you to select and configure a printer.

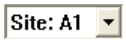
Recent Workspaces Command (File Menu)

Displays a Recent Workspaces submenu from which you can select a workspace.

Exit Command (File Menu)

Closes the IDE. If the workspace or any other tool document files have changed, you will be asked if you would like to save them.

Attach to Test Program Command (File Menu)

 If the IDE is already set online (connected to the tester), this command attaches the C Debugger to the site's .COF file specified in the toolbar's 

Site Connect Status field.

Unload Test Program Command (File Menu)

Unloads the .COF file test program information from the C Program Debugger and displays its default main window.

Data Log Command (File Menu)

Supported for Agilent internal use only.

Test Communication Command (File Menu)

Supported for Agilent internal use only.

Edit Menu

Selecting Edit in the menu bar opens the menu in Figure 4-7. Most of the commands in this menu are not currently supported by the C Debugger because after the compiled test program .COF file is loaded the source code files are not currently editable from this tool.

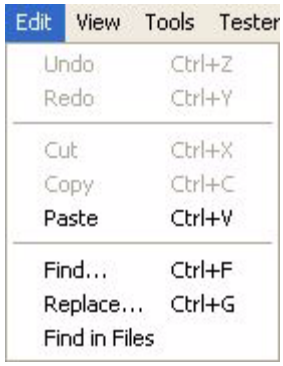


Figure 4-7. Edit Menu

The Edit menu contains the following commands:

- Undo command on page 88
- Redo command on page 88
- Cut command on page 88
- Copy command on page 89
- Paste command on page 89
- Find command on page 89
- Replace command on page 89
- Find in Files command on page 89

Undo Command (Edit Menu)

Not currently supported by the C Debugger.

Redo Command (Edit Menu)

Not currently supported by the C Debugger.

Cut Command (Edit Menu)

Not currently supported by the C Debugger.

Copy Command (Edit Menu)

 Not currently supported by the C Debugger.

Paste Command (Edit Menu)

 Not currently supported by the C Debugger.

Find Command (Edit Menu)

Displays the Find dialog box (Figure 4-8) used for text searching.

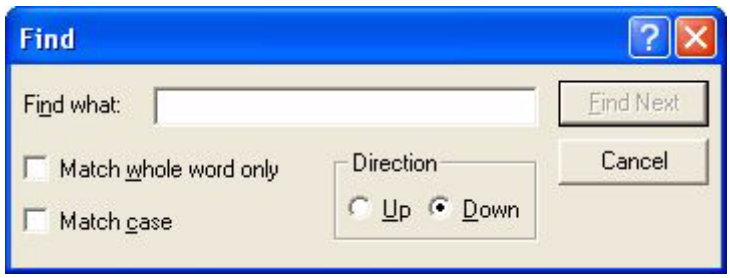


Figure 4-8. Find Dialog Box

Replace Command (Edit Menu)

Displays the Replace dialog box (Figure 4-9) that provides text replacement capability based on the criteria you specify.

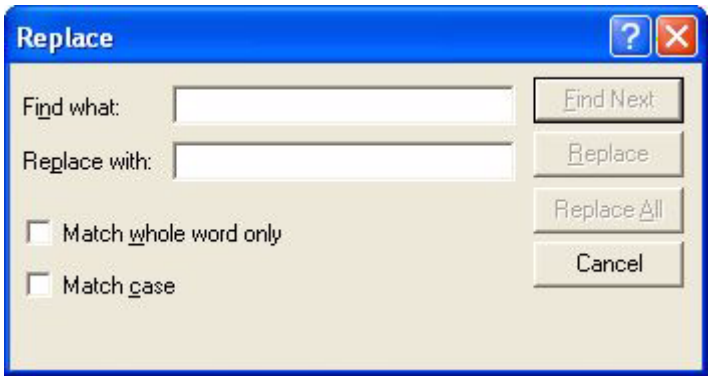


Figure 4-9. Replace Dialog Box

Find in Files Command (Edit Menu)

Displays the Find in Files dialog box (Figure 4-10) that provides search capability based on the criteria you specify.

The dialog box contains the following fields:

- `Find What` – Enter the name of symbol or text you would like to find.
- `In files/file types` – The type of files to look in (referenced by extension), or specific files that you would like to search (for example, "*.c" or ".apg", or "p:\src\myprogram\file1"). If you would like to specify multiple types of files, separate each term by a space, for example, "*.c *.apg p:\src\myprogram\file1".
- `In folder` – Enter the name of the directories you would like to search in. If you click on the button next to this field (labeled "..."), you can select a folder through a GUI file dialog interface.
- `Match whole word only` – If you check this box, only the lines containing the target as a whole (and not as part of another word) will be displayed.
- `Match case` – If you check this box, the lines containing the target will be displayed only if the cases match.
- `Regular Expressions` – If you check this box, the text in the `Find What` field will be interpreted as a regular expression,
- `Look in subfolders` – If you check this box, in addition to searching the folders specified in the `In Folder` field, the subdirectories of the folders specified in the `In Folder` field will be searched.
- `Find in Workspace` – If you check this box, only the files contained in the workspace will be searched. The "In Folder" field will be ignored.

After clicking on the Find button, the Find in Files output tab will be brought to the front in the Output Pane, the results from the search process will be displayed as they are generated. If you double-click on any of the lines, the file specified on that line will be opened, and the file window will be scrolled to the location specified by the line you double-clicked.

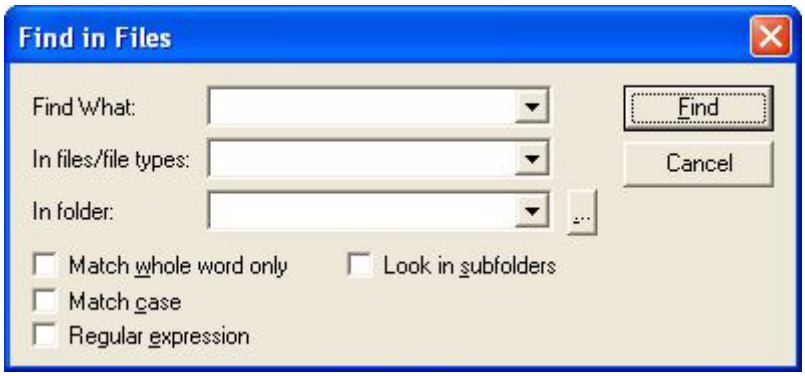


Figure 4-10. Find in Files Dialog Box

View Menu

Selecting View in the menu bar opens the menu in Figure 4-11.

Figure 4-11. View Menu

The View menu contains the following commands:

- Toolbar command on page 92
- Status Bar command on page 93
- Navigator Pane command on page 94
- Output Pane command on page 95
- Document Tabs command on page 96
- Variable command on page 96
- Watch command on page 97

- Memory command on page 97
- Stack command on page 98
- Break Point command on page 98

Toolbar Command (View Menu)

Displays or hides the toolbar shown in Figure 4-12. The toolbar displays at the top of the C Program Debugger main window when a ✓ is displayed in front of the Toolbar command. Clicking on the buttons in the toolbar give you quick access to many of the menu bar commands. The C Debugger menu bar and toolbar buttons are enabled after a test program .COF file is finished loading and it is selected as the active document window.

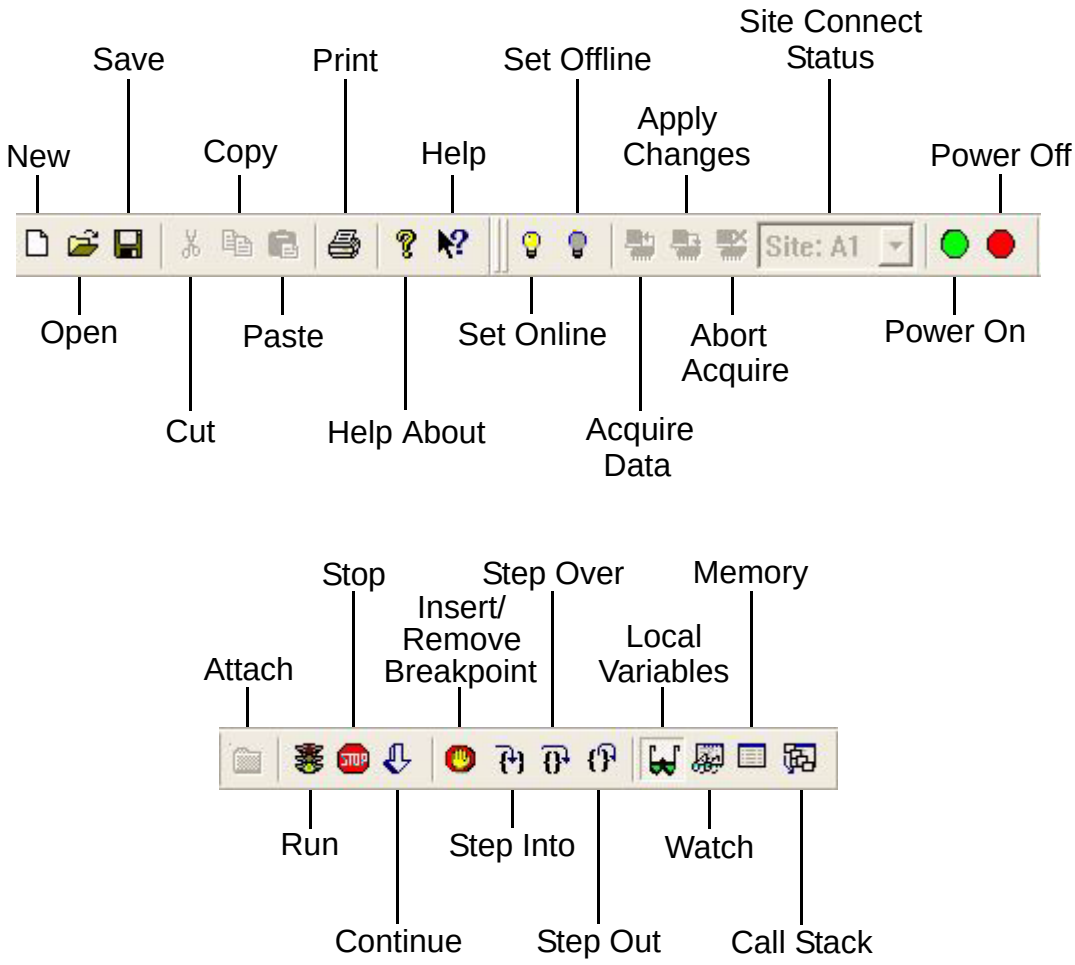


Figure 4-12. C Program Debugger Toolbar

The toolbar contains the following command buttons:

 File > New on page 81

 File > Open on page 83

 File > Save on page 85

 Edit > Cut on page 88

 Edit > Copy on page 89

 Edit > Paste on page 89

 File > Print on page 87

 Help > About V4400 Software on page 112

 Help > Help Topics on page 112

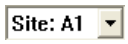
 Tester > Set Online on page 103

 Tester > Set Offline on page 103

 Tester > Acquire Data on page 103 (not supported by C Debugger)

 Tester > Apply Changes on page 103 (not supported by C Debugger)

 Tester > Abort Acquire on page 103 (not supported by C Debugger)



IDE Site Connect Status

 Tester > Power On on page 103

 Tester > Power Off on page 103

 File > Attach page 87

 Debug > Run on page 106

 Debug > Stop on page 109

 Debug > Continue on page 109

 Debug > Insert/Remove Breakpoint on page 108

 Debug > Step In on page 106

 Debug > Step Over on page 106

 Debug > Step Out on page 108

 View > Local Variables on page 96

 View > Watcher on page 97

 View > Memory on page 97

 View > Calling Stack on page 98

Status Bar Command (View Menu)

Displays or hides the Status Bar. The Status Bar displays at the bottom of the C Program Debugger main window when a ✓ is displayed in front of the Status Bar command.

The Status Bar displays which line (`Ln`) and column (`Col`) the cursor is active in the Source Code Browser Pane. It also displays the last command executed by the C Debugger such as `Run program`, `Step in`, `Step Over`, and so forth.

Navigator Pane Command (View Menu)

Displays or hides the Navigator Pane (similar to Figure 4-13 or Figure 4-1 on page 79). The Navigator Pane displays on the left side of the C Debugger main window when a ✓ displays in front of its command in the View menu.

The C Debugger is associated with the following two tabs on the Navigator Pane:

- Tools Tab  : Within the Tools Tab is a `CDebugger` icon that can be used to launch the tool. Double-clicking the icon displays the default C Debugger Document Window.
- C Debugger Tab  (`Cdeb`): The C Debugger Tab lists all the source code file names and function names for the loaded test program. Navigating to and selecting a source code file name or function displays its source code in the Source Code Browser window (similar to Figure 4-1 on page 79).

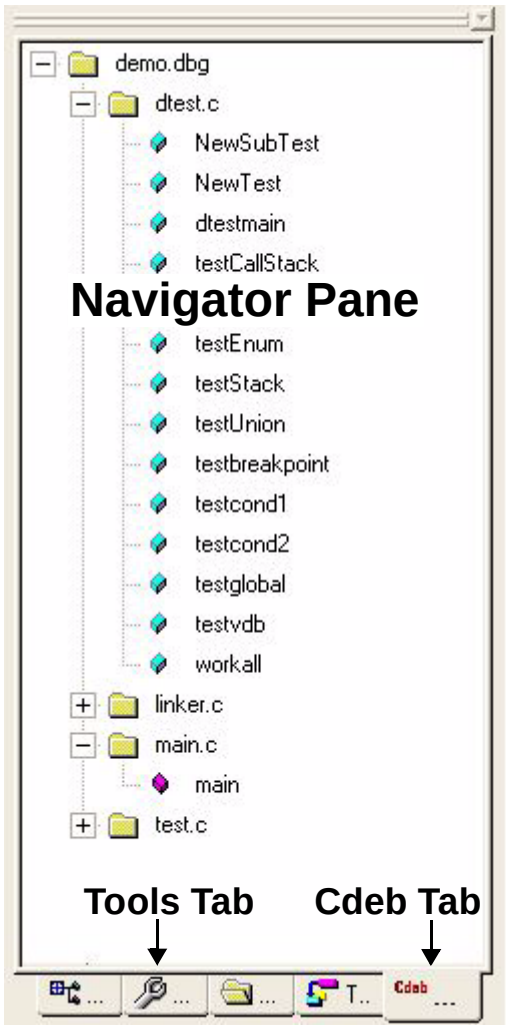


Figure 4-13. Navigator Pane C Debugger (Cdeb) Tab

Output Pane Command (View Menu)

Displays the Output Pane (similar to Figure 4-1 on page 79) when a ✓ displays in front of its command in the View menu.

The C Debugger is associated with the following tabs in the Output Pane:

- `VOS Command` tab: The `VOS Command` tab is enabled when the IDE is set online by the selecting the yellow Set Online toolbar button or the corresponding `Tester > Set Online` command. The VOS Command tab allows you to enter VOS terminal commands and display the results on the tab and in the corresponding test site window in the VK Test Station main

window. See the "VOS Terminal Commands" chapter in the *Command Reference Volume 2* for the available commands.

- `Find in Files` tab: This tab displays output from a Find In Files process as it is generated from the results of the `Edit > Find In Files` command dialog box (Figure 4-10 on page 91).

Document Tabs Command (View Menu)

Displays the Document Tabs at the bottom of the Tool Document Window (similar to Figure 4-1 on page 79) when a ✓ displays in front of its command in the View menu.

Variable Command (View Menu)

 Displays or hides the Local Variables Pane in the C Debugger main window (similar to Figure 4-14 or Figure 4-1 on page 79). The Local Variables Pane displays when a ✓ is displayed in front of the its command in the View menu.

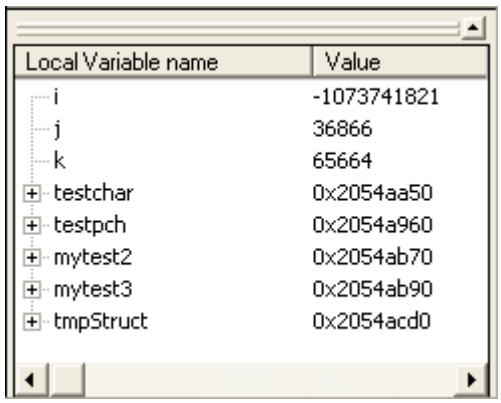


Figure 4-14. Local Variables Pane

An important feature the debugger provides is the capability to monitor the values of local variables. The C Program Debugger has various features that provide this capability.

When you step into a function, the values of local variables need to be checked frequently. The debugger provides a Local Variables Pane that lists all the local variables. It automatically queries for the values of those variables and then displays them every time you single step or hit a breakpoint.

If the variable is an array, structure, or other type of variable that contains sub-items, you can click the expand ⊞ button on the left side of the variable's name to expand the variable.

Watch Command (View Menu)

 Displays or hides the General Variables Watcher Pane in the C Debugger main window (similar to Figure 4-15 or Figure 4-1 on page 79). The General Variables Watcher Pane displays when a ✓ is displayed in front of its command in the View menu.

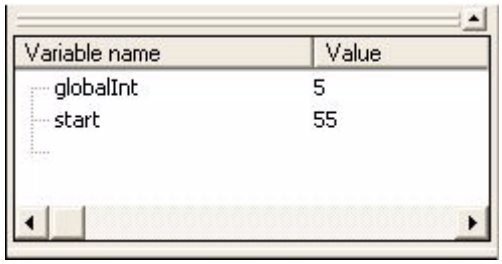


Figure 4-15. General Variables Watcher Pane

Besides viewing local variables, you also need to monitor the values of global variables and modify the values of local and global variables. For this the debugger provides a general variables watcher. You can type in the name of a variable in the `Variable name` pane or highlight the variable in the browser window using the mouse and drag it to the pane, and the value of that variable displays on the right side of the pane. The debugger automatically queries the target for the values of those variables and then displays them every time you single step or hit a breakpoint. You can modify the values of the variables by clicking a variable value and typing in a new value.

Memory Command (View Menu)

 Displays or hides the Memory Pane in the C Debugger main window (similar to Figure 4-16 or Figure 4-1 on page 79). The Memory Pane displays when a ✓ is displayed in front of its command in the View menu.

The Memory Pane allows you to browse through the target memory controlled by the CPU on the Test Site Controller. You can enter a specific `Address` to browse and then the debugger queries the target to display its contents.

You can press the Page Up/Page Down keys, the ↑/↓ arrow keys, the scroll bar, or enter a new memory address to see the contents of a different memory area.

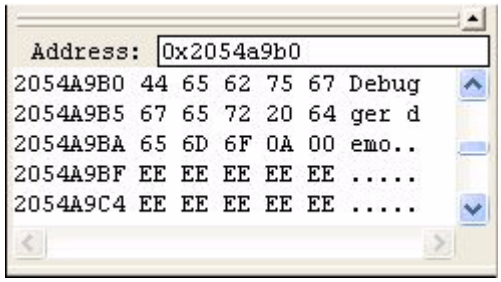


Figure 4-16. Memory Pane

Stack Command (View Menu)

 Displays or hides the Stack Pane in the C Debugger main window (similar to Figure 4-17 or Figure 4-1 on page 79). The Stack Pane displays when a ✓ is displayed in front of its command in the View. It displays the current calling stack with the current function, the parent function, and the passed parameters.

When you step into a function, it is useful to know the parent function and the parameters passed into the function. The Stack Watcher pane provides the capability for you to watch the parent functions of the current function and the parameters passed to it.

Figure 4-17. Stack Pane

Break Point Command (View Menu)

Displays the BreakPoint dialog box (similar to Figure 4-18). It displays the memory address location of each break point, the source code path and file name, and the source code line number of the break point. You can use this dialog box to remove break points. See the `Debug > Insert/Remove Breakpoint` command on page 108 for information about setting break points.

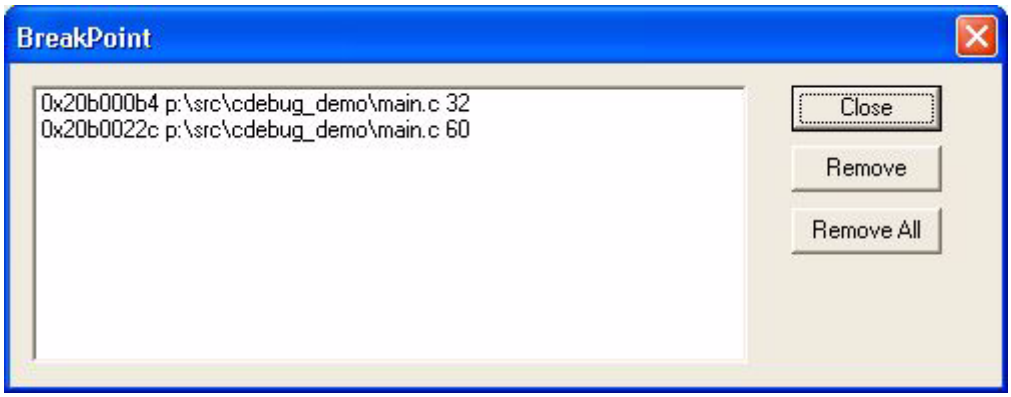


Figure 4-18. BreakPoint Dialog Box

Tools Menu

Selecting Tools in the menu bar opens the menu in Figure 4-19. The commands in the Tools menu are only for Agilent-internal use for the Waveform Tool.

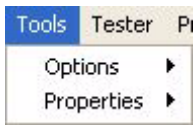


Figure 4-19. Tools Menu

The Tools menu contains the following commands:

- Options command on page 99
- Properties command on page 101

Options Command (Tools Menu)

Displays the Options submenu shown in Figure 4-20.

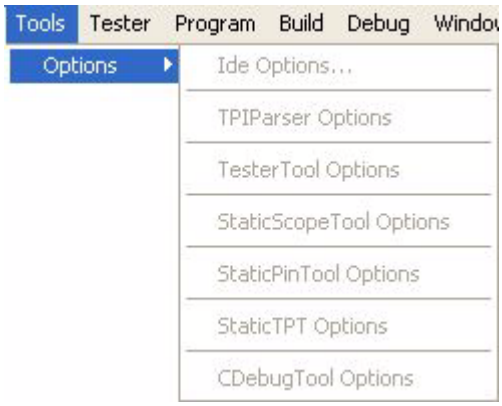


Figure 4-20. Options Submenu

The Options command submenu contains the following commands that are not currently supported by the IDE:

- Ide Options command on page 100
- TPIParser Options command on page 100
- TesterTool Options command on page 100
- StaticScopeTool Options command on page 100
- StaticPinTool Options command on page 100
- StaticTPT Options command on page 101
- CDebugTool Options command on page 101

Ide Options Command (Options Command Submenu)

Not currently supported by the IDE.

TPIParser Options Command (Options Command Submenu)

Not currently supported by the IDE.

TesterTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticPinTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticTPT Options Command (Options Command Submenu)

Not currently supported by the IDE.

CDebugTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

Properties Command (Tools Menu)

Displays the Properties submenu shown in Figure 4-21.

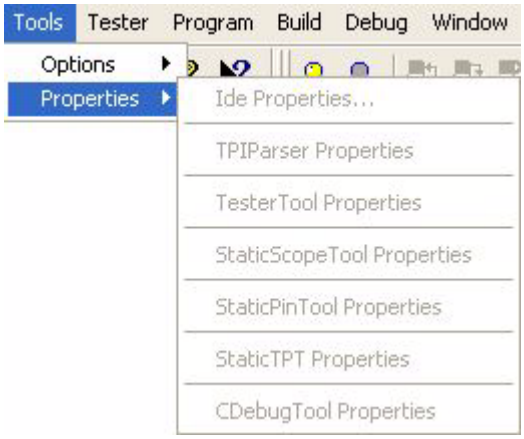


Figure 4-21. Properties Submenu

The Properties command submenu contains the following commands that are not currently supported by the IDE:

- Ide Properties command on page 101
- TPIParser Properties command on page 101
- TesterTool Properties command on page 102
- StaticScopeTool Properties command on page 102
- StaticPinTool Properties command on page 102
- StaticTPT Properties command on page 102
- CDebugTool Properties command on page 102

Ide Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TPIParser Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TesterTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticPinTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticTPT Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

CDebugTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

Tester Menu

Selecting Tester in the menu bar opens the menu in Figure 4-22.

Figure 4-22. Tester Menu

The Tester menu contains the following commands:

- Set Online command on page 103
- Set Offline command on page 103
- Acquire Data command on page 103
- Apply Changes command on page 103
- Abort Acquire command on page 103
- Tester Power On command on page 103
- Tester Power Off command on page 103

Set Online Command (Tester Menu)

 Connects the IDE to the tester for the following tools that support online mode:

- C Program Debugger (currently has no offline capability)
- Pattern Tool (currently has no offline capability)
- Waveform Tool
- Timing Tool

Set Offline Command (Tester Menu)

 Disconnects the IDE from the tester. The following tools support offline mode:

- Pin Tool (currently has no online capability)
- Waveform Tool (viewing saved files only)
- Timing Tool (viewing saved files only)
- Bitmap Tool (currently has no online capability)

Acquire Data Command (Tester Menu)

 Not currently supported by the C Debugger. The Timing Tool supports this command.

Apply Changes Command (Tester Menu)

 Not currently supported by the C Debugger. The Timing Tool supports this command.

Abort Acquire Command (Tester Menu)

 Not currently supported by the C Debugger. The Timing Tool supports this command.

Tester Power On Command (Tester Menu)

 Same as the VK Test Station main window `Utilities > Power On` command and its corresponding  toolbar button. Resets and powers up the test sites (Test Head).

Tester Power Off Command (Tester Menu)

 Same as the VK Test Station main window `Utilities > Power Off` command and its corresponding  toolbar button. Turns off power to the test sites (Test Head).

Program Menu

Selecting Program in the menu bar opens the menu in Figure 4-23. The Program menu is not currently supported by the IDE.

Figure 4-23. Program Menu

The Program menu contains the following commands that are supported by the Test Program Tool:

- Set Active Test Program command on page 104
- Add Files to Test Program command on page 104
- Remove from Test Program command on page 104

Set Active Test Program Command (Program Menu)

Not currently supported by the IDE.

Add Files to Test Program Command (Program Menu)

Not currently supported by the IDE.

Remove from Test Program Command (Program Menu)

Not currently supported by the IDE.

Build Menu

Selecting Build in the menu bar opens the menu in Figure 4-24. The Build menu is not currently supported by the IDE.

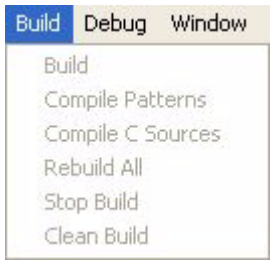


Figure 4-24. Build Menu

The Build menu contains the following commands:

- Build command on page 105
- Compile command on page 105
- Compile Patterns command on page 105
- Compile C Sources command on page 105
- Rebuild All command on page 105
- Stop Build command on page 105
- Clean Build command on page 105

Build Command (Build Menu)

Not currently supported by the IDE.

Compile Command (Build Menu)

Not currently supported by the IDE.

Compile Patterns Command (Build Menu)

Not currently supported by the IDE.

Compile C Sources Command (Build Menu)

Not currently supported by the IDE.

Rebuild All Command (Build Menu)

Not currently supported by the IDE.

Stop Build Command (Build Menu)

Not currently supported by the IDE.

Clean Build Command (Build Menu)

Not currently supported by the IDE.

Debug Menu

Selecting Debug in the menu bar opens the menu in Figure 4-25.

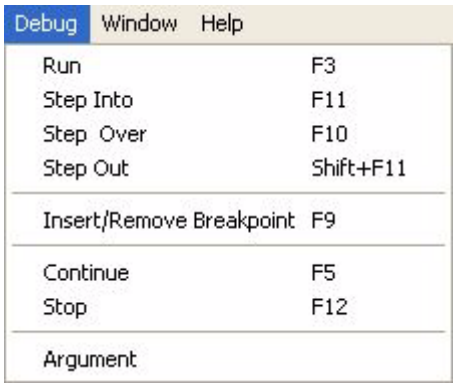


Figure 4-25. Debug Menu

The Debug menu contains the following commands:

- Run command on page 106
- Step Into command on page 106
- Step Over command on page 106
- Step Out command on page 108
- Insert/Remove Breakpoint command on page 108
- Continue command on page 109
- Stop command on page 109
- Argument command on page 110

Run Command (Debug Menu)

Runs the test program to completion or to the first break point. See the `Debug > Insert/Remove Breakpoint` command on page 108 for information about setting break points. This command is also executed by selecting the F3 key.

Step Into Command (Debug Menu)

Steps into a subroutine. This command is also executed by selecting the F11 key.

Step Over Command (Debug Menu)

Steps to the next C level instruction in the same routine. This command is also executed by selecting the F10 key.When you single step to a break point, the program stops with the green test flow arrow pointing in that line (similar to Figure 4-26).

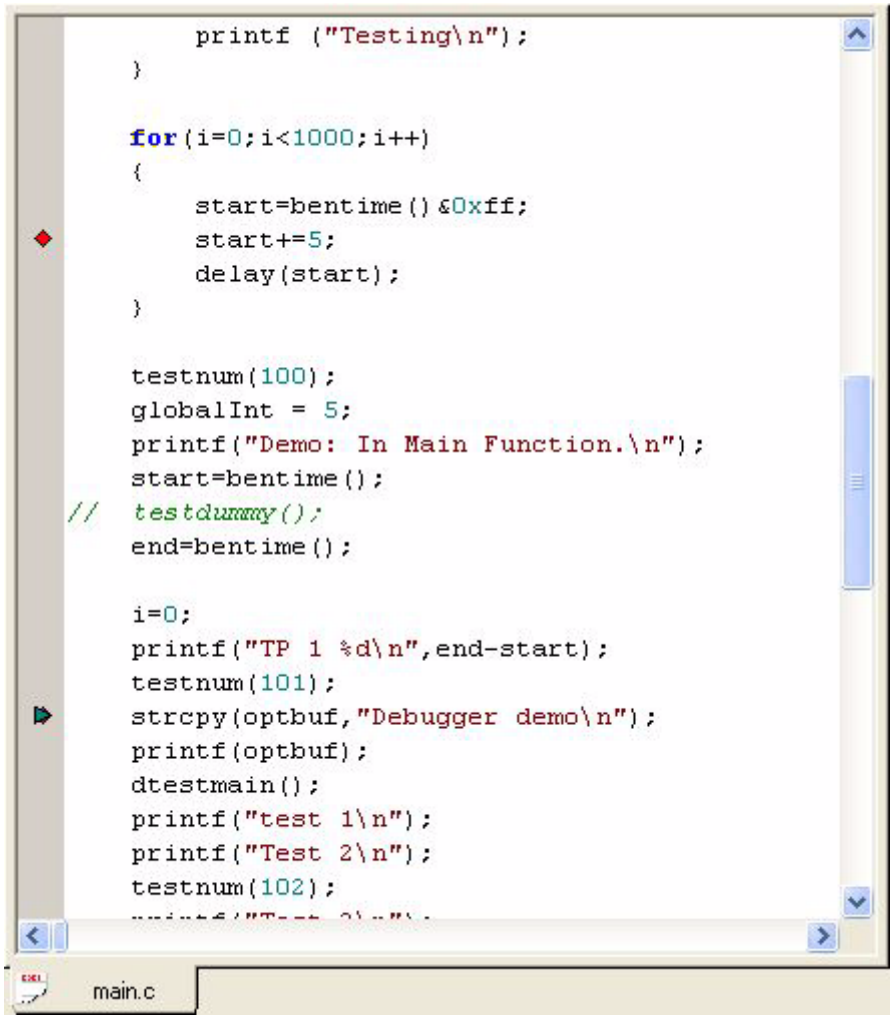


Figure 4-26. Test Flow Stopped at Function with Break Point

Single stepping into a function causes the debugger to jump to and display the source code of the function in the Source Code Browser Pane, and the green test flow arrow stops at the next C level instruction.

Single stepping is not allowed to Versatest Series C language commands. The C Debugger steps over all Versatest Series C language commands. See the “General Command Set” table in chapter 1 of the *Versatest Series Command Reference Volume 1* for a listing of the C language commands with brief descriptions or chapter 2, “C Language Commands,” for detailed descriptions.

Step Out Command (Debug Menu)

 Goes back to the parent routine that called the current routine. This command is also executed by selecting the Shift + F11 keys.

Insert/Remove Breakpoint Command (Debug Menu)

 Inserts a break point in the Source Code Browser Pane in the line of code where the mouse pointer cursor is placed (similar to Figure 4-27). When you set a break point, a red diamond tag displays in the gray boarder area on the left side of the Browser window. Repeating the process in other lines of code sets additional break points. This command is also executed by selecting the F9 key. Reselecting the command in a line of code with a break point, removes it. See the `View > BreakPoint` command on page 98 that lists all of the break points with memory address locations, source code file names and line numbers, and how to remove individual or multiple break points.

Setting break points is a common technique used to debug programs. Setting a break point at a certain location in the program forces the program to be suspended exactly at that location.

The break point can only be set on a source line. Therefore, for the following segment of source code, you would be able to set a break point on line 5 but not line 3.

```
Line1: int test(void)
Line2: {
Line3:           int I;
Line4:
Line5:           I=5
Line6:}
```

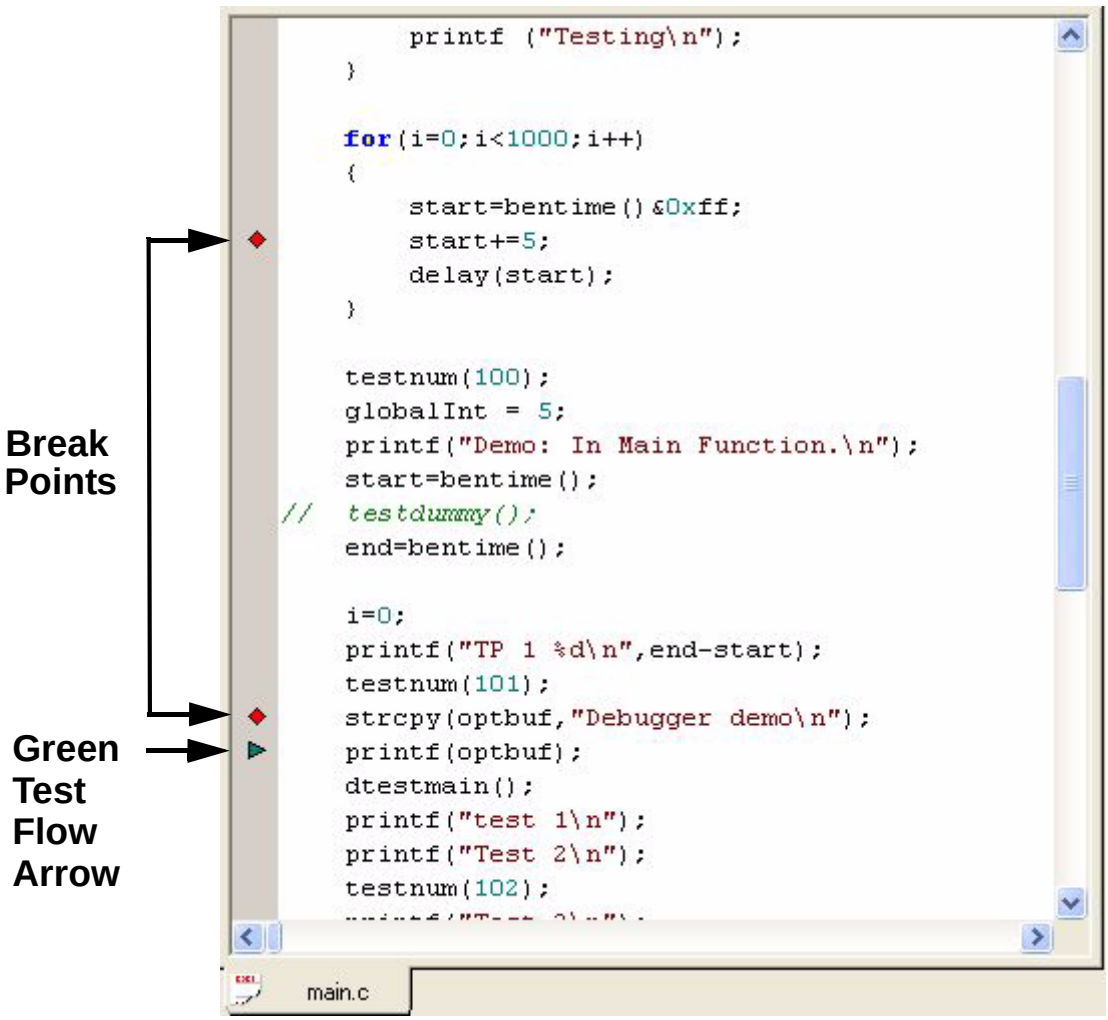


Figure 4-27. Browser Pane Displaying Break Points

Continue Command (Debug Menu)

Continues test program execution after it has been halted at a break point. This command is also executed by selecting the F5 key.

Stop Command (Debug Menu)

Stops test program execution. You must select the Debug > Run command to restart program execution from the beginning. This command is also executed by selecting the F12 key.

Argument Command (Debug Menu)

Displays the Argument dialog box (Figure 4-28). This dialog box specifies the argument that VOS passes to SHELL2A.C (V4400) or SHELL2B.C's (V5400) main function that calls different functions in your DEVICE.C program based on those arguments. The default and most commonly used argument is `test`. It causes SHELL2A.C/SHELL2B.C to call the `DoTestProgram` function when you run your test program.

Another commonly used argument that can be entered in the dialog box is `init`. The `init` argument re-initializes the system and places it in a known state.

Other arguments that can be used can be found in the shell2a.c/shell2b.c file.

Figure 4-28. Argument Dialog Box

Window Menu

Selecting Window in the menu bar opens the menu in Figure 4-29.

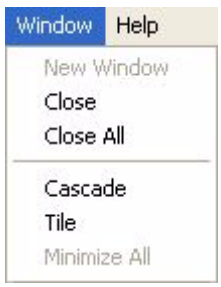


Figure 4-29. Window Menu

The Window menu contains the following commands:

- New Window command on page 111

- Close command on page 112
- Close All command on page 112
- Cascade command on page 112
- Tile command on page 112
- Minimize All command on page 112

New Window Command (Window Menu)

Displays a duplicate Source Code Browser Pane in the C Debugger main window (similar to Figure 4-30 or Figure 4-1 on page 79). The Source Code Browser window displays the source code for the file selected in the Project window.

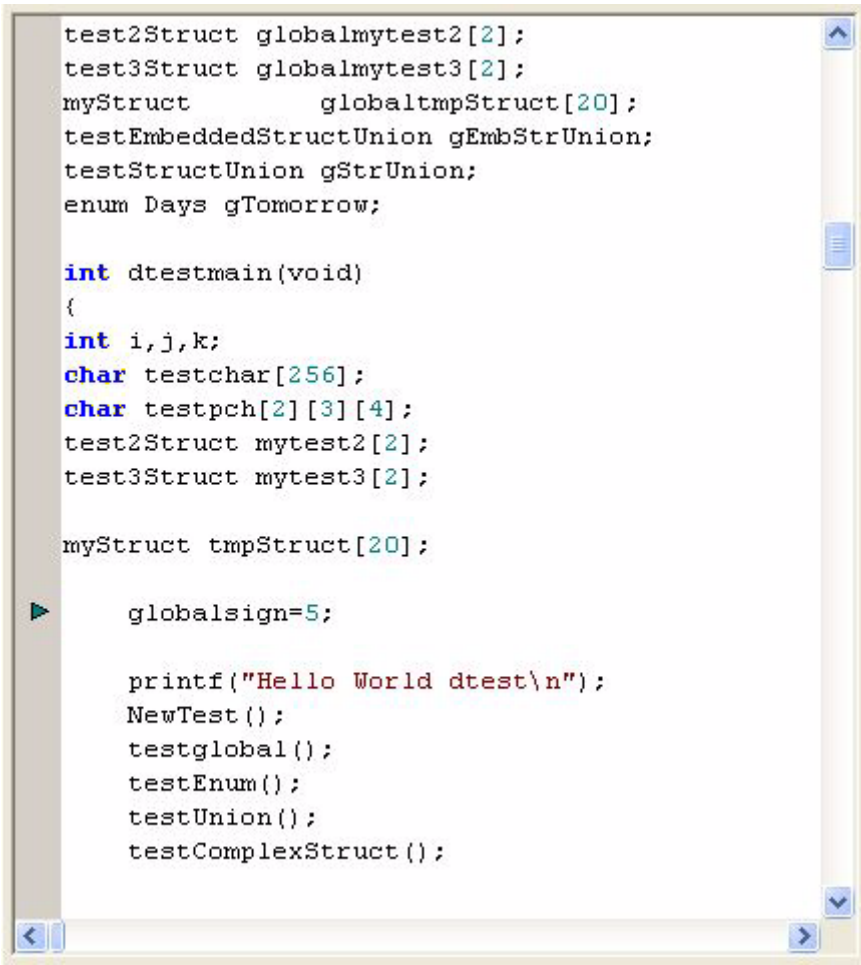


Figure 4-30. Source Code Browser Pane

Close Command (Window Menu)

Closes the active tool document window.

Close All Command (Window Menu)

Closes all tool document windows with their corresponding tabs.

Cascade Command (Window Menu)

Arranges all open tool document windows in an overlapping fashion one on top of another with the title bar of each visible.

Tile Command (Window Menu)

Tiles all open tool document windows in a non-overlapping fashion.

Minimize All Command (Window Menu)

Not currently supported by the IDE.

Help Menu

Selecting Help in the menu bar opens the menu in Figure 4-31.

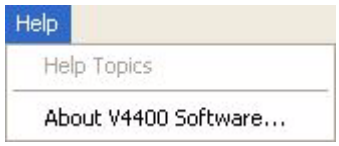


Figure 4-31. Help Menu

The Help menu contains the following command:

Help Topics Command (Help Menu)

Not currently supported.

About V4400 Software Command (Help Menu)

Displays the About V4400 Series Tester Software dialog box that contains software component version and copyright information (similar to Figure 4-32).

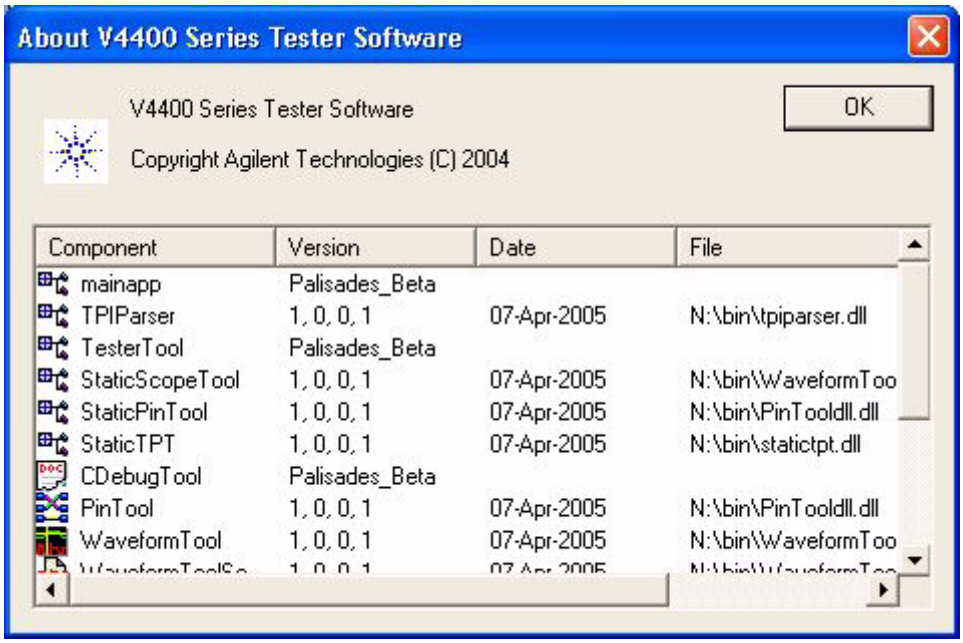


Figure 4-32. About V4400 Software Dialog Box

C Program Debugger Getting Started

This section demonstrates how to load and run a test program on the system and the C Program Debugger and use many of the debugger's features. For additional information about the C Debugger, see the "C Program Debugger Main Window" section on page 78 that provides descriptions of all the menus, menu commands, and dialog boxes that make up the tool's interface.

Getting Started Contents

This Getting Started describes how to perform the following tasks:

- "Loading the Test Program on the System" on page 114 demonstrates how to load a plan file and power on the system from the VK Test Station main window.
- "Displaying the C Program Debugger Main Window" on page 118 launches the IDE, connects the IDE to the tester, launches the C Program Debugger application, loads the test program, and navigates to browse source code.
- "Setting Break Points" on page 124 explains where break points can be set, and demonstrates how to set and remove break points.
- "Launching the Program" on page 126 sets an argument and runs the test program to a break point.
- "Single Stepping" on page 127 describes the three types of single steps, steps through the program, displays the output results in the VK Test Station main window, steps into and out of a function and displays its source code, and how to remove all or selected break points in a program.

Loading the Test Program on the System

This section describes how to load a plan file and power on the system from the VK Test Station main window.

1 Selecting  > `All Programs` > `Versatest Test System Software` > `VK Test Station` displays the VK Test Station main window (similar to Figure 4-33).

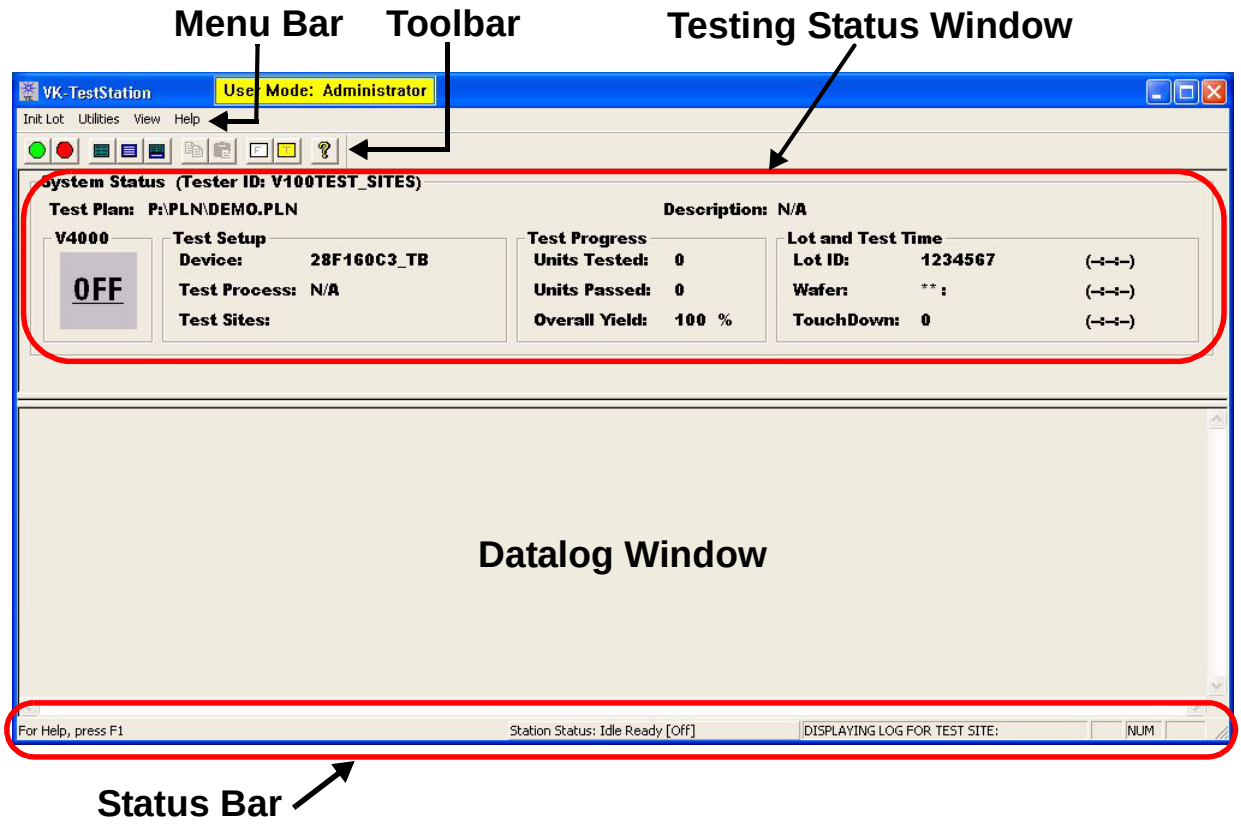


Figure 4-33. VK Test Station Main Window

2 In the menu bar, selecting `Init Lot > Enter Lot Information` command displays the Initialize Test Station Setup dialog box (similar to Figure 4-34) that is used to set up each lot for testing.

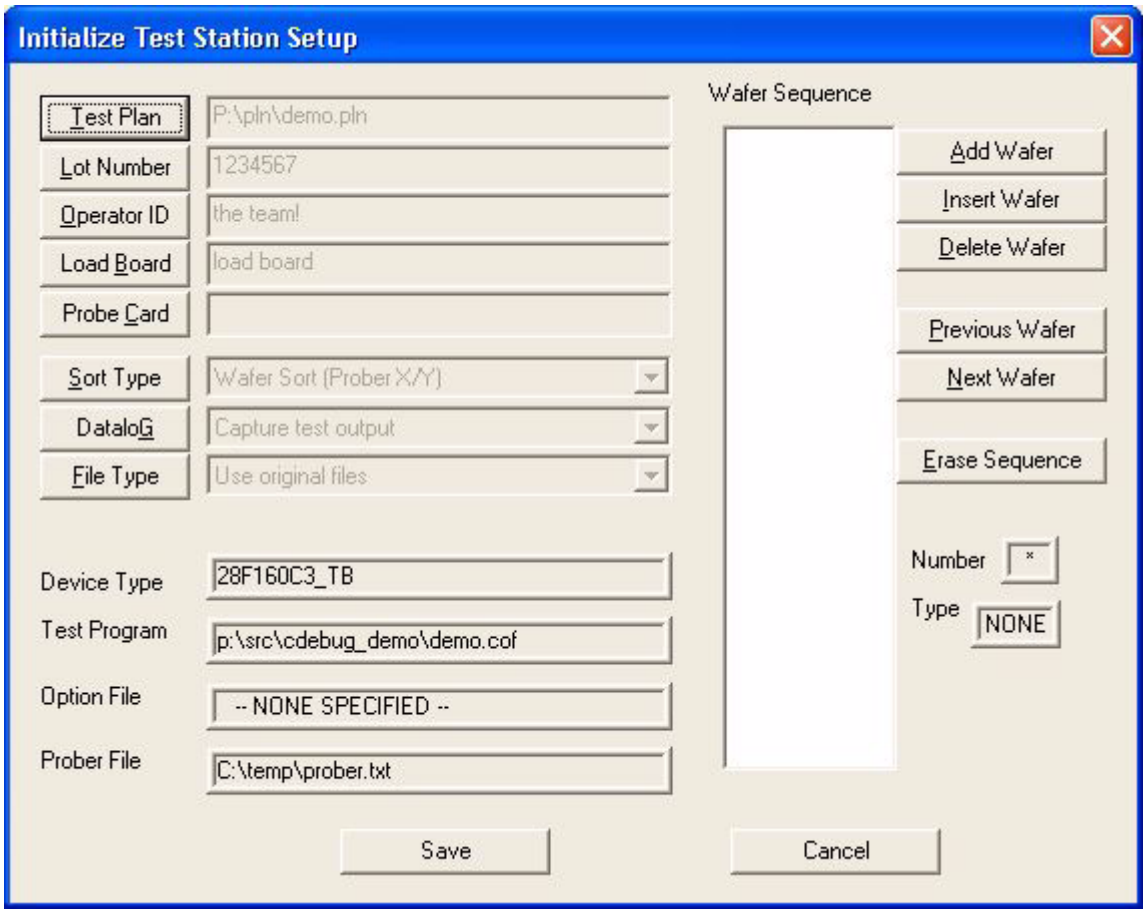


Figure 4-34. Initialize Test Station Setup Dialog Box

3 Selecting the Test Plan button displays an Open dialog box that lists the available plan files. The Test plan files define the tester setup that is used. The `demo.pln` plan file will be used for this example.

4 In the Open dialog box, the P:\PLN\demo.pln plan file is selected for this example, and then the Save button is selected to display the Initialize Test Station Setup dialog box with the selected plan file displaying in the Test Plan field (Figure 4-34).

5 Selecting the Save button in the dialog box (Figure 4-34) by default displays consecutively two Red Hand Alert dialog boxes warning about the loss of summary data, and to Z down the wafer and disconnect all DUTs prior to initialization of the test sites. The TEST_PLAN_WARNING configuration plan file switch controls whether the Alert dialog boxes display.

6 Selecting OK in the two Red Hand Alert dialog boxes displays the Test Plan Validation dialog box (Figure 4-35). The `VALIDATE 0x10` plan file test switch controls whether this dialog box displays. It displays the corresponding checksums and adds them to the summary file.

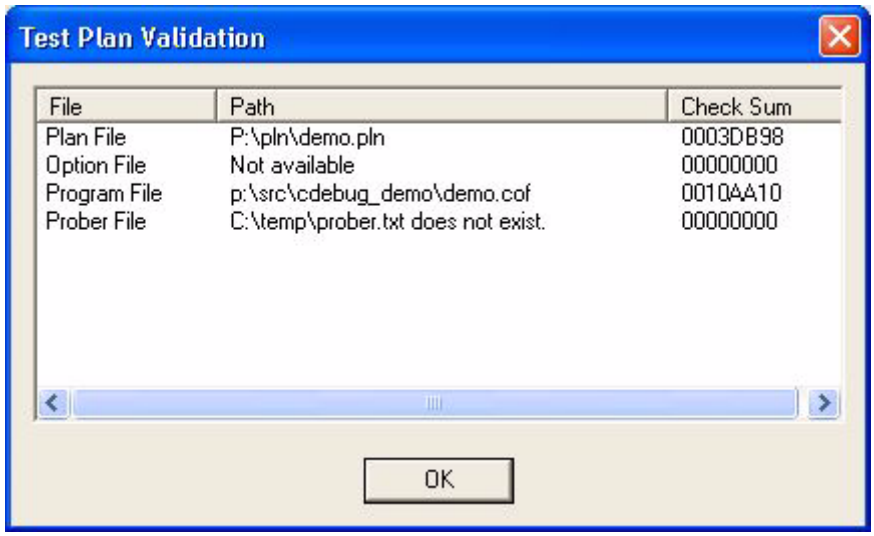


Figure 4-35. Test Plan Validation Dialog Box

7 Selecting OK begins the test head power on and downloads the Versatest Operating System (VOS) and the test program files specified in the plan file. The power on is complete when the terminal prompt `A1>` displays in the Datalog window (Figure 4-36).

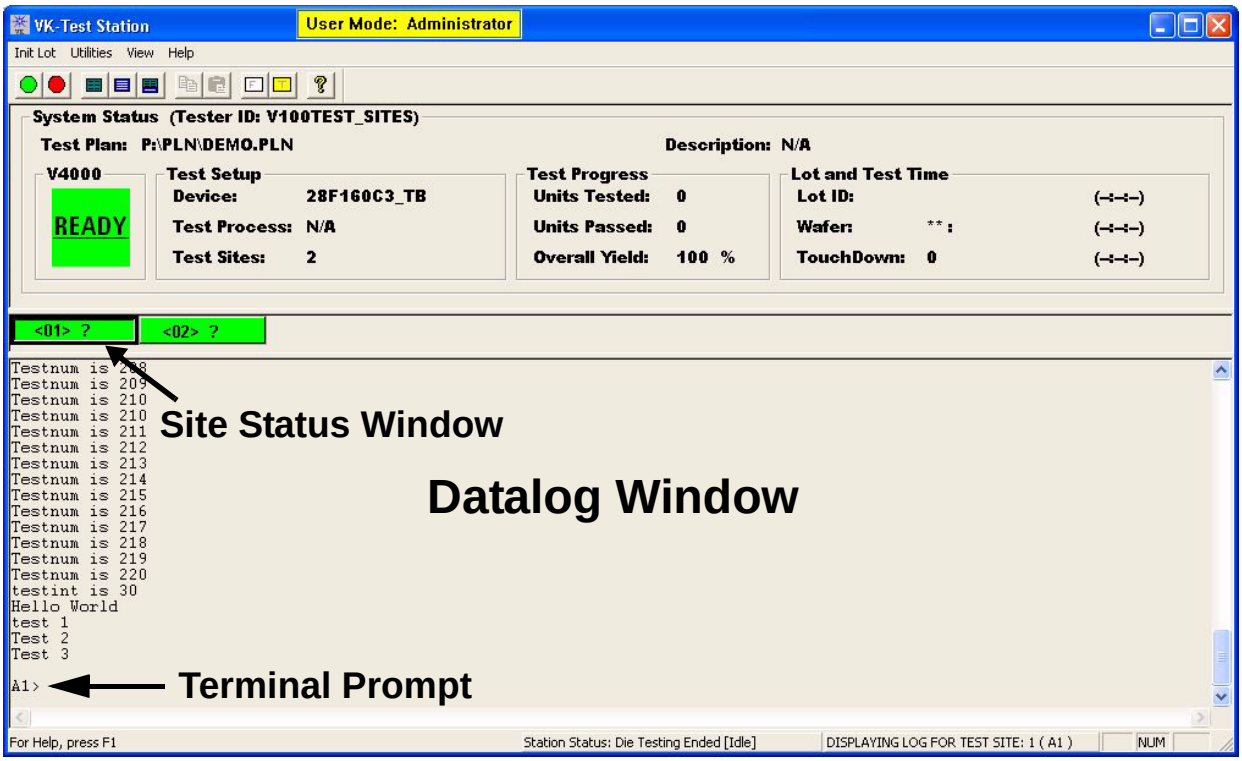


Figure 4-36. VK Test Station Main Window After Power On

Displaying the C Program Debugger Main Window

This section launches the IDE, connects the IDE to the tester, launches the C Program Debugger application, loads the test program, and navigates to browse source code. Prior to launching the IDE and the C Debugger application, the system must be powered on as described in the previous "Loading the Test Program on the System" procedure that starts on page 114.

1 Selecting start > `All Programs` > `Versatest Test System Software` > `Integrated Development Environment` displays the default V4400 Series Tester Software main window that contains the Integrated Development Environment or IDE (similar to Figure 4-37). The Menu bar and Toolbar are context sensitive and change for the selected active tool or document. The menus and Toolbar show and enable only the commands and buttons that are relevant to the tool or document you select.

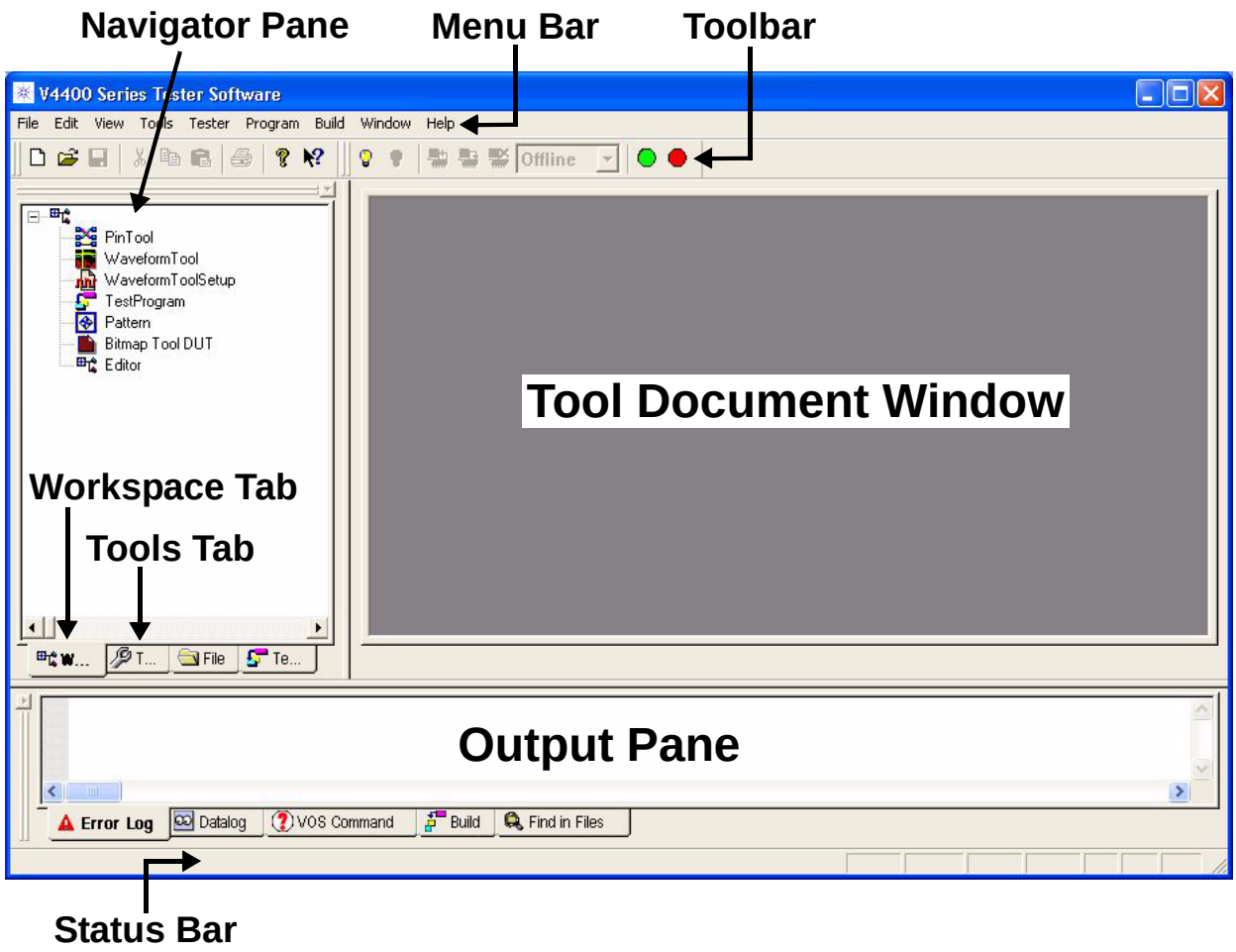


Figure 4-37. V4400 Series Tester Software IDE Main Window

2 Selecting the yellow light bulb Set Online toolbar button or corresponding `Tester` > `Set Online` command enables the IDE to connect to the tester when the Site Connect Status drop-down list box `Site: A1` Site: A1 is enabled as shown in the toolbar in Figure 4-38.

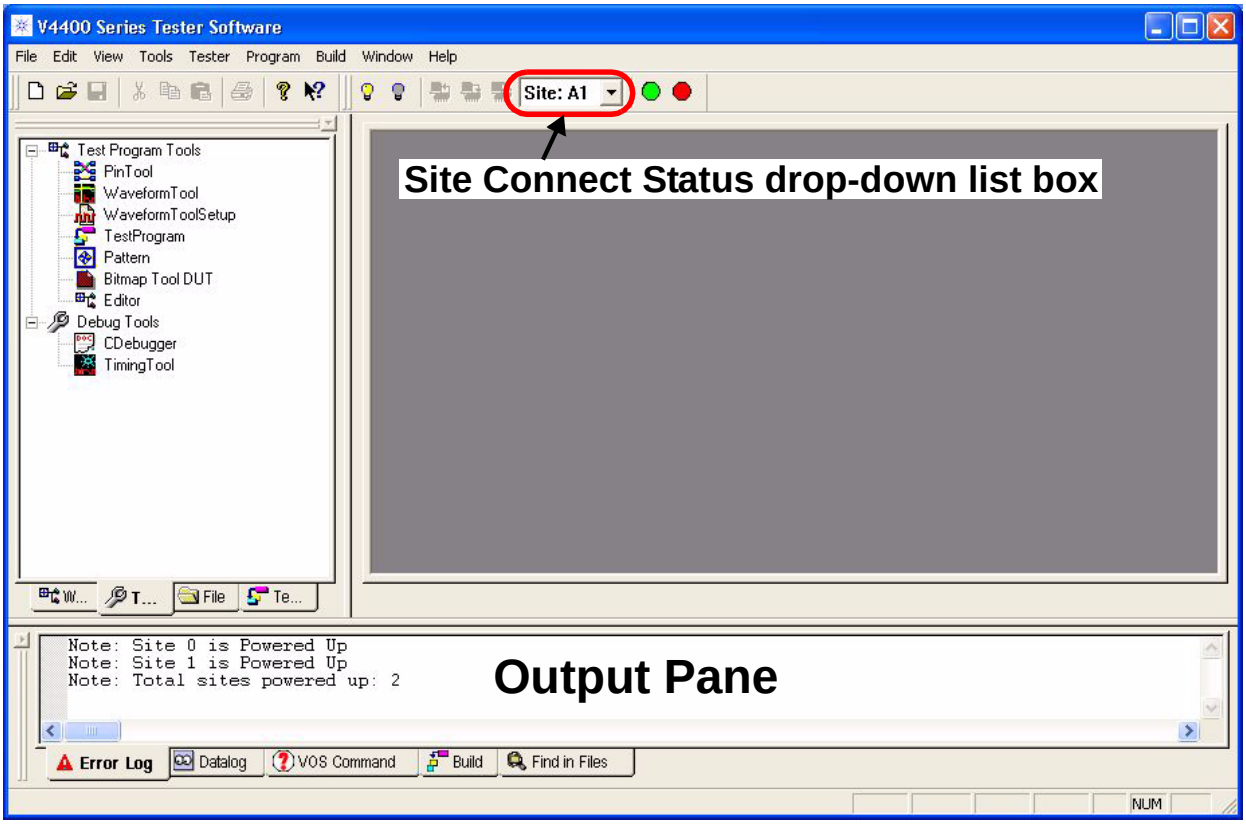


Figure 4-38. IDE Main Window Set Online

3 Choosing the site that the IDE connects to is done by selecting the down-arrow on the right side of the Site Connect Status drop-down list box to display the available sites and selecting from the list (similar to Figure 4-39). Selecting a tool makes the connection to that site and disables the Site Connect Status drop-down list box.

Figure 4-39. Site Connect Status Drop-Down List Box

4 Selecting the Tools Tab icon in the Navigator Pane displays its tab (Figure 4-40).

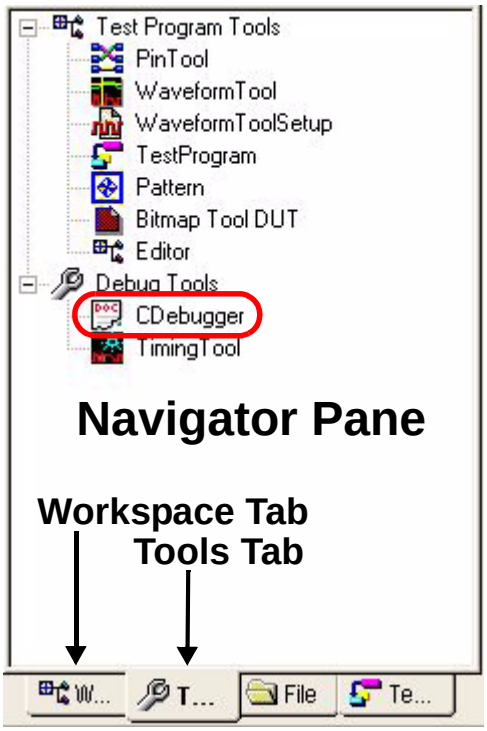


Figure 4-40. Navigator Pane Tools Tab

5 Double-clicking `CDebugger` under `Debug Tools` (Figure 4-40) displays the C Debugger as the active tool in the Tool Document pane, and connects the IDE to the previously selected test site and disables the Site Connect Status drop-down list box (Figure 4-41). This also adds the C Debugger Cdeb (Cdeb) tab to the Navigation pane, its menu bar and toolbar, and redisplays the Workspace tab in the Navigator pane.

The C Program Debugger loads a test program via loading the .COF file format compiled by the GCC (GNU C Compiler). The .COF file is the C language test program object code file that is created by the GNU compiler when you “make” your test program. It is the object code file that is downloaded to the test sites. During the loading of the test program, the debugger extracts debug information that is put into the .COF file by the compiler. Thus the debugger knows the source code files for the loaded test program.

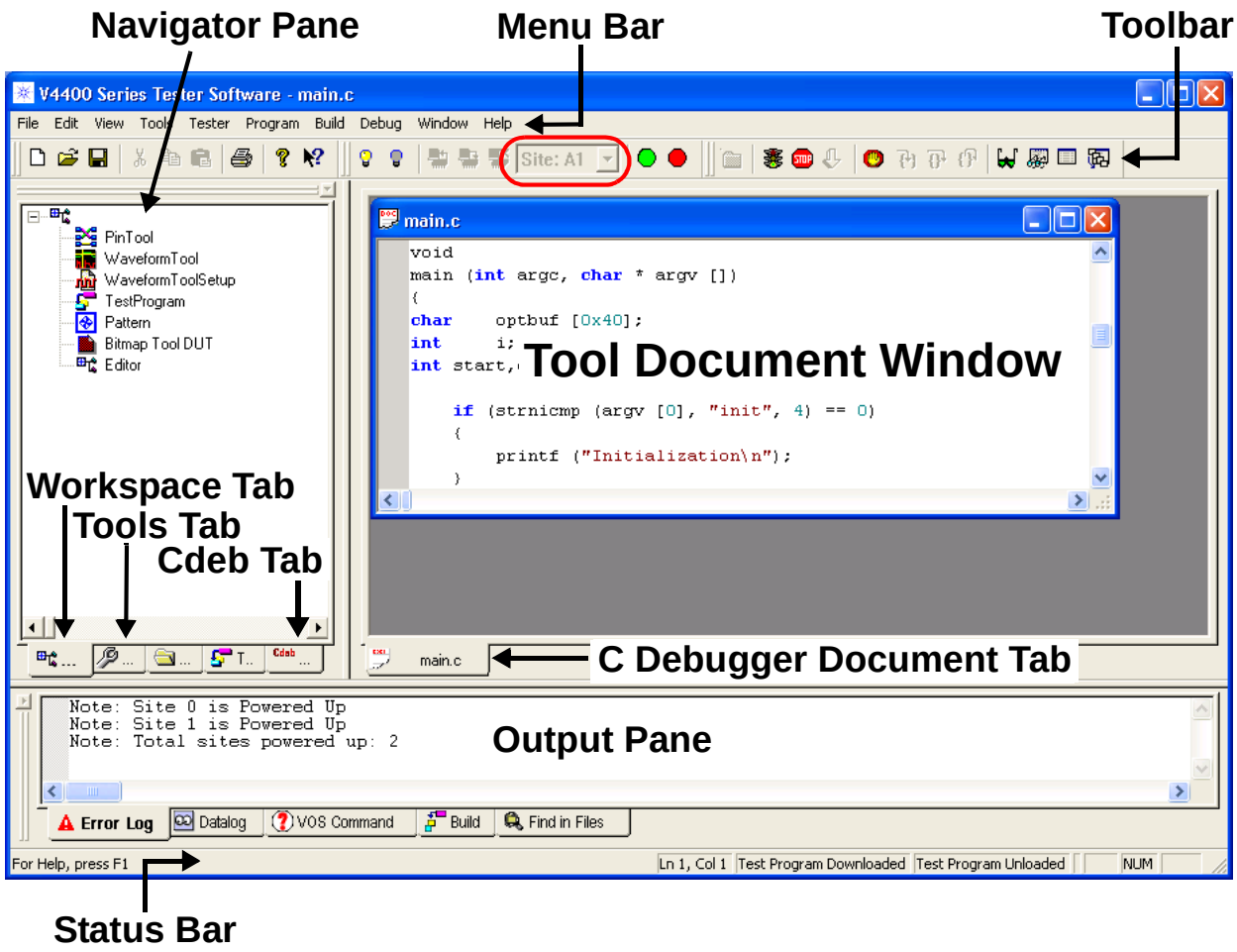


Figure 4-41. IDE Displaying C Debugger

6 Selecting the Cdeb Cdeb tab in the Navigation Pane displays its tab that lists all the source code file names and function names for the loaded test program (similar to Figure 4-42).

Figure 4-42. C Debugger Cdeb Tab

7 In the C Debugger Cdeb tab, navigating to and double-clicking the `dtest.c` > `dtestmain` function displays it in the Source Code Browser Pane. Selecting the Tool Document Window's maximize button displays it full-screen (similar to Figure 4-43).

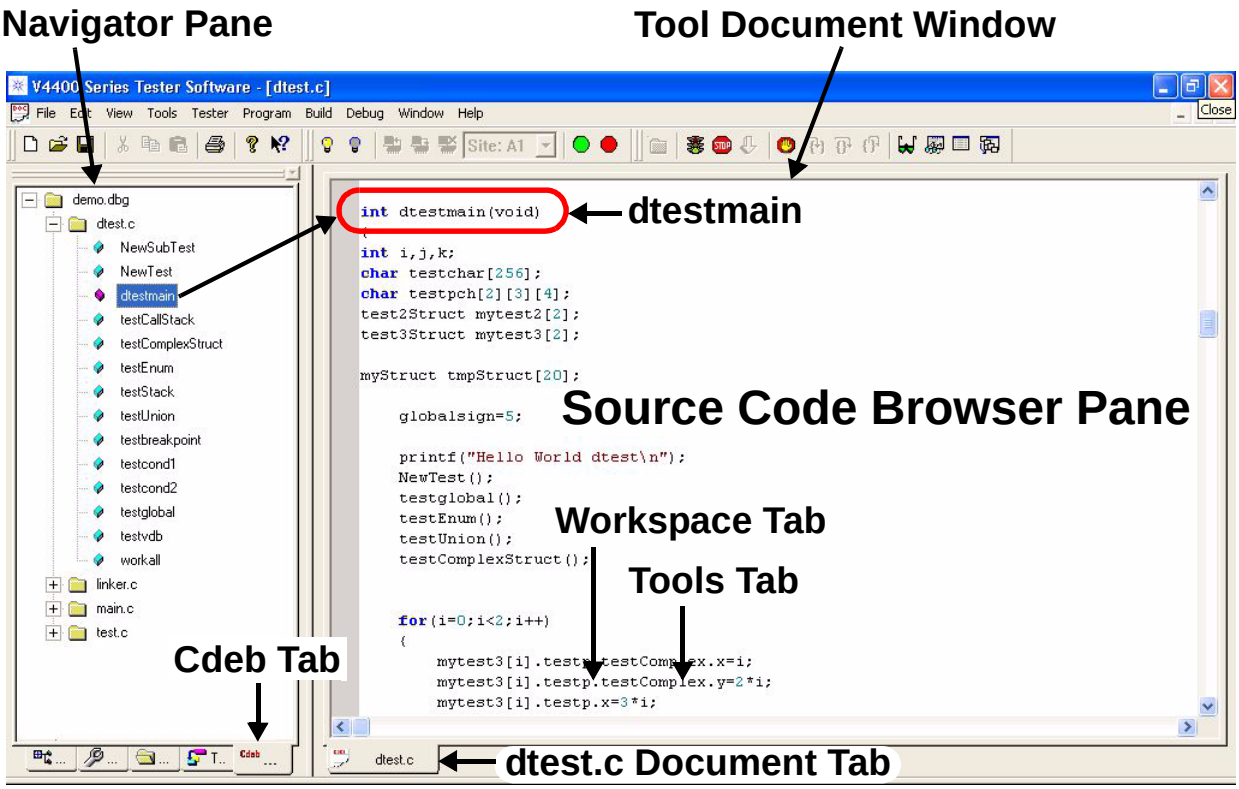


Figure 4-43. C Debugger Displaying dtest.c Document Window

Setting Break Points

Setting break points is a common technique used to debug programs. Setting a break point at a certain location in the program forces the program to be suspended exactly at that location.

To set or remove a break point, place the cursor in the line of code in the Source Code Browser Pane and select `Debug > Insert/Remove Breakpoint` command or press the F9 key. The break point can only be set on a source line. Therefore, for the following segment of source code, you would be able to set a break point on line 5 but not line 3. If you attempt to set a break point in a line of code other than a source line, nothing will happen.

```
Line1: int test(void)
Line2: {
Line3:          int I;
Line4:
Line5:          I=5
Line6:}
```

1 In the C Debugger Cdeb tab, navigating to and double-clicking the `main.c > main` function displays it in the Source Code Browser Pane (similar to Figure 4-44).

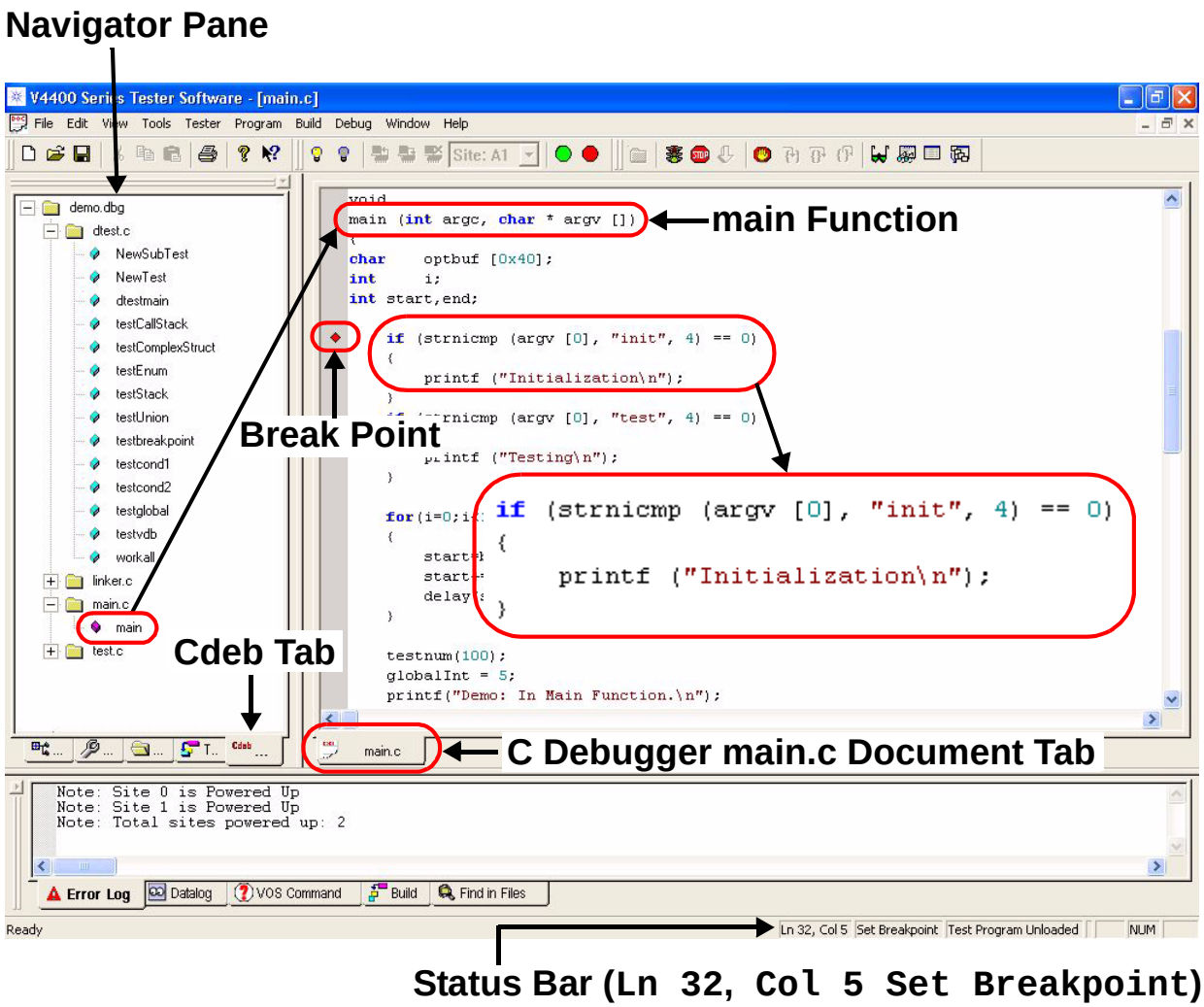


Figure 4-44. Source Code Browser Pane Displaying a Break Point

2 In the Source Code Browser Pane, placing the cursor in the source line shown in Figure 4-44 and selecting the `Debug > Insert/Remove Breakpoint` command, its toolbar button, or pressing the F9 key inserts a break point.

When you set a break point, a red diamond tag displays in the gray boarder area on the left side of the Browser window (Figure 4-44). A break point is set at the target. If you press F9 on the same line, the red diamond disappears and the break point is removed from the corresponding target. Note that the Status bar at the bottom of the window displays which line (`Ln`) and column (`Col`) the cursor is active.

Launching the Program

This section runs the test program to the break point.

1 Selecting the `Debug` > `Argument` command displays the Argument dialog box (similar to Figure 4-45). The default argument is `test`. This dialog box specifies the argument that VOS passes to SHELL2A.C (V4400) or SHELL2B.C's (V5400) main function that calls different functions in your DEVICE.C program based on those arguments. The default and most commonly used argument is `test`. It causes SHELL2A.C/SHELL2B.C to call the `DoTestProgram` function when you run your test program.

Another commonly used argument that can be entered in the dialog box is `init`. The `init` argument re-initializes the system and places it in a known state.

Figure 4-45. Argument Dialog Box

2 Typing `init` in the text box to replace the default `test` argument (Figure 4-45) and selecting OK closes the dialog box.

3 Selecting the Run  toolbar button or the `Debug` > `Run` command runs the test program to the break point (Figure 4-46). A green test flow arrow displays over the break point where the C Debugger has paused program execution.

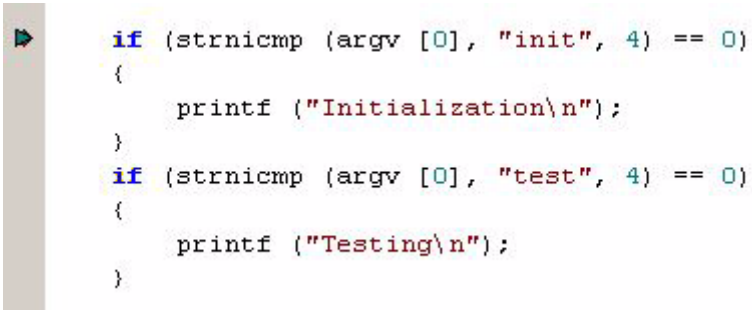


Figure 4-46. Program Runs to Break Point

Single Stepping

Single stepping is another common technique used in debugging programs. There are three types of single steps and the C Program Debugger supports all three as follows:

- Step in (`Debug > Step Into` or  toolbar button): Steps into a subroutine.
- Step through (`Debug > Step Over` or  toolbar button): Steps to the next C level instruction in the same routine.
- Step out (`Debug > Step Out` or  toolbar button): Goes back to the parent routine that called the current routine.

Single stepping is not allowed to the C language commands. The C Debugger steps over all C language commands. See the “General Command Set” table in chapter 1 of the *Versatest Series Command Reference Volume 1* for a listing of the C language commands with brief descriptions or chapter 2, “C Language Commands,” for detailed descriptions.

1 Selecting the `Debug > Step Over` command or Step Over  toolbar button steps to the next C level instruction (Figure 4-47). The green test flow arrow indicates where the program is currently

suspended. Note that since `init` was passed as the argument, the program is following the “init” branch.

Figure 4-47. Program Single Stepping

2 Selecting the `Debug` > `Step Over` command or Step Over toolbar button again steps to the next line in the program (Figure 4-48).

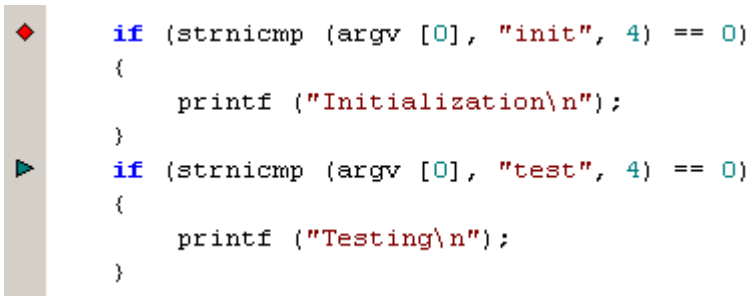


Figure 4-48. Single Stepping to the Next Line

3 The VK Test Station Main Window displays `Initialization` in the Datalog Window (Figure 4-49) after execution of the `printf (“Initialization\n”);` output function.

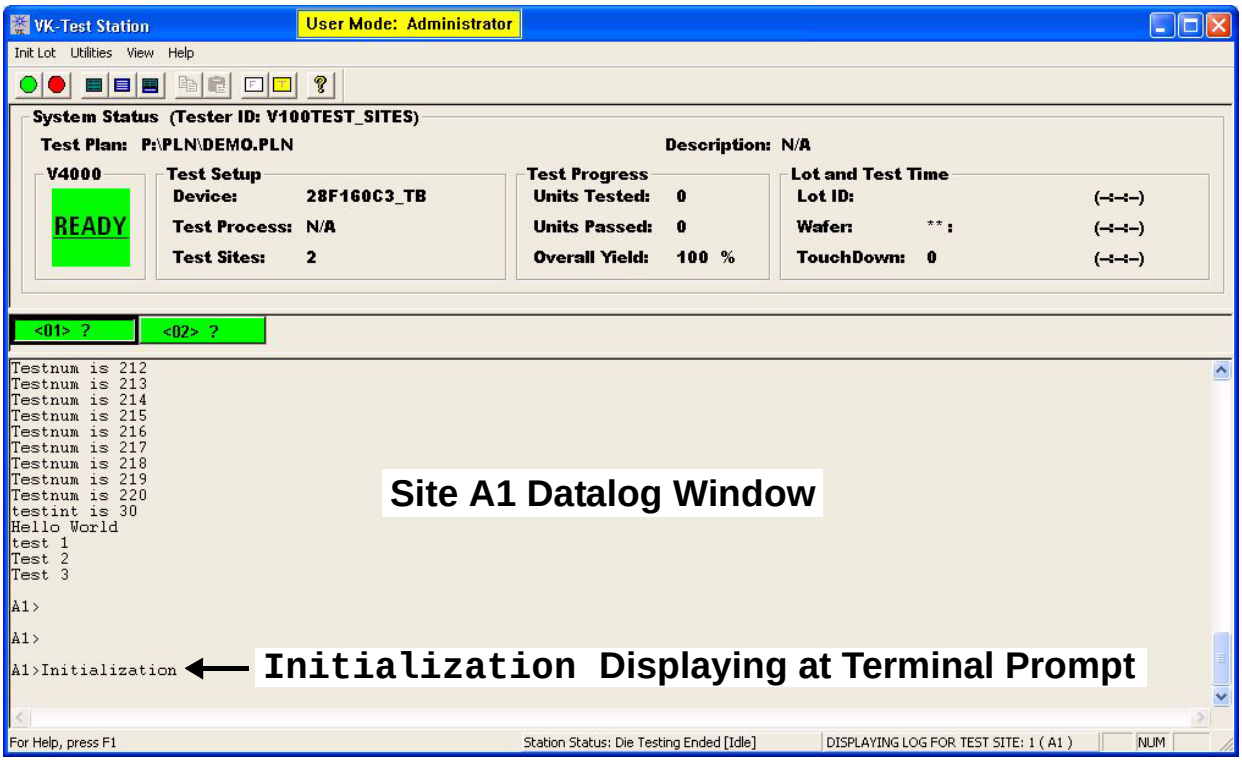


Figure 4-49. VK Test Station Main Window Displaying “init” Branch Print Output

4 Scrolling to line 60 a second break point is set and the Continue toolbar button or `Debug > Continue` command is selected to execute the program up to the second break point (Figure 4-50). This line is a function call to `dtestmain`.

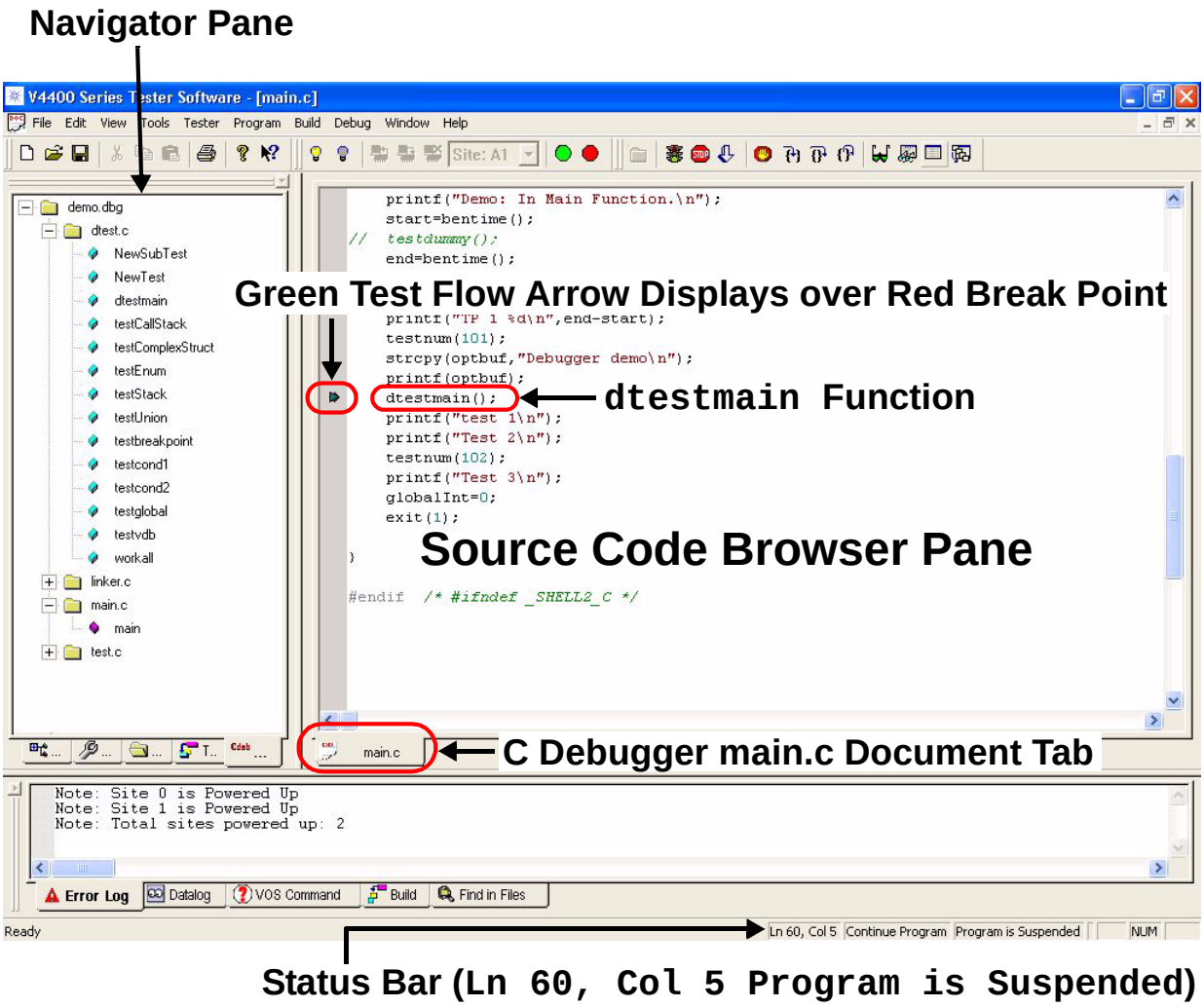


Figure 4-50. Setting and Continuing to a Second Break Point

5 Selecting the `Debug > Step In` command or Step In toolbar button steps into the `dtestmain` function and displays its source code in the Source Code Browser Pane and its `dtest.c` Document Tab (Figure 4-51).

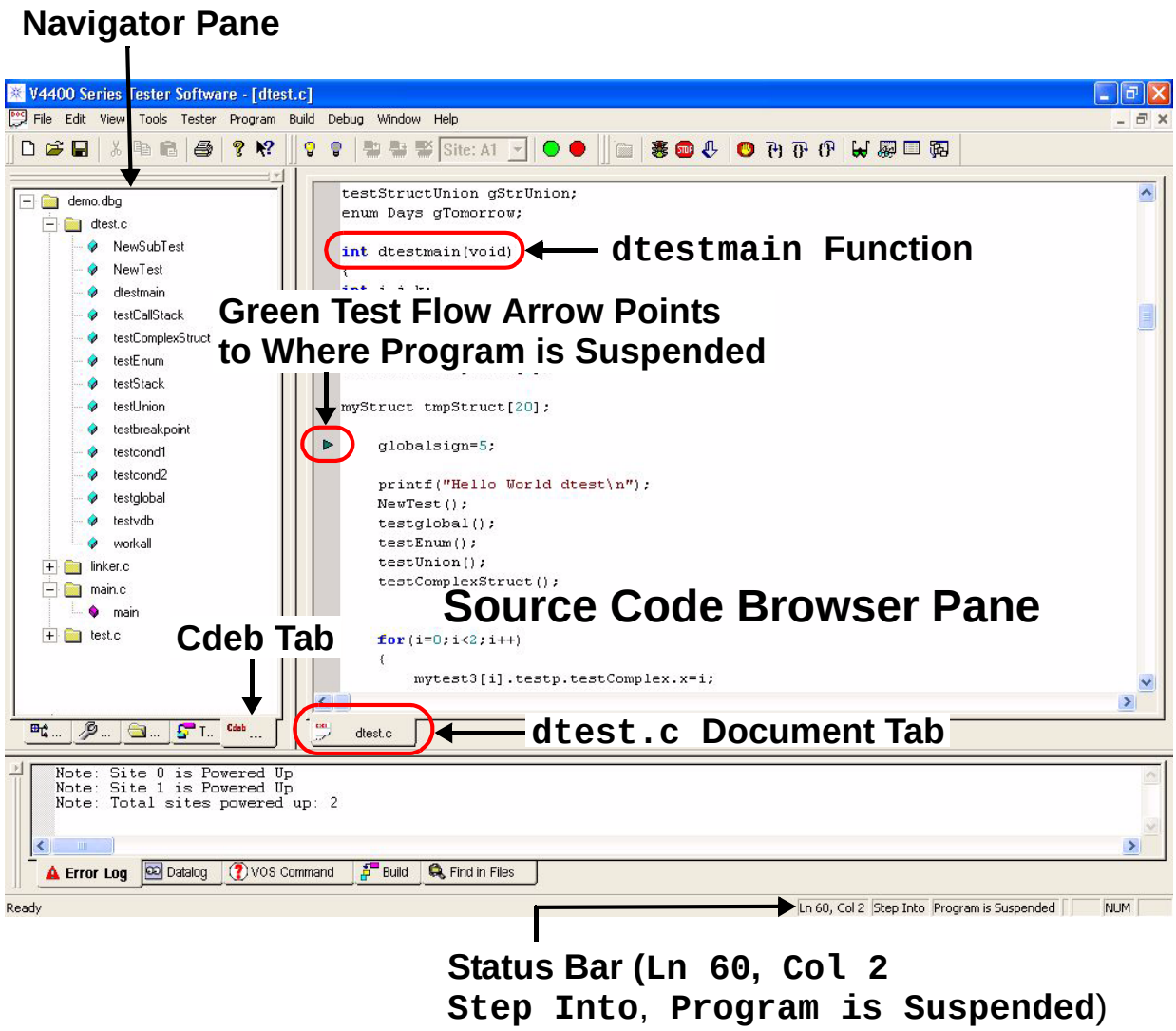


Figure 4-51. Stepping Into and Displaying `dtestmain` Function

6 Selecting the `Debug` > `Step Out` command or Step Out toolbar button returns to the calling `main` function (Figure 4-52).

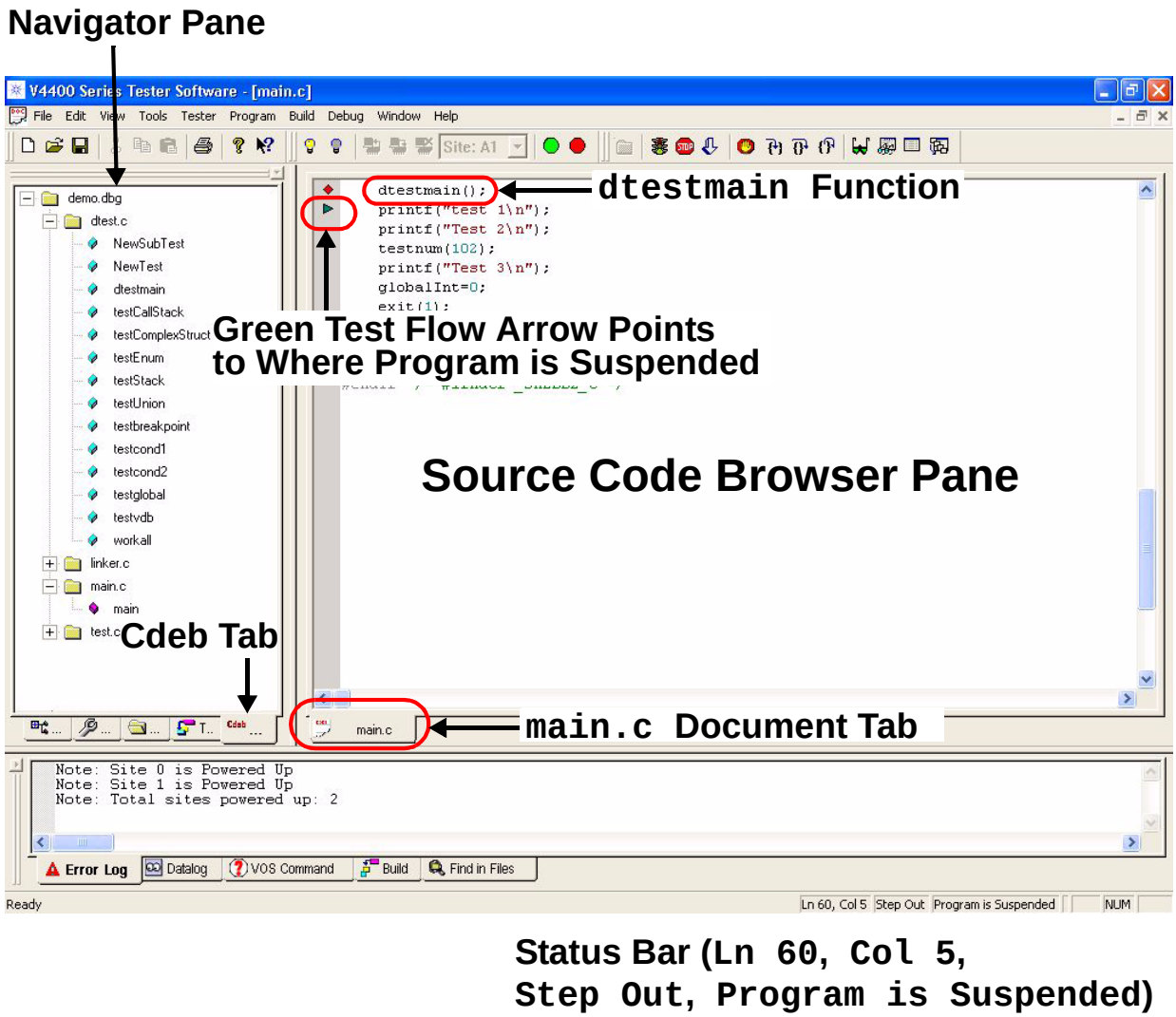


Figure 4-52. Step Out to Calling `main` Function

7 Selecting the `View > Break Point` command displays the Breakpoint dialog box that displays the memory address location of each break point, the source code path and file name, and the source code line number (Figure 4-53). This dialog box allows you to view all break points and delete any undesired ones.

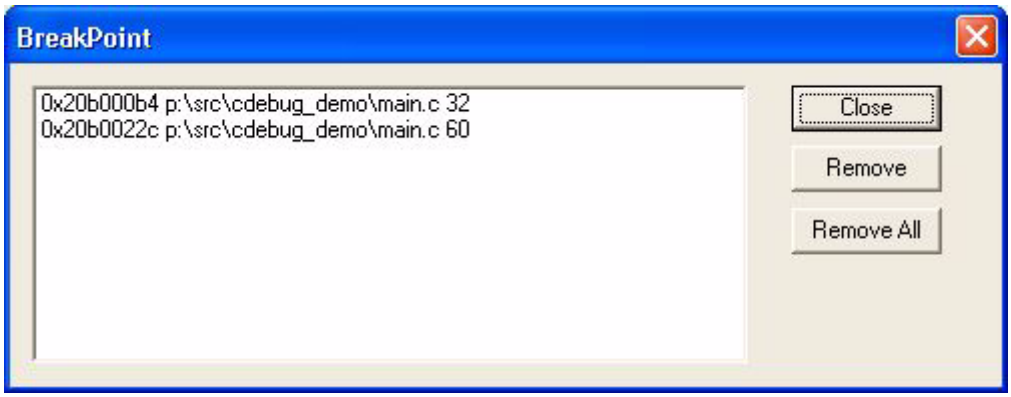


Figure 4-53. BreakPoint Dialog Box Listing Break Points

8 Selecting the Remove All button removes all the break points (Figure 4-54) and then the Close button closes the dialog box.

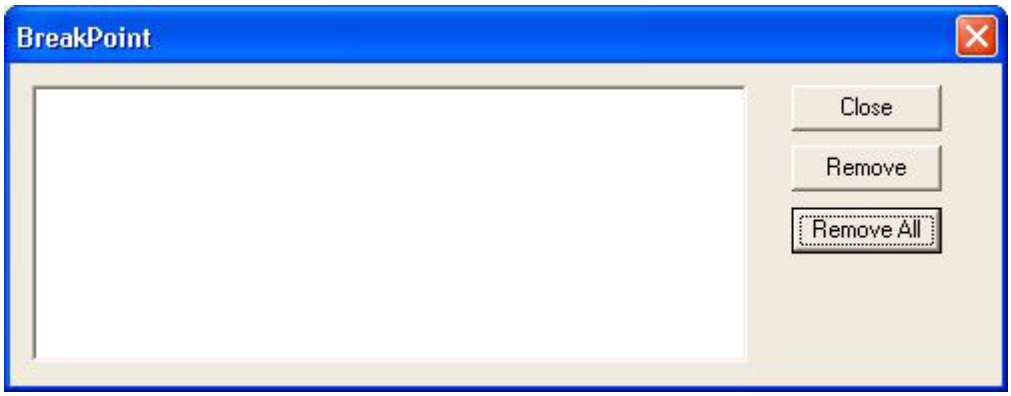


Figure 4-54. BreakPoint Dialog Box with Break Points Removed

9 Since there are no more break points, selecting the Continue toolbar button or `Debug > Continue` command finishes the execution of the test program.

5

Pattern Tool

Introduction

This chapter provides information for the Versatest Series Pattern Tool. The Pattern Tool provides a means for easily managing APG patterns using an intuitive graphical user interface (GUI). The Pattern Tool currently provides a debugging environment and will provide a development environment in a future software release.

Chapter Contents

This chapter contains the following information about the Pattern Tool:

NOTE The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Online Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification.

Pattern Tool Overview

The Pattern Tool provides a means for easily managing APG patterns using an intuitive graphical user interface (GUI). The Pattern Tool offers both a debugging environment and development environment.

NOTE In the current version of the Pattern Tool, only debug mode features on the hardware are available. The development environment is not currently supported.

The debugging environment gives you the ability to analyze run-time characteristics of any pattern in their workspace, or loaded into the system hardware prior to debug. With the pattern loaded into the system, you can view and modify various hardware states (registers, memory content, and so forth) in the system on-the-fly. The purpose of debug mode is to provide a more efficient way of testing and analyzing the code that is developed in order to make improvements and corrections.

The development environment essentially manages all things related to APG patterns, such as the following:

- Micro-instructions (memory and logic instructions)
- Resources (macros, time sets, cams, and pin groups)
- Files related to both the instructions and resources.

Pattern Tool Main Window

The Pattern Tool main window shown in Figure 5-1 is the application interface within the IDE.

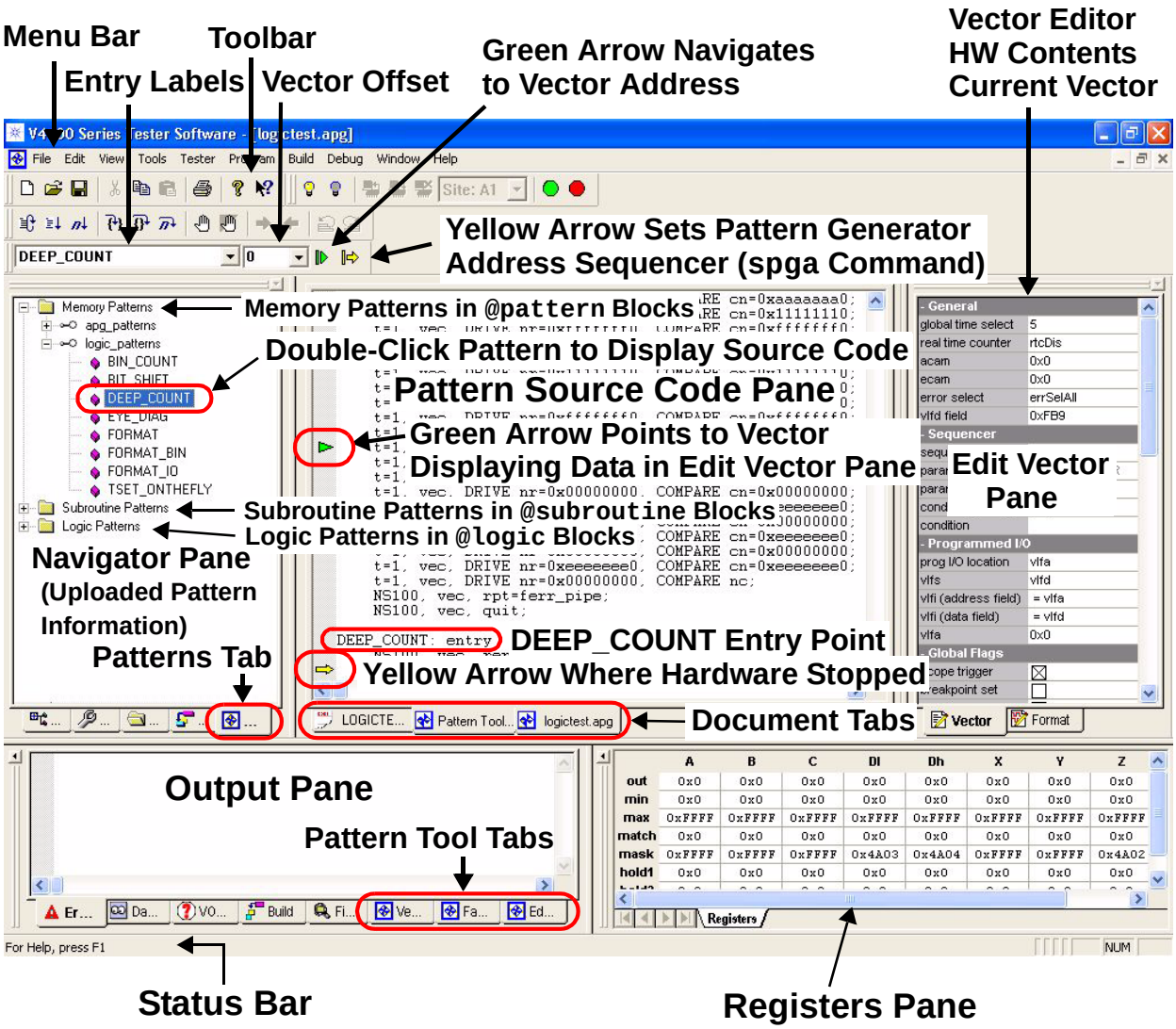


Figure 5-1. Pattern Tool Main Window

The interface is composed of the following functional areas:

- Navigator Pane: See `View > Navigator Pane` on page 153
- Menu bar on page 139.
- Toolbar: See the `View > Toolbar` command on page 151.
- Pattern Source Code Pane: See "Pattern Source Code Pane" on page 177.
- Edit Vector Pane: See the `View > EditVector` command on page 157.
- Document Tabs: See the `View > Document Tabs` command on page 157
- Output Pane: See the `View > Output Pane` command on page 155.
- Status Bar: See the `View > Status Bar` command on page 153.
- Registers Pane: See the `View > Registers` command on page 160.

Menu Bar

The menu bar at the top of the Pattern Tool main window (Figure 5-1) contains the following eight pull-down menus from which you can select commands.

- File menu on page 139
- Edit menu on page 146
- View menu on page 150
- Tools menu on page 161
- Tester menu on page 168
- Program menu on page 170
- Build menu on page 171
- Debug menu on page 172
- Window menu on page 174
- Help menu on page 176

File Menu

Selecting File in the menu bar opens the menu in Figure 5-2.

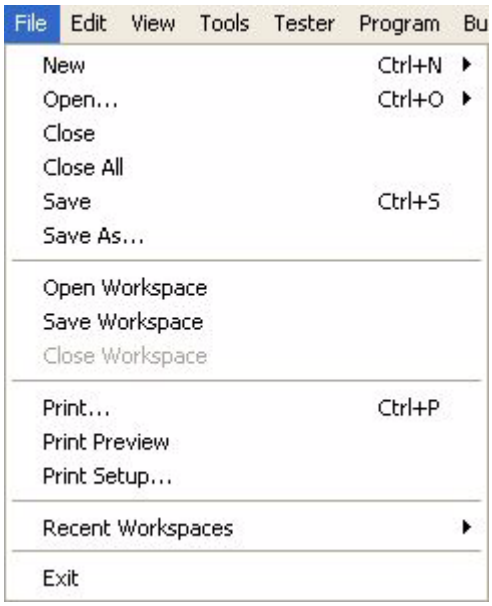


Figure 5-2. File Menu

The File menu contains the following commands:

- New command on page 141
- Open command on page 143
- Close command on page 145
- Close All command on page 145
- Save command on page 145
- Save As command on page 145
- Open Workspace command on page 145
- Save Workspace command on page 145
- Close Workspace Command on page 146
- Print command on page 146
- Print Preview command on page 146
- Print Setup command on page 146
- Recent Workspaces command on page 146
- Exit command on page 146

New Command (File Menu)

Displays the New command submenu (Figure 5-3) that allows you to display a new Workspace or create new IDE documents. The New toolbar button displays a New dialog box that lists the same items to select as the submenu.

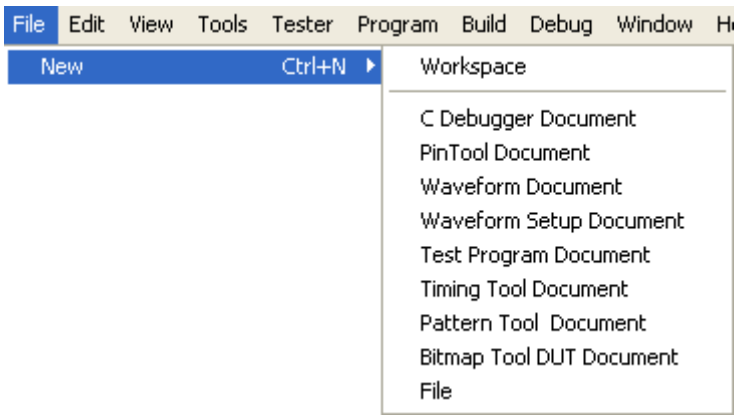


Figure 5-3. File > New Command Submenu

The New command submenu contains the following commands:

- Workspace command on page 141
- C Debugger Document command on page 142
- PinTool Document command on page 142
- Waveform Document command on page 142
- Waveform Setup Document command on page 142
- Test Program Document command on page 142
- Timing Tool Document command on page 142
- Pattern Tool Document command (Pattern Tool) on page 142
- Bitmap Tool DUT Document command on page 142
- File command on page 142

Workspace Command (New Command Submenu)

Displays as the active Workspace its default with its corresponding Menu bar, Toolbar, Navigator pane, Output pane, and Status bar.

C Debugger Document Command (New Command Submenu)

Displays as the active document a blank C Debugger document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

PinTool Document Command (New Command Submenu)

Displays as the active document a blank PinTool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Document Command (New Command Submenu)

Displays as the active document a blank Waveform Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Setup Document Command (New Command Submenu)

Displays as the active document a blank Waveform Setup Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Test Program Document Command (New Command Submenu)

Note currently supported by the IDE.

Timing Tool Document Command (New Command Submenu)

Displays as the active document a blank Timing Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and graphical display window), Output pane, and Status bar.

Pattern Tool Document Command (New Command Submenu)

Displays as the active document a blank Pattern Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Bitmap Tool DUT Document Command (New Command Submenu)

Displays an Open dialog box from which you open a DUT Description file (.dut) to display a blank Bitmap Tool document with the loaded DUT file and corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

File Command (New Command Submenu)

Not currently supported by the IDE.

Open Command (File Menu)

Displays the Open command submenu (Figure 5-4) that allows you to open a Workspace or IDE documents from the submenu list. The Open toolbar button displays a generic Open dialog box from which you can open a selection listed in the submenu.

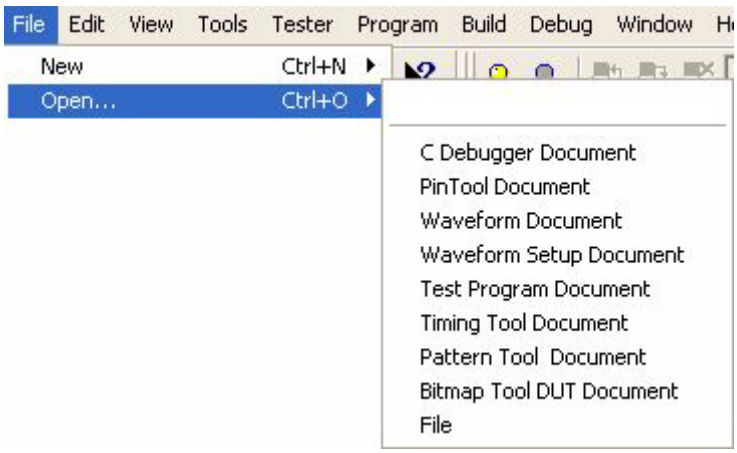


Figure 5-4. Open Command Submenu

The Open command submenu contains the following commands that display an Open dialog box similar to Figure 5-5:

- C Debugger Document command on page 144
- PinTool Document command on page 144
- Waveform Document command on page 144
- Waveform Setup Document command on page 144
- Test Program Document command on page 144
- Timing Tool Document command on page 144
- Pattern Tool Document command on page 145
- Bitmap Tool DUT Document command on page 145
- File command on page 145

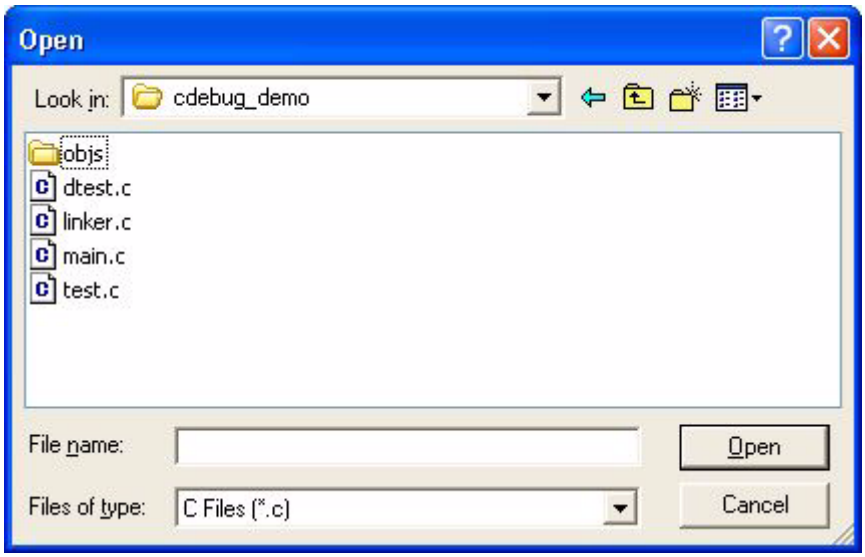


Figure 5-5. File > Open Dialog Box

C Debugger Document Command (Open Command Submenu)

Displays an Open dialog box (Figure 5-5) to select a previously saved C Debugger Tool document file with a *.cof extension.

PinTool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 5-5) to select a previously saved PinTool document file with a *.pin file extension.

Waveform Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 5-5) to select a previously saved Waveform document file with a *.dnc file extension.

Waveform Setup Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 5-5) to select a previously saved Waveform Setup document file with a *.stp file extension.

Test Program Document Command (Open Command Submenu)

Note currently supported by the IDE.

Timing Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 5-5) to select a previously saved Timing Tool document file with a *.vtt file extension.

Pattern Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 5-5) to select a previously saved Pattern Tool document file with an *.apg2 file extension.

Bitmap Tool DUT Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 5-5) to select a previously saved Bitmap Tool DUT definition document file with a *.dut file extension.

File Command (Open Command Submenu)

Note currently supported by the IDE.

Close Command (File Menu)

Closes the active tool document.

Close All Command (File Menu)

Closes all tool documents and displays the default IDE main window.

Save Command (File Menu)

 Saves the active document file.

Save As Command (File Menu)

Displays the Save As dialog box to save the active tool document file.

Open Workspace Command (File Menu)

Displays an Open Workspace dialog box with a *.wsp extension. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace and opening another. The Workspace consists of the tools, layout, and open documents.

Save Workspace Command (File Menu)

Saves the current workspace with a *.wsp extension. The Workspace consists of the tools, layout, and open documents. This command enables you to save the tools, layout, and open documents' current state, and later resume with the same Workspace by using the `File > Open Workspace` command.

Close Workspace Command (File Menu)

Closes the current workspace. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace.

Print Command (File Menu)

 Prints the source code displaying in the active Pattern Source Code pane.

Print Preview Command (File Menu)

Displays the Pattern Tool print preview window showing the source code that will be printed. Pressing the Esc key returns to the Pattern Tool main window.

Print Setup Command (File Menu)

Displays a printer setup dialog box that allows you to select and configure a printer.

Recent Workspaces Command (File Menu)

Displays a Recent Workspaces submenu from which you can select a workspace.

Exit Command (File Menu)

Closes the IDE. If the workspace or any other tool document files have changed, you will be asked if you would like to save them.

Edit Menu

Selecting Edit in the menu bar opens the menu in Figure 5-6. Editing done on the Format Format tab and Vector Vector tab in the Edit Vector pane is applied immediately to the hardware but can be undone/redone through the Edit menu.

Figure 5-6. Edit Menu

The Edit menu contains the following commands:

- Undo command on page 147
- Redo command on page 147
- Cut command on page 148
- Copy command on page 148
- Paste command on page 148
- Find command on page 148
- Replace command on page 148
- Find in Files command on page 149
- Undo Vector Edit command on page 150
- Redo Vector Edit command on page 150

Undo Command (Edit Menu)

Allows you to undo changes. Undoes any edit of instruction words as well as format data for one or more vectors. The editing of multiple vectors ("block-editing") is only available for logic patterns displayed in the Logic Grid Display (Figure 5-35 on page 179).

Redo Command (Edit Menu)

Allows you to redo changes. Redoing changes is available up to the latest point of edit. For example, consider the following edit history: A-B-C-D-E-F-G. If you undo back to step B and then introduce a new step H, the edit steps C-G will not be available anymore.

Cut Command (Edit Menu)

Cuts the selected text and copies it to the Clipboard.

Copy Command (Edit Menu)

Copies the selected text and copies it to the Clipboard.

Paste Command (Edit Menu)

Pastes the contents of the Clipboard to the cursor's position.

Find Command (Edit Menu)

Displays the Find dialog box (Figure 5-7) used for text searching.

Figure 5-7. Find Dialog Box

Replace Command (Edit Menu)

Displays the Replace dialog box (Figure 5-8) that provides text replacement capability based on the criteria you specify.

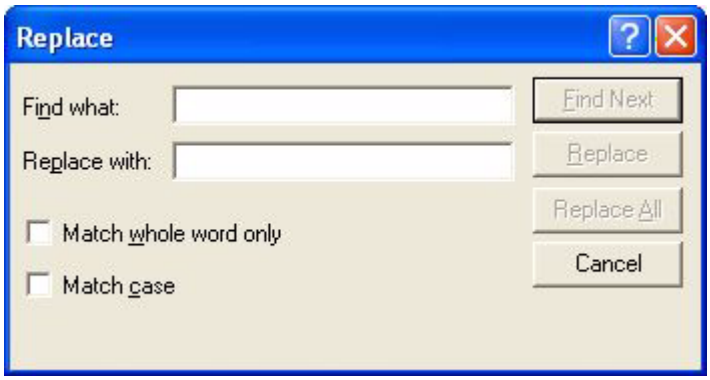


Figure 5-8. Replace Dialog Box

Find in Files Command (Edit Menu)

Displays the Find in Files dialog box (Figure 5-9) that provides search capability based on the criteria you specify.

The dialog box contains the following fields:

- `Find What` – Enter the name of symbol or text you would like to find.
- `In files/file types` – The type of files to look in (referenced by extension), or specific files that you would like to search (for example, "*.c" or ".apg", or "p:\src\myprogram\file1"). If you would like to specify multiple types of files, separate each term by a space, for example, "*.c *.apg p:\src\myprogram\file1".
- `In folder` – Enter the name of the directories you would like to search in. If you click on the button next to this field (labeled "..."), you can select a folder through a GUI file dialog interface.
- `Match whole word only` – If you check this box, only the lines containing the target as a whole (and not as part of another word) will be displayed.
- `Match case` – If you check this box, the lines containing the target will be displayed only if the cases match.
- `Regular Expressions` – If you check this box, the text in the `Find What` field will be interpreted as a regular expression,
- `Look in subfolders` – If you check this box, in addition to searching the folders specified in the `In Folder` field, the subdirectories of the folders specified in the `In Folder` field will be searched.
- `Find in Workspace` – If you check this box, only the files contained in the workspace will be searched. The "In Folder" field will be ignored.

After clicking on the Find button, the Find in Files output tab will be brought to the front in the Output Pane, the results from the search process will be displayed as they are generated. If you double-click on any of the lines, the file specified on that line will be opened, and the file window will be scrolled to the location specified by the line you double-clicked.

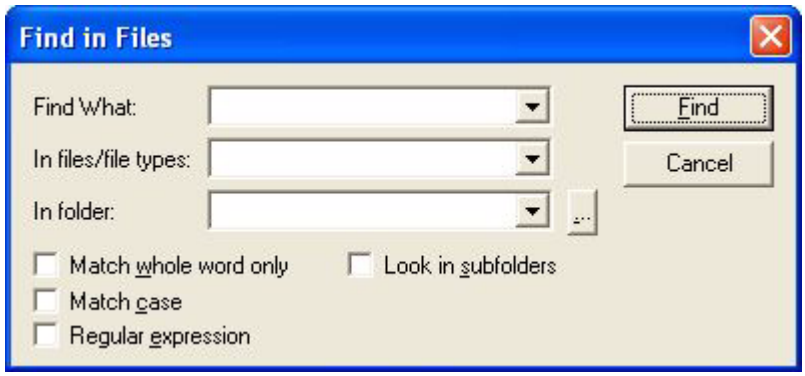


Figure 5-9. Find in Files Dialog Box

Undo Vector Edit Command (Edit Menu)

Allows you to undo vector editing that has been entered in the Edit Vector pane.

Redo Vector Edit Command (Edit Menu)

Allows you to redo vector editing that has been entered in the Edit Vector pane.

View Menu

Selecting View in the menu bar opens the menu in Figure 5-10.

Figure 5-10. View Menu

The View menu contains the following commands:

- Toolbar command on page 151
- Status Bar command on page 153
- Navigator Pane command on page 153

- Output Pane command on page 155
- Document Tabs command on page 157
- EditVector command on page 157
- Registers command on page 160

Toolbar Command (View Menu)

Displays or hides the optional toolbar shown in Figure 5-11. The toolbar displays at the top of the Pattern Tool main window when a ✓ displays in front of its command in the View menu. Clicking on the buttons in the toolbars give you quick access to many of the menu bar commands. Clicking in the Pattern Tool main window activates the associated toolbar buttons.

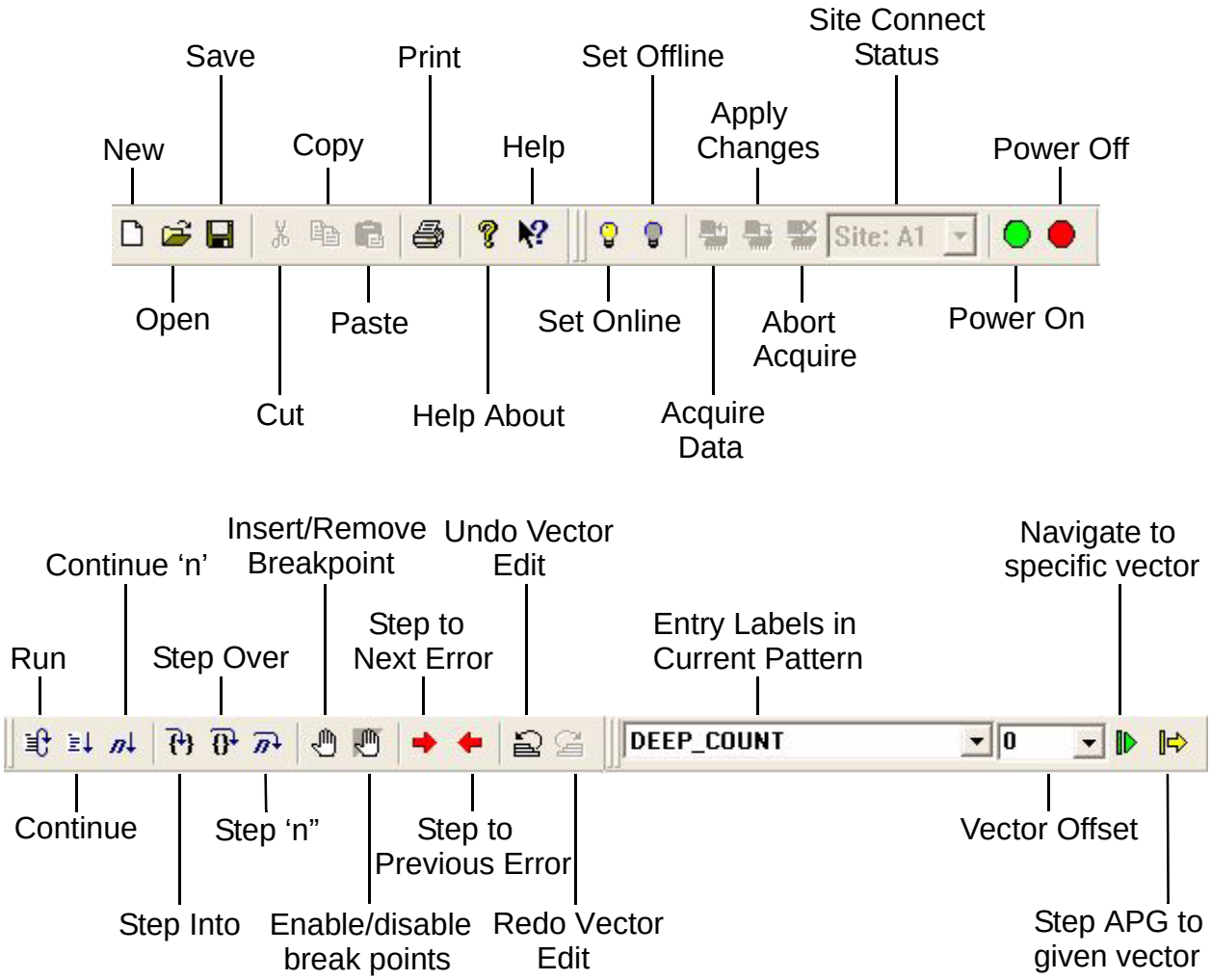


Figure 5-11. Pattern Tool Toolbar

The two toolbars contain the following command buttons:

 File > New on page 141

 File > Open on page 143

 File > Save on page 145

 Edit > Cut on page 148

 Edit > Copy on page 148

 Edit > Paste on page 148

 File > Print on page 146

 Help > About on page 176

 Help > Help on page 176

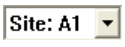
 Tester > Set Online on page 169

 Tester > Set Offline on page 169

 Tester > Acquire Data on page 170 (not supported by Pattern Tool)

 Tester > Apply Changes on page 170 (not supported by Pattern Tool)

 Tester > Abort Acquire on page 170 (not supported by C Debugger)



IDE Site Connect Status

 Tester > Power On on page 170

 Tester > Power Off on page 170

 Debug > Run on page 173

 Debug > Continue on page 173

 Debug > Continue ‘n’ on page 173

 Debug > Step Into on page 173

 Debug > Step Over on page 174

 Debug > Step ‘n’ on page 173

 Debug > Insert/Remove Breakpoint on page 174

 Debug > Enable/disable break points on page 174

 Debug > Step to Next Error on page 174

 Debug > Step to Previous Error on page 174

 Edit > Undo Vector Edit on page 150

 Edit > Redo Vector Edit on page 150

Entry Labels in Current Pattern drop-down list box

Vector Offset drop-down list box

 Navigate to specific vector in Vector Offset field

 Step APG to given vector in Vector Offset field

Status Bar Command (View Menu)

Displays or hides the Status Bar (Figure 5-1 on page 138). The Status Bar displays at the bottom of the Pattern Tool main window when a ✓ displays in front of its command in the View menu. The Status Bar provides information about the current state of what you are viewing in the window and any other status-oriented information.

Navigator Pane Command (View Menu)

Displays or hides the Navigator pane (similar to Figure 5-12 or Figure 5-1 on page 138). The Navigator Pane displays on the left side of the Pattern Tool main window when a ✓ displays in front of its command in the View menu.

The Pattern Tool is associated with the following two tabs on the Navigator Pane:

- Workspace Tab  : Within the Workspace tab tree is a `Pattern` icon that is used to launch the tool. Double-clicking the icon displays the default Pattern Tool Document Window.
- Patterns Tab  : Displays the uploaded pattern information (similar to Figure 5-12 or Figure 5-1 on page 138).

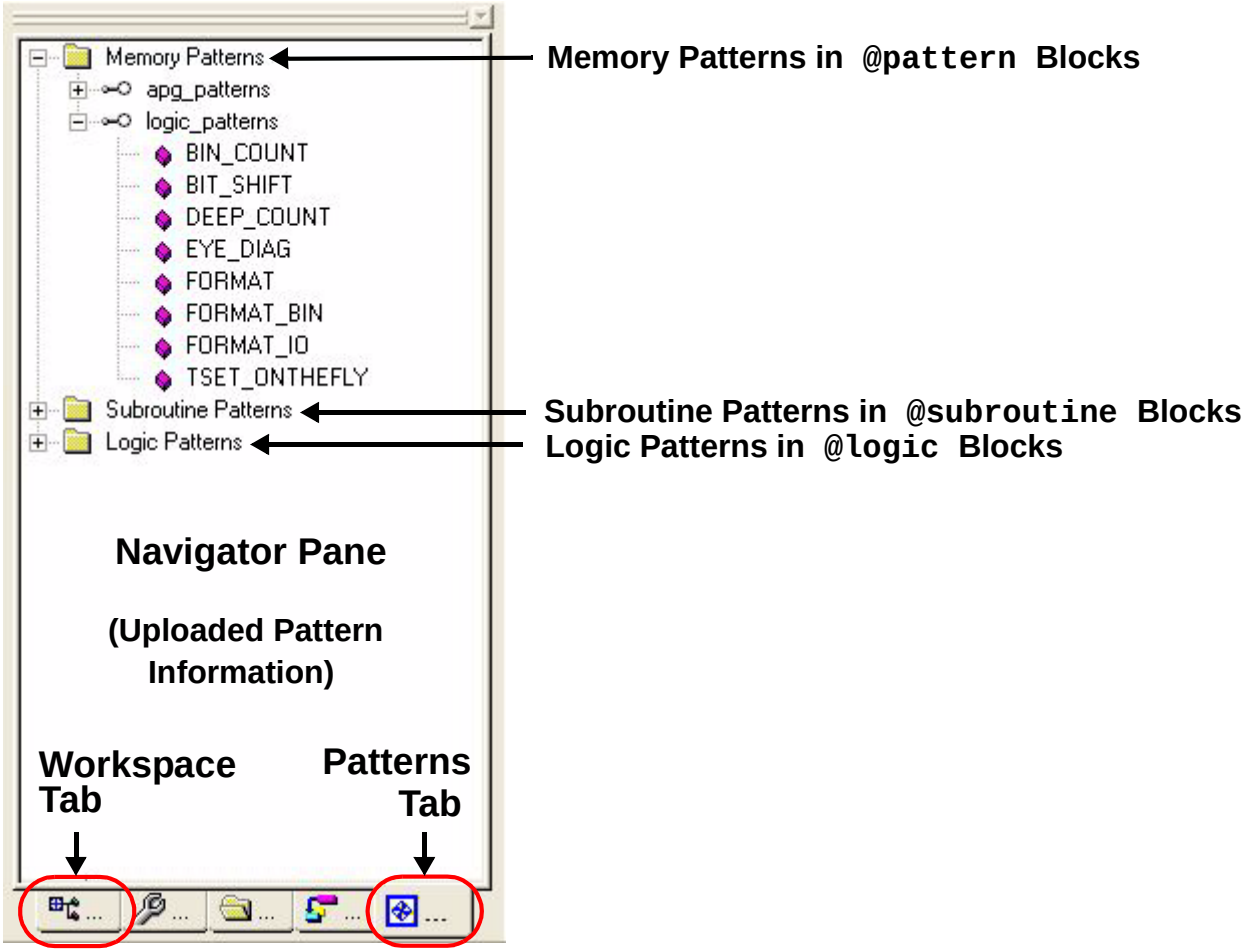


Figure 5-12. Navigator Pane

The Patterns tab in the Navigator pane allows you to navigate to various `Memory Patterns` (in `@pattern` blocks), `Subroutine Patterns` (in `@subroutine` blocks), and `Logic Patterns` (in `@logic` blocks) loaded into the system hardware (debug mode) or within your workspace (that will be available in a future software release). Clicking on an expand plus ⊞ button opens that hierarchical branch in a tree, and clicking the collapse minus ⊟ button collapses that branch. You can navigate down to a pattern entry point label, and double-click on it to display the pattern source code in the Pattern Source Code pane.

When in debug mode, the Pattern Tool contacts the hardware and retrieves information on the memory patterns, logic patterns, and subroutines that are currently loaded into the system. Again, double-clicking on an entry point name or label causes that portion of the pattern, starting at the entry point name or label selected, to be displayed in the Pattern Source Code pane (similar to Figure 5-1 on page 138).

When in development mode (that will be available in a future software release), the Pattern Tool area shows the memory patterns, logic patterns, and subroutines that have been created in the given workspace. Through this view, you can navigate to any vector in your program.

Output Pane Command (View Menu)

Displays or hides the Output Pane (similar to Figure 5-13 below or Figure 5-1 on page 138). The Output Pane displays on the bottom left corner of the Pattern Tool main window when a ✓ displays in front of its command in the View menu.

The Pattern Tool is associated with the following four tabs on the Output Pane:

- VOS Command tab on page 156
- Vector Unroll tab on page 156
- Failures tab on page 156
- Edit History tab on page 156

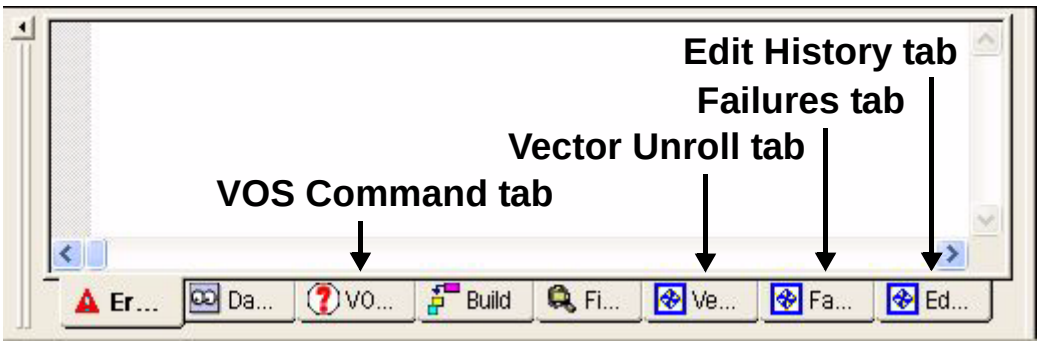


Figure 5-13. Pattern Tool Output Pane

VOS Command Tab

The `VOS Command` tab is enabled when the IDE is set online by the selecting the yellow Set Online toolbar button or the corresponding `Tester > Set Online` command. The VOS Command tab allows you to enter VOS terminal commands and display the results on the tab and in the corresponding test site window in the VK Test Station main window. See the "VOS Terminal Commands" chapter in the *Command Reference Volume 2* for the available commands.

Vector Unroll Tab

Displays previous vector unrolling (like the dvec VOS terminal command), and displays previous vector register contents. It can be configured in the `Tools > Properties > PatternTool Properties` > Pattern Tool Properties dialog box Vector Unrolling tab on page 167.

Failures Tab

Provides a summary of pattern failures (similar to Figure 5-14).

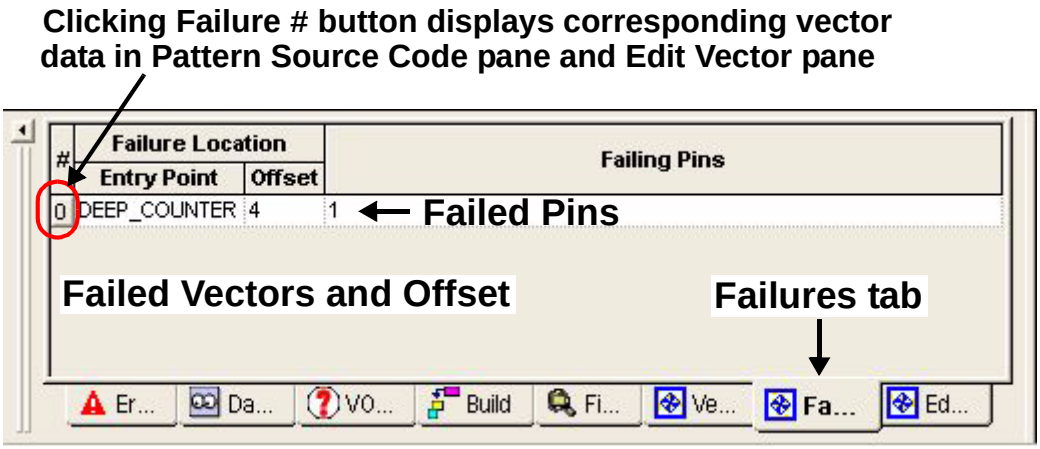


Figure 5-14. Output Pane Failures Tab

Edit History Tab

The Edit History Tab (similar to Figure 5-15) displays the editing history made in the `View > EditVector >` Edit Vector pane on page 157.

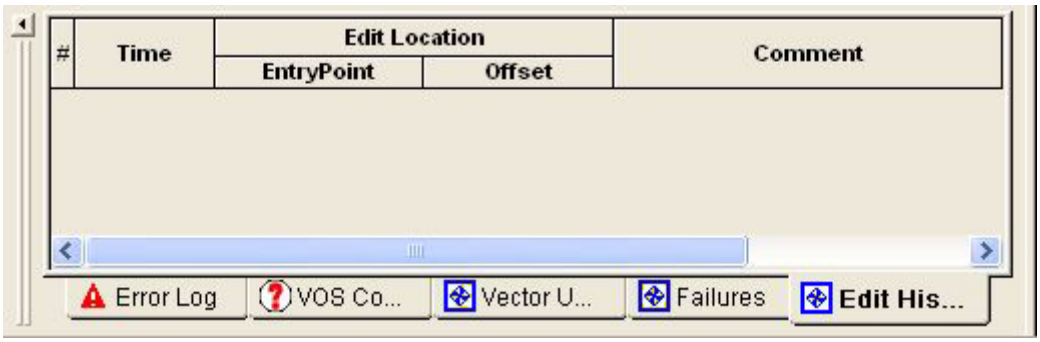


Figure 5-15. Output Pane Edit History Tab

Document Tabs Command (View Menu)

Displays the Document tabs at the bottom of the Tool Document Window (similar to Figure 5-1 on page 138) when a ✓ displays in front of its command in the View menu.

Edit Vector Command (View Menu)

Displays or hides the Edit Vector pane that consists of a Vector Vector tab (similar to Figure 5-16 or Figure 5-1 on page 138) and a Format Format tab (similar to Figure 5-17). The Edit Vector pane displays on the right side of the Pattern Tool main window when a ✓ displays in front of its command in the View menu. This is the central location in which all editing of vectors takes place. Editing done is this pane is applied to the hardware immediately but can be undone/redone through the Edit menu.

The Vector Vector tab (Figure 5-16) displays the sequencer instructions.

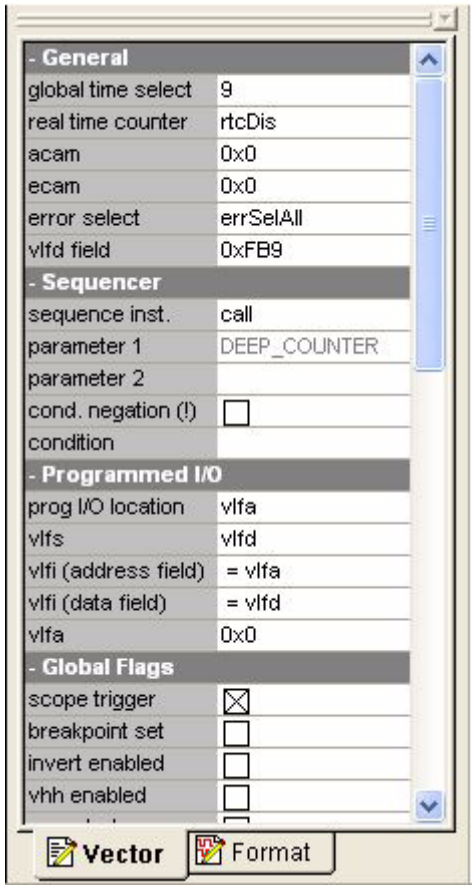


Figure 5-16. Vector Tab in Editor Vector Pane

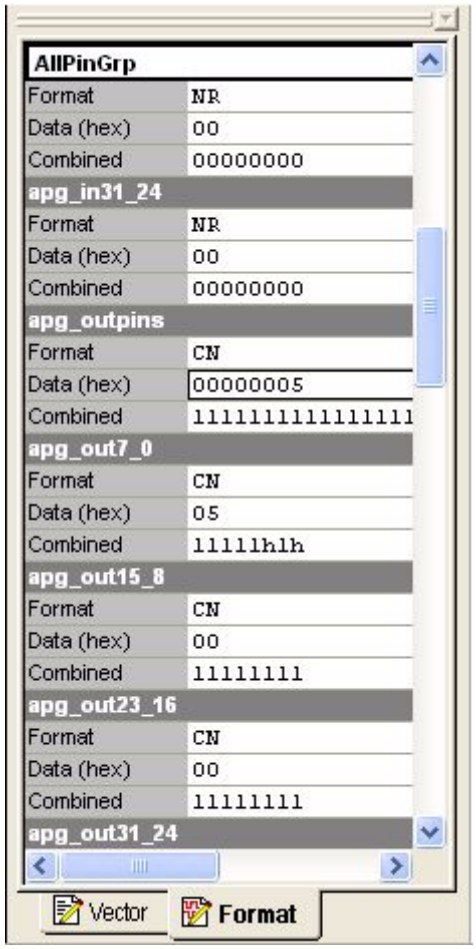


Figure 5-17. Format Tab in Edit Vector Pane

The Format tab (similar to Figure 5-17) displays the pin and pin group format and data information and the combined format and data information. Its information comes from the .VEC file.

The order the pin groups and pins display is the same as the order they are defined in the .APG file and resulting .VEC file.

The combined PE drive and compare format/data characters are listed below in Table 5-1. Note that these are the same characters that are used for the `format` pattern language vector command's binary format:

```
format <group or pin> bin = $xxx...
```

where `bin=$` indicates that each character following the `$` (and before a comma if one is present at the end to specify another operation in the vector) specifies one of the combined PE

format/data characters listed in Table 5-1. See the *Command Reference Volume 1* for detailed information about the `format bin` pattern language vector command.

Table 5-1. Combined PE Drive and Compare Format/Data Characters

Drive PE Format Characters		Compare PE Format Characters	
Combined Drive Format Character	**Drive Format = PEL[1] Level**	**Combined Compare Format Character**	**Compare Format = PEL* Level**
0	NR = 0	l	CN = 0
1	NR = 1	h	CN = 1
m	SC = 0	k	CL = 0
w	SC = 1	g	CL = 1
r	RTO = 0	t	CZ = 0
u	RTO = 1	T	CZ = 1
d	RZ = 0	x	NC = 0
c	RZ = 1	y	NC = 1
Drive Format = PEL* Level	**Combined Drive Format Character**	**Compare Format = PEL* Level**	**Combined Compare Format Character**
NR = 0	0	CN = 0	l
NR = 1	1	CN = 1	h
SC = 0	m	CL = 0	k
SC = 1	w	CL = 1	g
RTO = 0	r	CZ = 0	t
RTO = 1	u	CZ = 1	T
RZ = 0	d	NC = 0	x
RZ = 1	c	NC = 1	y

1 PEL (pin electronics logic) level = 0 or 1.

Registers Command (View Menu)

Displays or hides the Registers pane (similar to Figure 5-18 and Figure 5-1 on page 138). The Output pane displays on the bottom right corner of the Pattern Tool main window when a ✓ displays in front of its command in the View menu.

Displays the current counters (A, B, and C), data generators (Dl and Dh), and address generators (X, Y, and Z) register information (similar to Figure 5-18). For example, the current value of the C match register for the current vector can be found in column “C,” row “match.”

You can edit the contents of a counter or generator register by clicking on its cell in the Registers pane, typing a value in decimal or hexadecimal, and pressing Enter to write the change to hardware. The new value displays in hexadecimal. Changes can be viewed in the VK Test Station main window by entering the `dvec` (display vector) VOS terminal command in the Datalog window of a test site. Note that the change is immediately written to hardware, but can be undone/redone through the Edit menu.

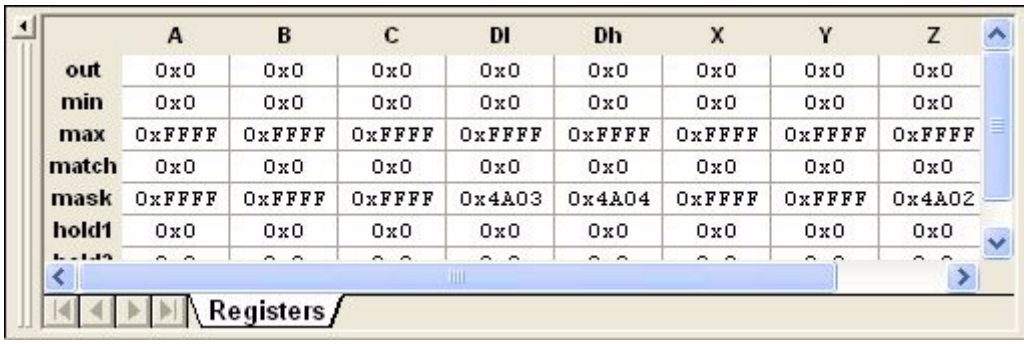


Figure 5-18. Registers Pane

Tools Menu

Selecting Tools in the menu bar opens the menu in Figure 5-19.

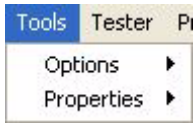


Figure 5-19. Tools Menu

The Tools menu contains the following commands:

- Options command on page 161
- Properties command on page 163

Options Command (Tools Menu)

Displays the Options submenu shown in Figure 5-20.

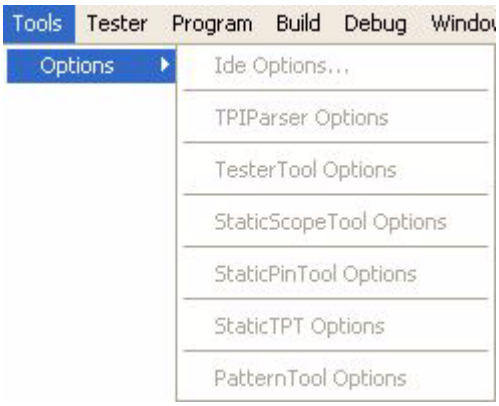


Figure 5-20. Options Submenu

The Options command submenu contains the following commands:

- Ide Options command on page 162
- TPIParser Options command on page 162
- TesterTool Options command on page 162
- StaticScopeTool Options command on page 162
- StaticPinTool Options command on page 162
- StaticTPT Options command on page 162
- PatternTool Options command on page 163

Ide Options Command (Options Command Submenu)

Not currently supported by the IDE.

TPIParser Options Command (Options Command Submenu)

Not currently supported by the IDE.

TesterTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticPinTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticTPT Options Command (Options Command Submenu)

Not currently supported by the IDE.

PatternTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

Properties Command (Tools Menu)

Displays the Properties submenu shown in Figure 5-21.

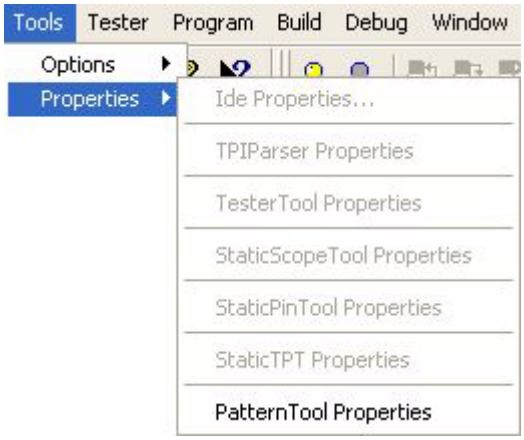


Figure 5-21. Properties Submenu

The Properties command submenu contains the following commands:

- Ide Properties command on page 163
- TPIParser Properties command on page 163
- TesterTool Properties command on page 163
- StaticScopeTool Properties command on page 164
- StaticPinTool Properties command on page 164
- StaticTPT Properties command on page 164
- PatternTool Properties command on page 164

Ide Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TPIParser Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TesterTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticPinTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticTPT Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

PatternTool Properties Command (Properties Command Submenu)

Displays the Pattern Tool Properties dialog box (similar to Figure 5-22) that has the following four tabs:

- General tab on page 164
- Conditional Stepping tab on page 165
- Logicview tab on page 166
- Vector Unrolling tab on page 167

General Tab (Pattern Tool Properties Dialog Box)

Contains the following panels (Figure 5-22):

- `Editing` panel: When you modify a vector instruction, it automatically applies the changes to the hardware. Currently, the `Manual` option button is not supported.The `Record edit History` option check box specifies whether the Output Pane's Vector Unroll tab (similar to Figure 5-13 on page 155) will log changes.
- `DUT disconnect` panel: Enables the disconnection of the DUT when you are stepping through a pattern to prevent damaging the device.
- Failures panel: Enables the tracking of errors in the Output Pane's Failures tab (similar to Figure 5-14 on page 156).

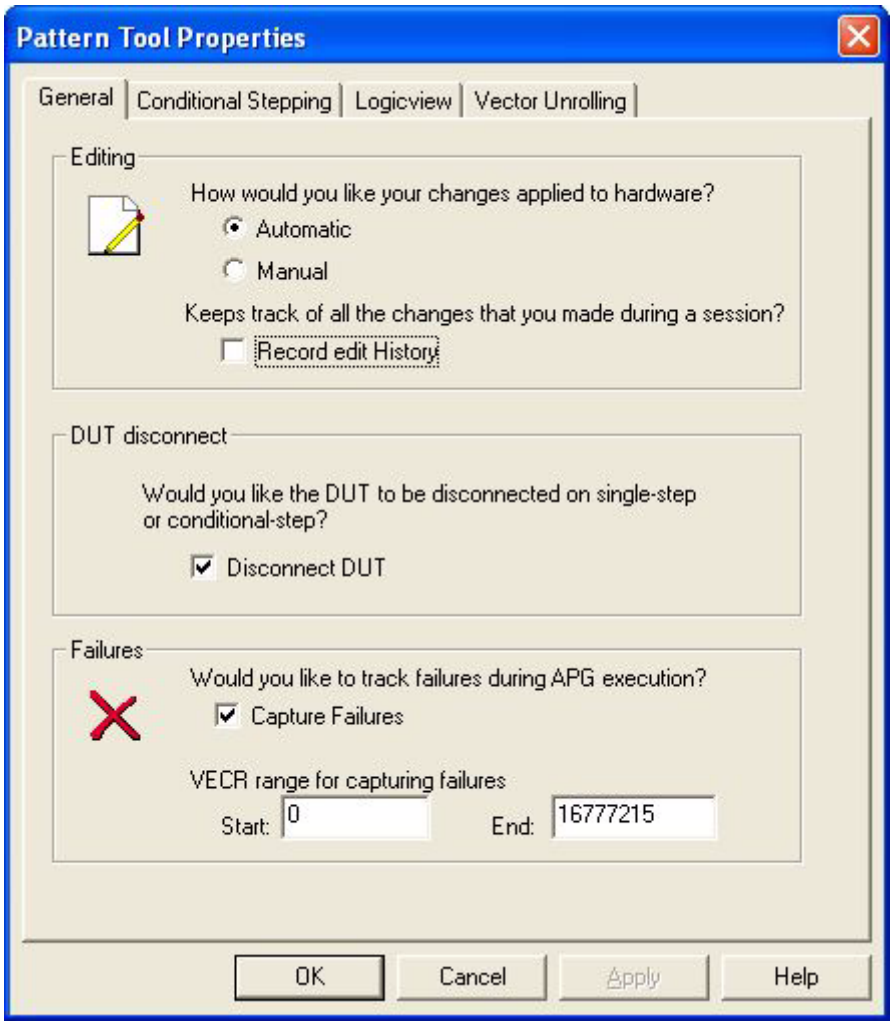


Figure 5-22. Pattern Tool Properties Dialog Box General Tab

Conditional Stepping Tab (Pattern Tool Properties Dialog Box)

Selecting the `Enable/Disable` check box activates the other fields. When you do conditional stepping, you set the conditions you want to stop on. When you run a pattern, it steps through the pattern vector-by-vector until it reaches one of the specified conditions or a quit.

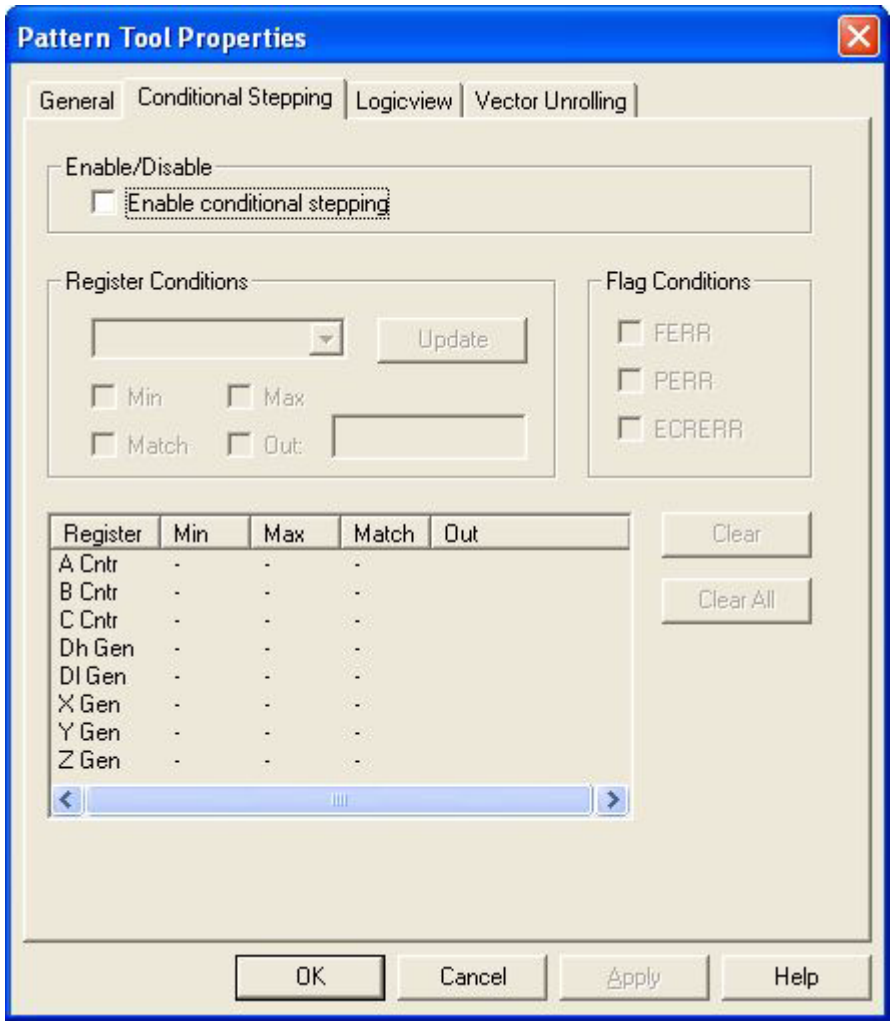


Figure 5-23. Pattern Tool Properties Dialog Box Conditional Stepping Tab

Logicview Tab (Pattern Tool Properties Dialog Box)

Configures what logic columns that will display in the Logic View Display Pane (similar to Figure 5-35 on page 179). The Logic View Grid is only available for logic patterns.

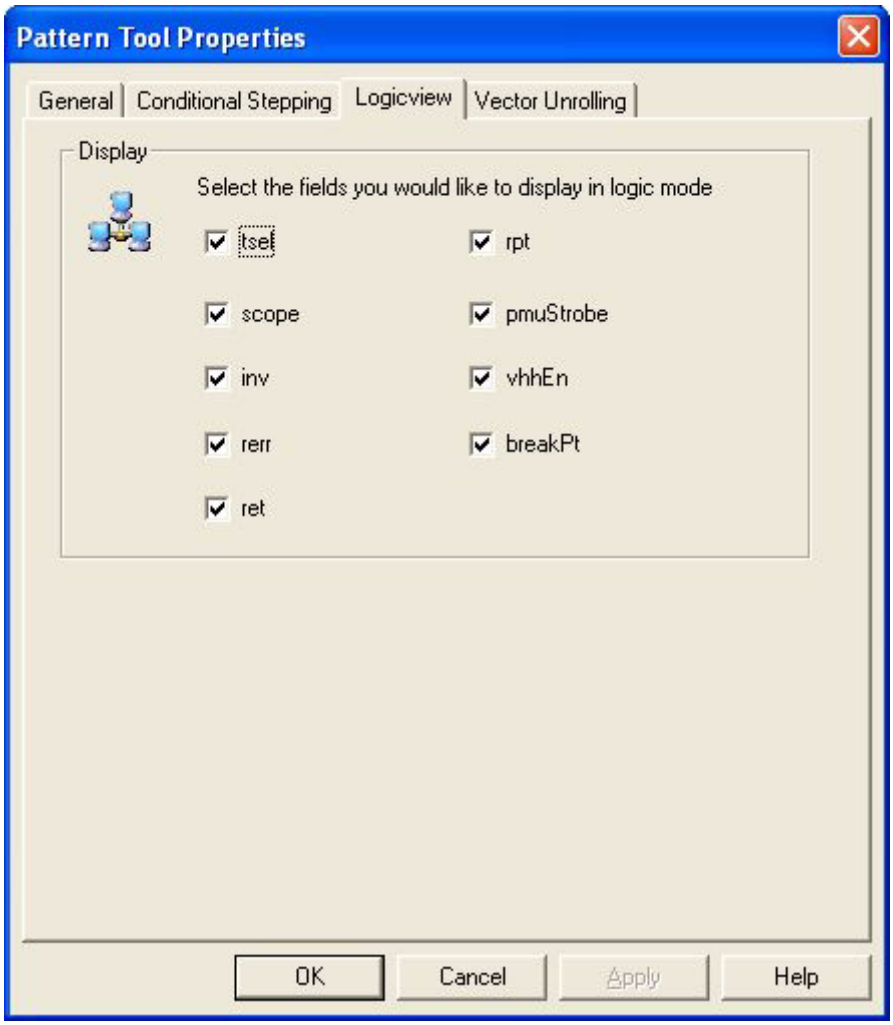


Figure 5-24. Pattern Tool Properties Dialog Logicview Tab

Vector Unrolling Tab (Pattern Tool Properties Dialog Box)

Configures what registers, counters, and flags (Figure 5-25) you want to display for each vector in the Output window's Vector Unroll tab (similar to Figure 5-13 on page 155). Selecting the `Enable Vector Unrolling` check box and from the `Available fields` panel specifies what displays for each vector in the Output window.

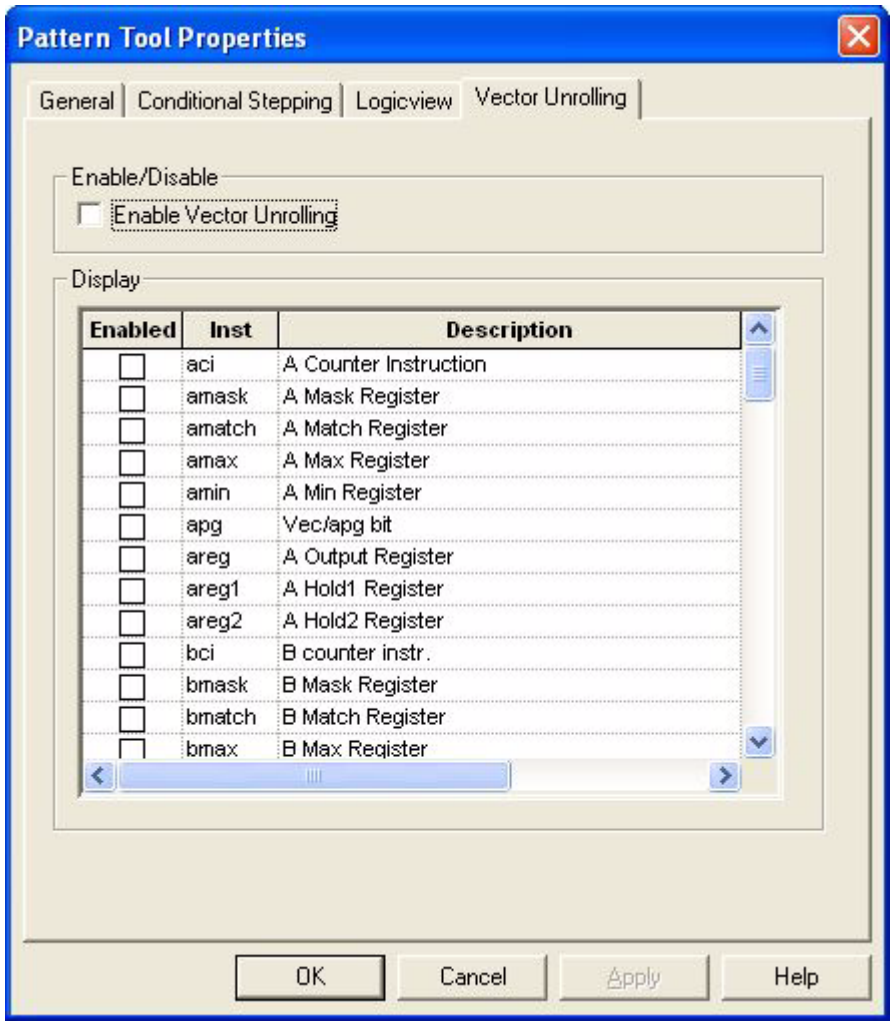


Figure 5-25. Pattern Tool Properties Dialog Box Vector Unrolling Tab

Tester Menu

Selecting Tester in the menu bar opens the menu in Figure 5-26.

Figure 5-26. Tester Menu

The Tester menu contains the following commands:

- Set Online command on page 169
- Set Offline command on page 169
- Acquire Data command on page 170
- Apply Changes command on page 170
- Abort Acquire command on page 170
- Tester Power On command on page 170
- Tester Power Off command on page 170

Set Online Command (Tester Menu)

Connects the IDE to the tester for the following tools that support online mode:

- C Program Debugger (currently has no offline capability)
- Pattern Tool (currently has no offline capability)
- Waveform Tool
- Timing Tool

Set Offline Command (Tester Menu)

Disconnects the IDE from the tester. The following tools support offline mode:

- Pin Tool (currently has no online capability)
- Waveform Tool (viewing saved files only)
- Timing Tool (viewing saved files only)
- Bitmap Tool (currently has no online capability)

Acquire Data Command (Tester Menu)

Not currently supported by the Pattern Tool. The Timing Tool supports this command.

Apply Changes Command (Tester Menu)

Not currently supported by the Pattern Tool. The Timing Tool supports this command.

Abort Acquire Command (Tester Menu)

Not currently supported by the Pattern Tool. The Timing Tool supports this command.

Tester Power On Command (Tester Menu)

Same as the VK Test Station main window `Utilities > Power On` command and its corresponding toolbar button. Resets and powers up the test sites (Test Head).

Tester Power Off Command (Tester Menu)

Same as the VK Test Station main window `Utilities > Power Off` command and its corresponding toolbar button. Turns off power to the test sites (Test Head).

Program Menu

Selecting Program in the menu bar opens the menu in Figure 5-27. The Program menu is not currently supported by the IDE.

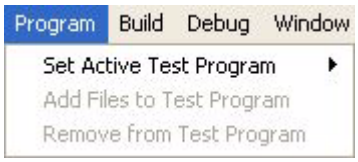


Figure 5-27. Program Menu

The Program menu contains the following commands:

- Set Active Test Program command on page 171
- Add Files to Test Program command on page 171
- Remove from Test Program command on page 171

Set Active Test Program Command (Program Menu)

Not currently supported by the IDE.

Add Files to Test Program Command (Program Menu)

Not currently supported by the IDE.

Remove from Test Program Command (Program Menu)

Not currently supported by the IDE.

Build Menu

Selecting Debug in the menu bar opens the menu in Figure 5-28. The Build menu is not currently supported by the IDE.

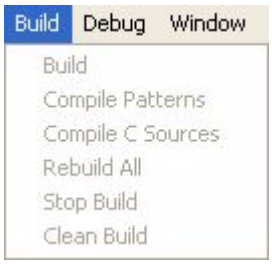


Figure 5-28. Build Menu

The Build menu contains the following commands:

- Build command on page 171
- Compile Patterns command on page 171
- Compile C Sources command on page 172
- Rebuild All command on page 172
- Stop Build command on page 172
- Clean Build command on page 172

Build Command (Build Menu)

Not currently supported by the IDE.

Compile Patterns Command (Build Menu)

Not currently supported by the IDE.

Compile C Sources Command (Build Menu)

Not currently supported by the IDE.

Rebuild All Command (Build Menu)

Not currently supported by the IDE.

Stop Build Command (Build Menu)

Not currently supported by the IDE.

Clean Build Command (Build Menu)

Not currently supported by the IDE.

Debug Menu

Selecting Debug in the menu bar opens the menu in Figure 5-29.

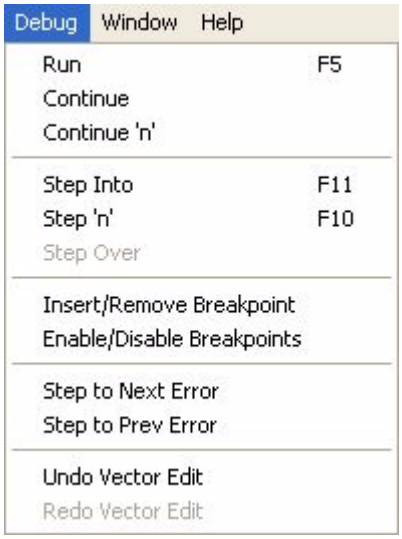


Figure 5-29. Debug Menu

The Debug menu contains the following commands:

- Run command on page 173.
- Continue command on page 173
- Continue ‘n’ command on page 173
- Step Into command on page 173.
- Step ‘n’ command on page 173.

- Step Over command on page 174
- Insert/Remove Breakpoint command on page 174
- Enable/Disable Break Points command on page 174
- Step to Next Error command on page 174
- Step to Previous Error command on page 174
- Undo Vector Edit command on page 174
- Redo Vector Edit command page 174

Run Command (Debug Menu)

Runs the pattern beginning at the entry point within the pattern. Runs to the end of the pattern or a quit. It will stop on a vector with a break point.

Continue Command (Debug Menu)

From the current vector, runs to the end of the pattern or a quit. It will stop on a vector with a break point.

Continue 'n' Command (Debug Menu)

Continues the APG after hitting break points "N" times. Displays a Step Count dialog box. Typing the number of break points in the `Steps` text box and selecting OK continues the APG after hitting that number of break points (or until it encounters a quit). This command does not currently display in the Debug menu.

Step Into Command (Debug Menu)

Steps to the next vector in the pattern and displays a yellow arrow pointing to the vector in the Pattern Source Code pane that indicates it is the vector where the hardware is currently stopped. The difference between the Step Over and the Step Into commands is that if you are on a vector that does a call, the Step Into command will bring you to the first vector of the entry point in the subroutine where Step Over will execute the subroutine and end up at the next vector in the pattern.

Step 'n' Command (Debug Menu)

Displays a Step Count dialog box. Typing in the number of vectors to step in the `Steps` text box and selecting OK steps that number of vectors (or until it encounters a quit) and displays a yellow arrow pointing to the vector in the Pattern Source Code Pane where the hardware is currently stopped. It will stop on a vector with a break point.

Step Over Command (Debug Menu)

 Jumps to the next vector in the pattern and displays a yellow arrow pointing to the vector in the Pattern Source Code pane that indicates it is the vector where the hardware is currently stopped. The difference between the Step Over and the Step Into commands is that if you are on a vector that does a call, the Step Into command will bring you to the first vector of the entry point in the subroutine where Step Over will execute the subroutine and end up at the next vector in the pattern.

Insert/Remove Breakpoint Command (Debug Menu)

 Inserts or removes a break point at the current APG location.

Enable/Disable Break Points Command (Debug Menu)

 Toggles enable/disable break points.

Step to Next Error Command (Debug Menu)

 Jumps to the next failing vector. It does not execute any vectors or make the vector the current vector. A green arrow points to the vector in the Pattern Source Code Pane and currently displayed in the Edit Vector Pane.

Step to Previous Error Command (Debug Menu)

 Jumps to the next previous failing vector. It does not execute any vectors or make the vector the current vector. A green arrow points to the vector in the Pattern Source Code Pane and currently displayed in the Edit Vector Pane.

Undo Vector Edit Command (Debug Menu)

 Allows you to undo vector editing that has been entered in the Edit Vector pane.

Redo Vector Edit Command (Debug Menu)

 Allows you to redo vector editing that has been entered in the Edit Vector pane.

Window Menu

Selecting Window in the menu bar opens the menu in Figure 5-30.

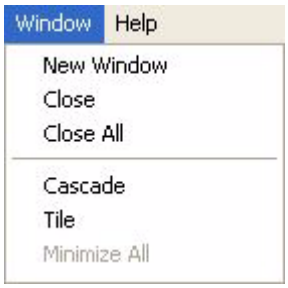


Figure 5-30. Window Menu

The Window menu contains the following commands:

- New Window command on page 175
- Close command on page 175
- Close All command on page 175
- Cascade command on page 175
- Tile command on page 175
- Minimize All command on page 175

New Window Command (Window Menu)

Displays a duplicate Pattern Source window.

Close Command (Window Menu)

Closes the active tool document window.

Close All Command (Window Menu)

Closes all tool document windows with their corresponding tabs.

Cascade Command (Window Menu)

Arranges the currently displayed Pattern Source windows one on top of another with the title bar of each visible.

Tile Command (Window Menu)

Arranges the currently displayed Pattern Source windows so that each is fully visible.

Minimize All Command (Window Menu)

Not currently supported by the IDE.

Help Menu

Selecting Help in the menu bar opens the menu in Figure 5-31.

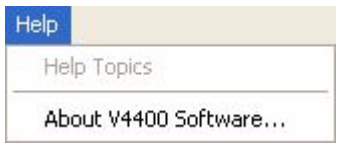


Figure 5-31. Help Menu

The Help menu contains the following two commands:

Help Topics Command (Help Menu)

Not currently supported.

About V4400 Software Command (Help Menu)

Displays the About V4400 Series Tester Software dialog box that contains software component version and copyright information (similar to Figure 5-32).

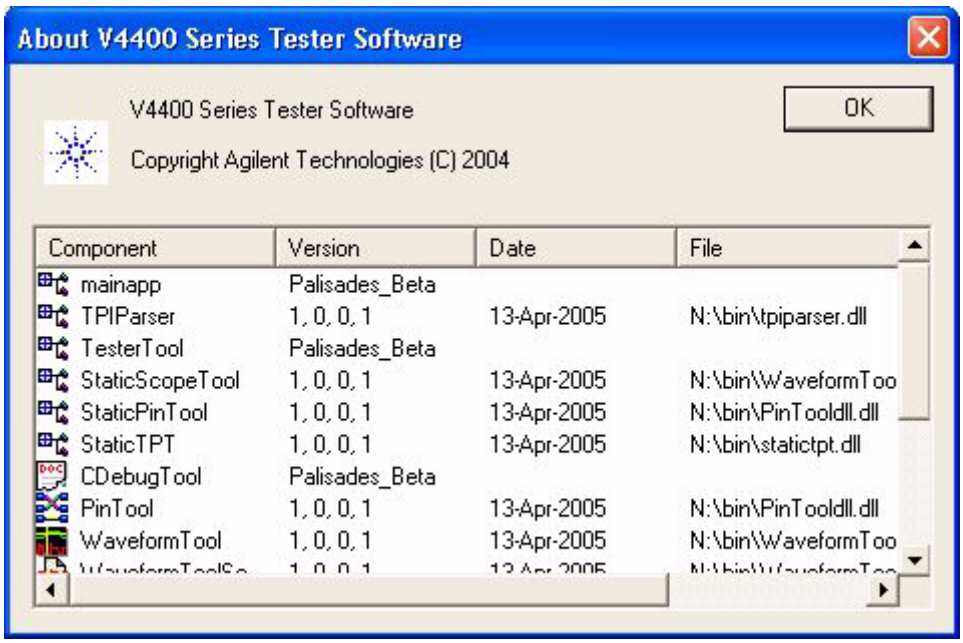


Figure 5-32. About V4400 Software Dialog Box

Pattern Source Code Pane

The Pattern Source Code Pane (similar to Figure 5-33) displays the pattern source code for the pattern that is double-clicked in the Patterns tab ... in the Navigator Pane (similar to Figure 5-1 on page 138).

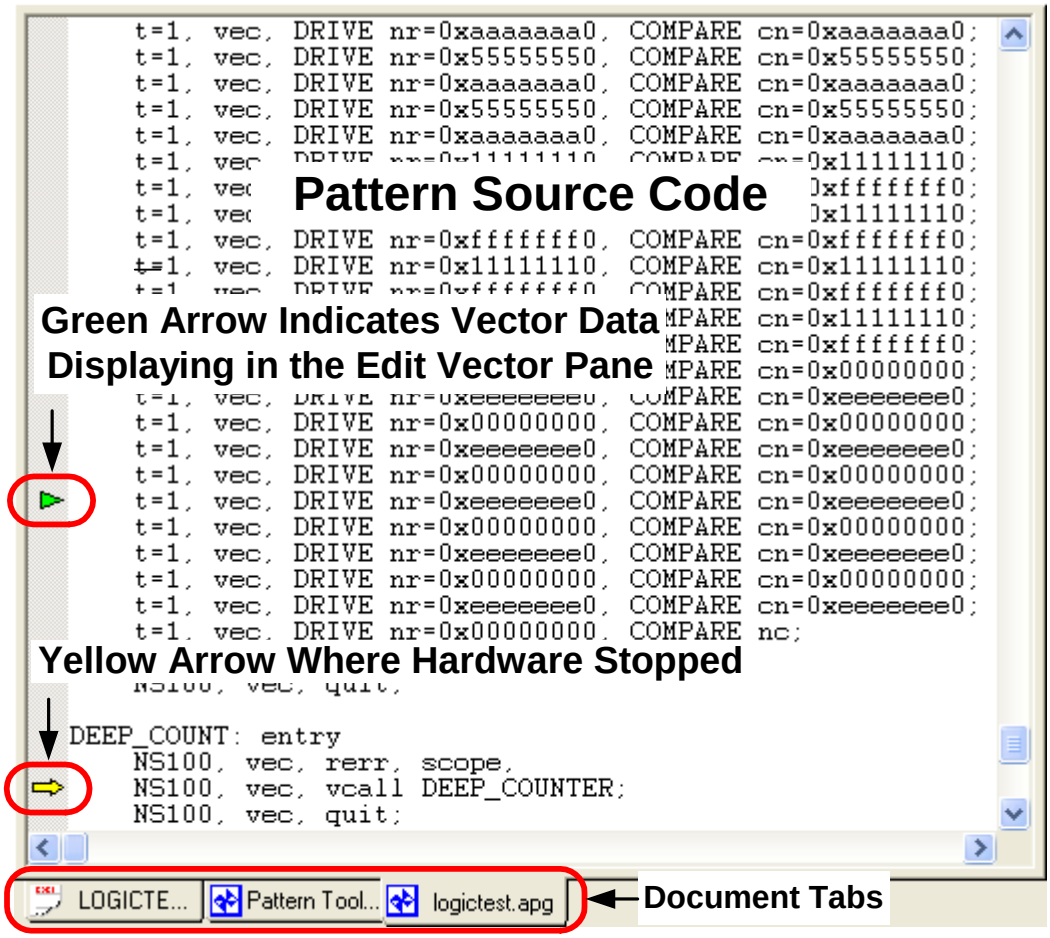


Figure 5-33. Pattern Source Code Pane

The green arrow indicates which vector data is currently displaying in the Edit Vector Pane (see the `View > Edit Vector` command on page 157). A yellow arrow points to the vector where the hardware is currently stopped.

Right-clicking over a vector in the Pattern Source Code Pane displays the pop-up menu shown in Figure 5-34.

Figure 5-34. Pattern Source Code Pop-Up Menu

Selecting the `Display Logic View` command displays a logic view of the pattern (Figure 5-35). This logic view is only available for logic patterns. The command is grayed out and inactive for other patterns. Vectors are represented in a grid format. In the grid, each row represents a different logic vector.

The sequencer column headings at the top (`break_pt`, `inv_en`, `pmustb`, and so forth) are selected in the `Tools` > `Properties` > `PatternTool Properties` > Pattern Tools Properties dialog box > Logicview tab (Figure 5-24 on page 167). The pins and pin groups are selected in the `View` > `Edit Vector` > Format Format tab (similar to Figure 5-17 on page 159). The current vector displays green in the Logic View Display Pane and is the vector where the right-click occurred to display the pop-up menu. Failed vectors display red.

Tools > Properties > PatternTool Properties > Pattern Tools Properties Dialog Box > Logicview Tab Selected Display Fields

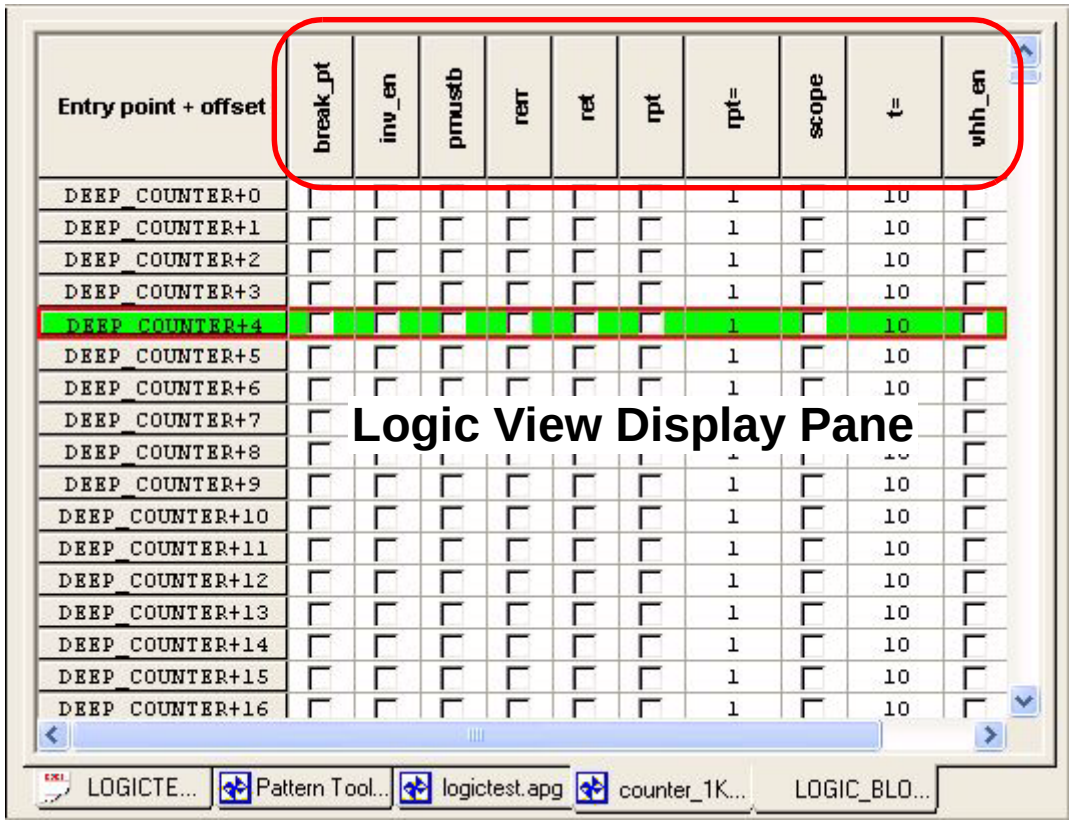


Figure 5-35. Logic View Display Pane

Pattern Tool Getting Started

The Pattern Tool allows management of APG patterns through the IDE graphical user interface. Its debugging environment gives the ability to analyze run-time characteristics of any pattern loaded in system hardware. Developers can view and modify, on-the-fly, various hardware states, such as registers or memory content. It is an efficient way of testing and analyzing written code for the purpose of making improvements or corrections.

This Getting Started demonstrates how to use the Pattern Tool to retrieve pattern information and view and debug failures. For additional information about the Pattern Tool, see the "Pattern Tool Main Window" section on page 138 that provides descriptions of all the menus, menu commands, and dialog boxes that make up the tool's interface.

Getting Started Contents

This Getting Started contains the following examples:

NOTE

The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

Loading the Test Program

In this section of the Getting Started we will perform the following tasks in preparation to use the C Program Debugger and Pattern Tool to retrieve pattern information, and run the APG to view and debug failures:

- Launch the VK Test Station application and display its VK Test Station main window.
- Load a plan file, power on the test sites (test head), and download the test program files specified in the plan file to the test sites.

1 Selecting start > `All Programs` > `Versatest Test System Software` > `VK Test Station` displays the VK Test Station main window (similar to Figure 5-36). Note that the Status Bar displays `Station Status: Idle Ready  NO PHYSICAL SITE CONFIGURED` that indicates the test sites are powered off and no plan file is loaded.

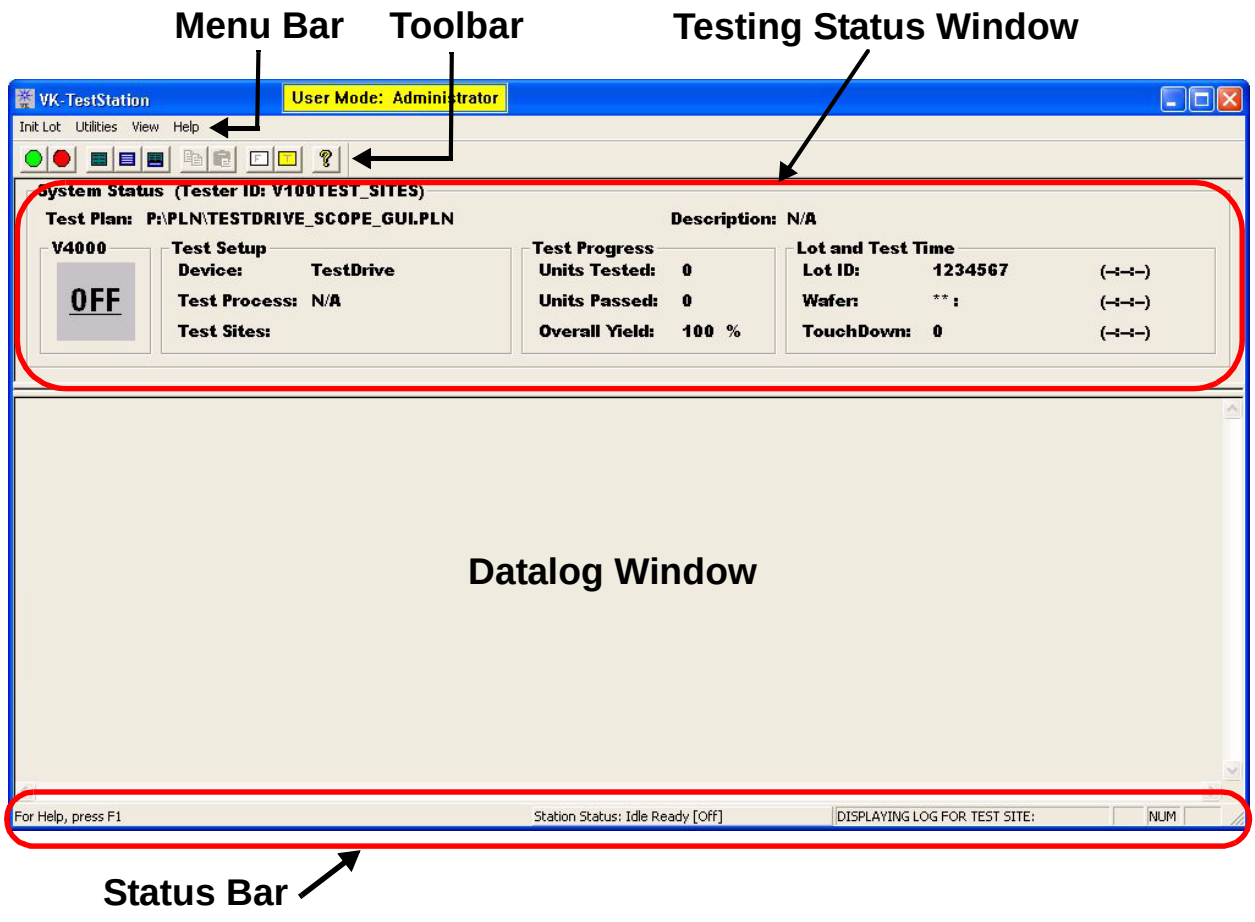


Figure 5-36. VK Test Station Main Window

2 In the menu bar, selecting `Init Lot > Enter Lot Information` displays the Initialize Test Station Setup dialog box (Figure 5-37) that is used to set up each lot for testing.

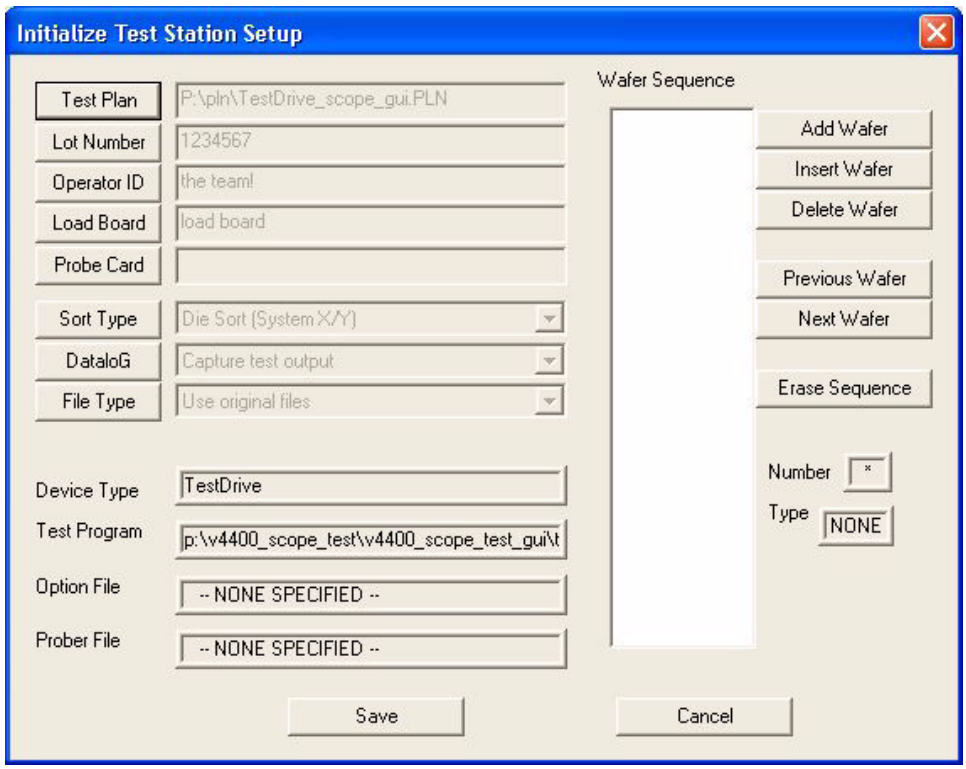


Figure 5-37. Initialize Test Station Setup Dialog Box

3 Selecting the Test Plan button displays the Open dialog box (Figure 5-38) that lists the available plan files. Test plan files define the tester setup that is used. The `TestDrive_scope_gui.PLN` plan file will be used for this example.

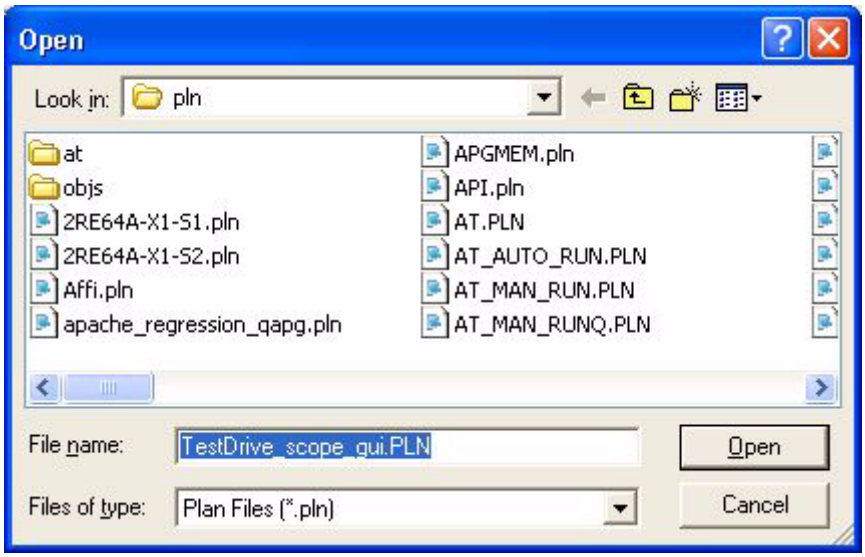


Figure 5-38. Select Test Plan Dialog Box

4 Selecting the `TestDrive_scope_gui.PLN` plan file and then selecting Open displays the Initialize Test Station Setup dialog box with the plan file displayed in the Test Plan field (Figure 5-36 on page 181).

5 Selecting the Save button in the dialog box displays a Red Hand Alert dialog box that warns about the loss of summary data (Figure 5-39). The TEST_PLAN_WARNING plan file configuration switch controls whether this dialog box displays. The default is for it to display.

Figure 5-39. Red Hand Alert Are You Sure Dialog Box

6 Selecting OK displays another Red Hand Alert dialog box (Figure 5-40) that warns to Z down the wafer and disconnect all DUTs prior to initialization of the test sites. The TEST_PLAN_WARNING plan file switch also controls whether this dialog box displays.

Figure 5-40. Red Hand Alert Z-Down Dialog Box

7 Selecting OK displays the Test Plan Validation dialog box (Figure 5-41). The `VALIDATE 0x10` plan file test switch controls whether this dialog box displays. It displays the corresponding checksums and adds them to the summary file.

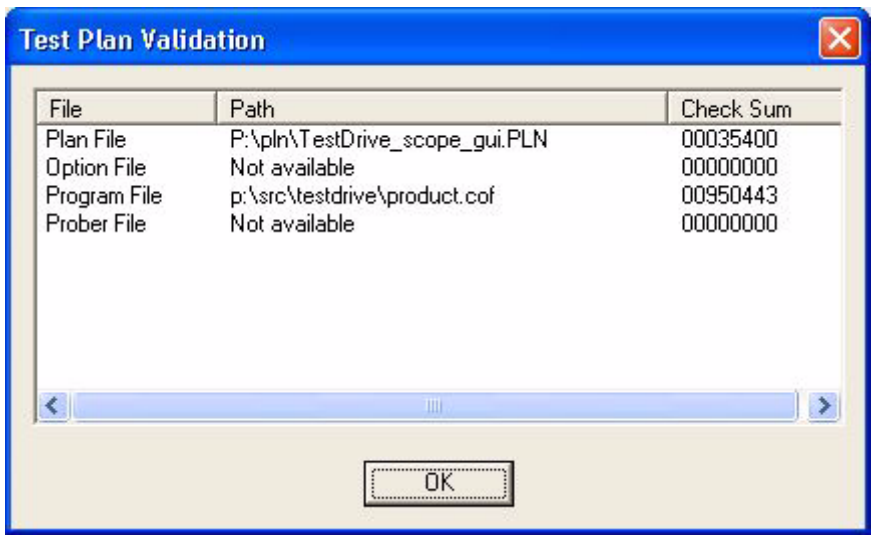


Figure 5-41. Test Plan Validation Dialog Box

8 Selecting OK begins the test head power on and downloads the Versatest Operating System (VOS) and the test program files specified in the plan file. The power on is complete when the terminal prompt `A1>` displays in the Datalog window (Figure 5-42). Note that the Status Bar displays `Station Status: Ready DISPLAYING LOG FOR TEST SITE: 1 (A1)` that indicates the test sites are powered on and ready to run the downloaded test program.

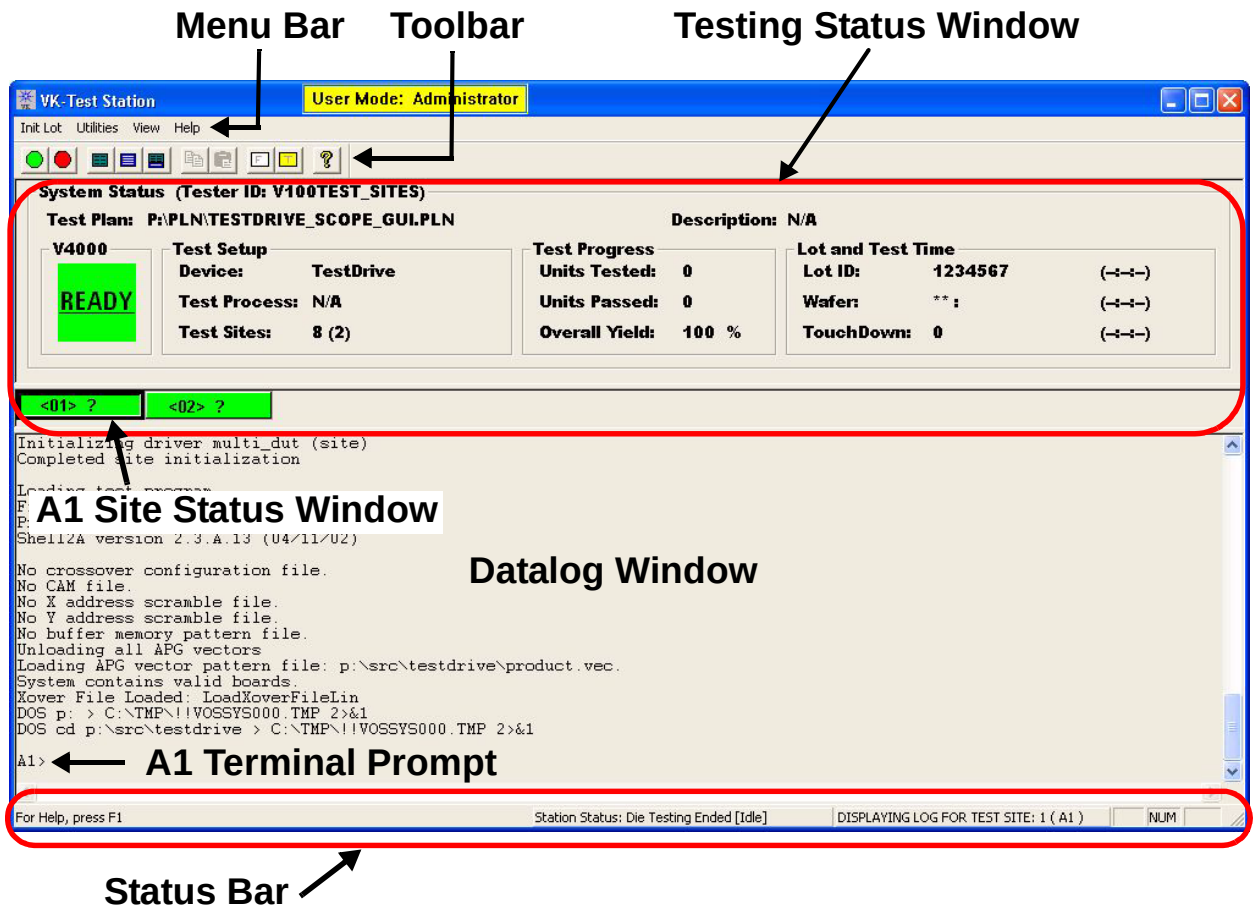


Figure 5-42. VK Test Station Main Window After Power On

Using the C Program Debugger to Control Program Execution

The C Program Debugger allows you to control the execution and inspect the status at the C language source code level. In this section of the Getting Started, we will use the C Program Debugger to perform the following tasks in preparation to use the Pattern Tool to retrieve pattern information, and run the APG to view and debug failures:

- Set a break point right before running a pattern.
- Run the test program to the break point.

1 Selecting  > `All Programs` > `Versatest Test System Software` > `Integrated Development Environment` displays the default V4400 Series Tester Software main window that contains the Integrated Development Environment or IDE (similar to Figure 5-43). The Menu bar and Toolbar are context sensitive and change for the selected active tool or document. The menus and Toolbar show and enable only the commands and buttons that are relevant to the tool or document you have selected.

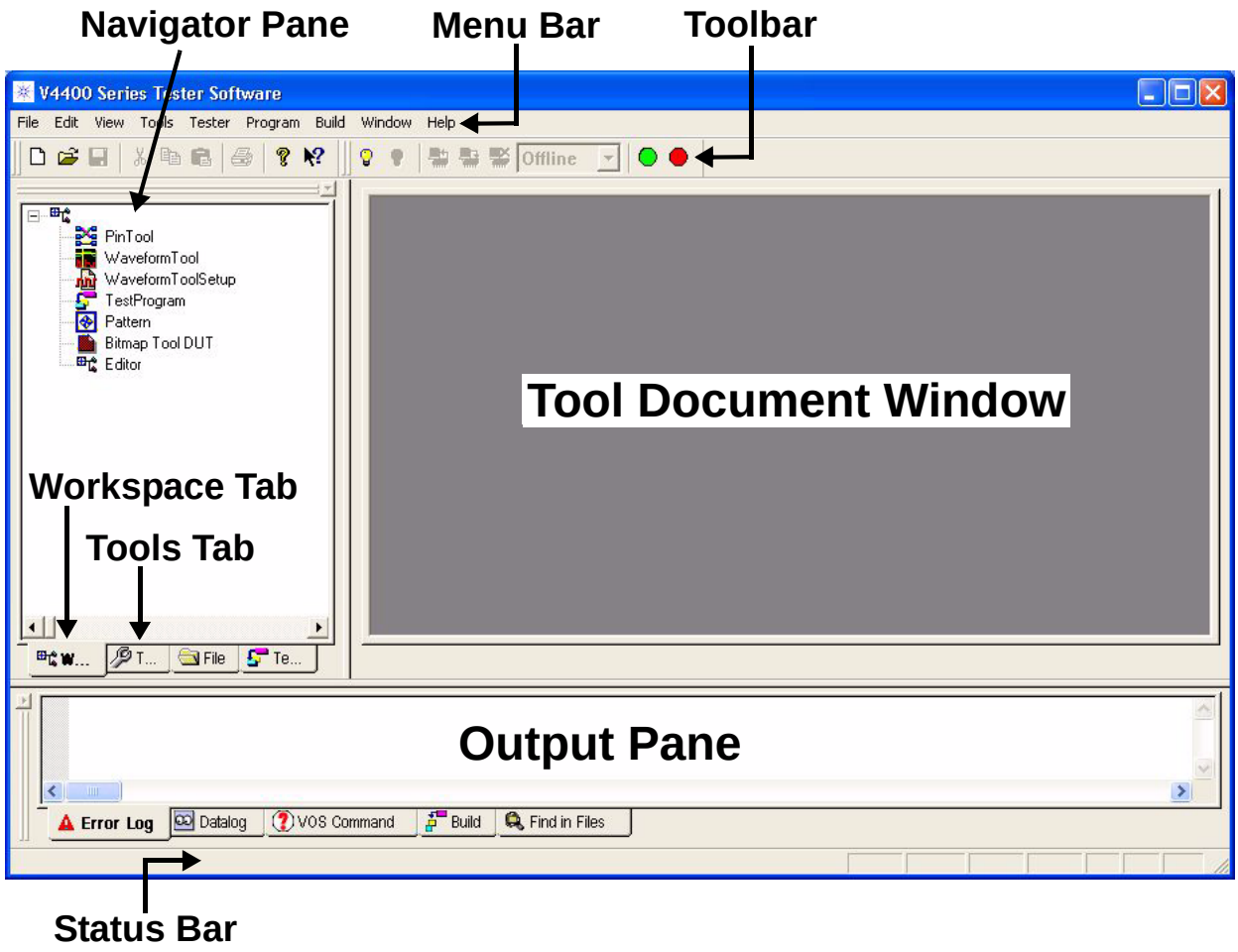


Figure 5-43. V4400 Series Tester Software IDE Main Window

2 Selecting the yellow light bulb Set Online toolbar button or corresponding `Tester > Set Online` command enables the IDE to connect to the tester when the Site Connect Status drop-down list box `Site: A1` Site: A1 is enabled as shown in the toolbar in Figure 5-44.

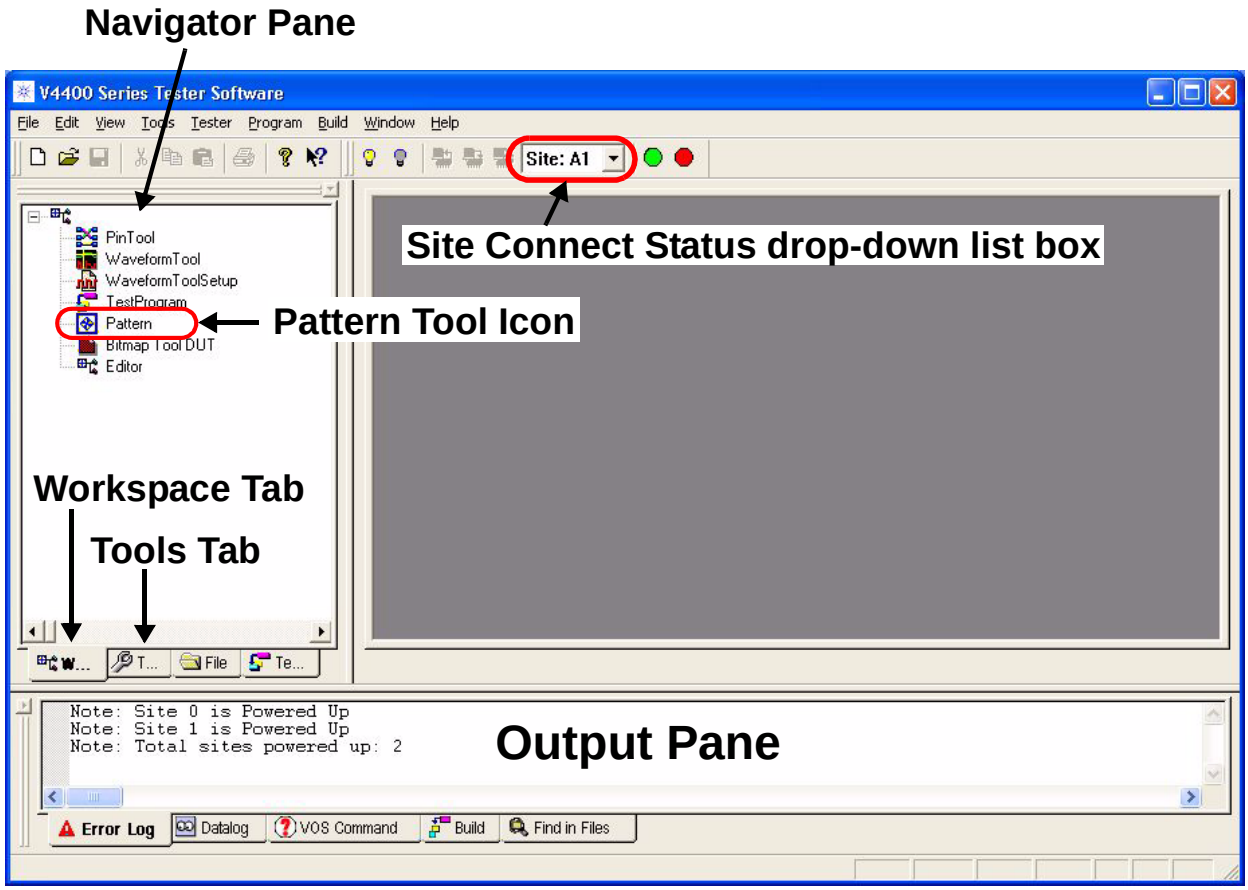


Figure 5-44. IDE Main Window Set Online

3 Choosing the site that the IDE connects to is done by selecting the down-arrow button on the right side of the Site Connect Status drop-down list box to display the available sites and selecting from the list (similar to Figure 5-45). Selecting a tool makes the connection to that site and disables the Site Connect Status drop-down list box.

Figure 5-45. Site Connect Status Drop-Down List Box

4 In the Navigator Pane, selecting the Tools tab icon displays its tab (Figure 5-46).

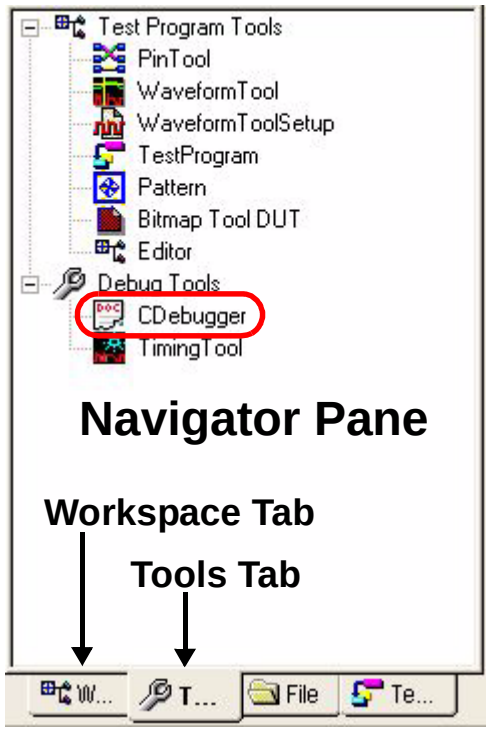


Figure 5-46. Navigator Pane Tools Tab

5 Double-clicking `CDebugger` under `Debug Tools` (Figure 5-46) displays the C Debugger as the active tool in the Tool Document window (Figure 5-47). Selecting the tool makes the connection to that site and disables the Site Connect Status drop-down list box. This also adds the C Debugger Cdeb (Cdeb) tab to the Navigator pane, its menu bar and toolbar, and displays the Workspace in the Navigator Pane.

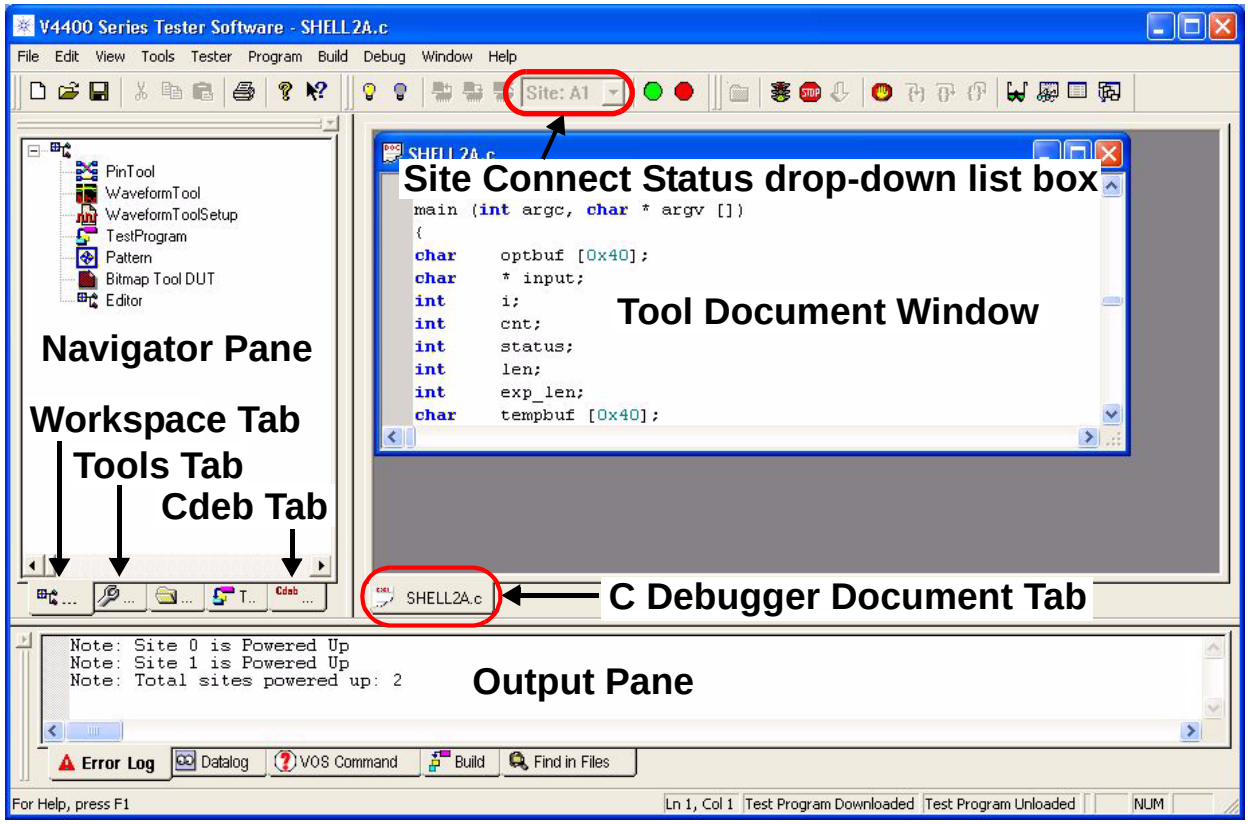


Figure 5-47. IDE Displaying C Debugger

6 Selecting the Cdeb tab in the Navigator pane displays its tab that lists all the source code file names and function names for the loaded test program (similar to Figure 5-48).

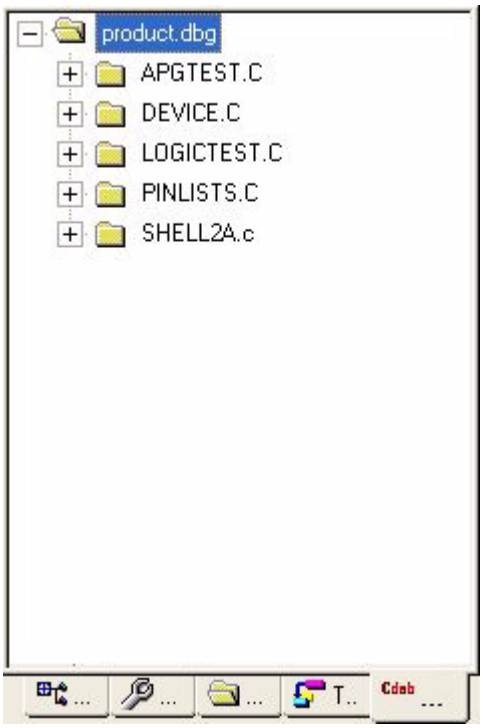


Figure 5-48. C Debugger Cdeb Tab

7 Navigating to and double-clicking the `LOGICTEST.C` > `logicDEEP_COUNT` function displays it in a window in the Tool Document Window (similar to Figure 5-49).

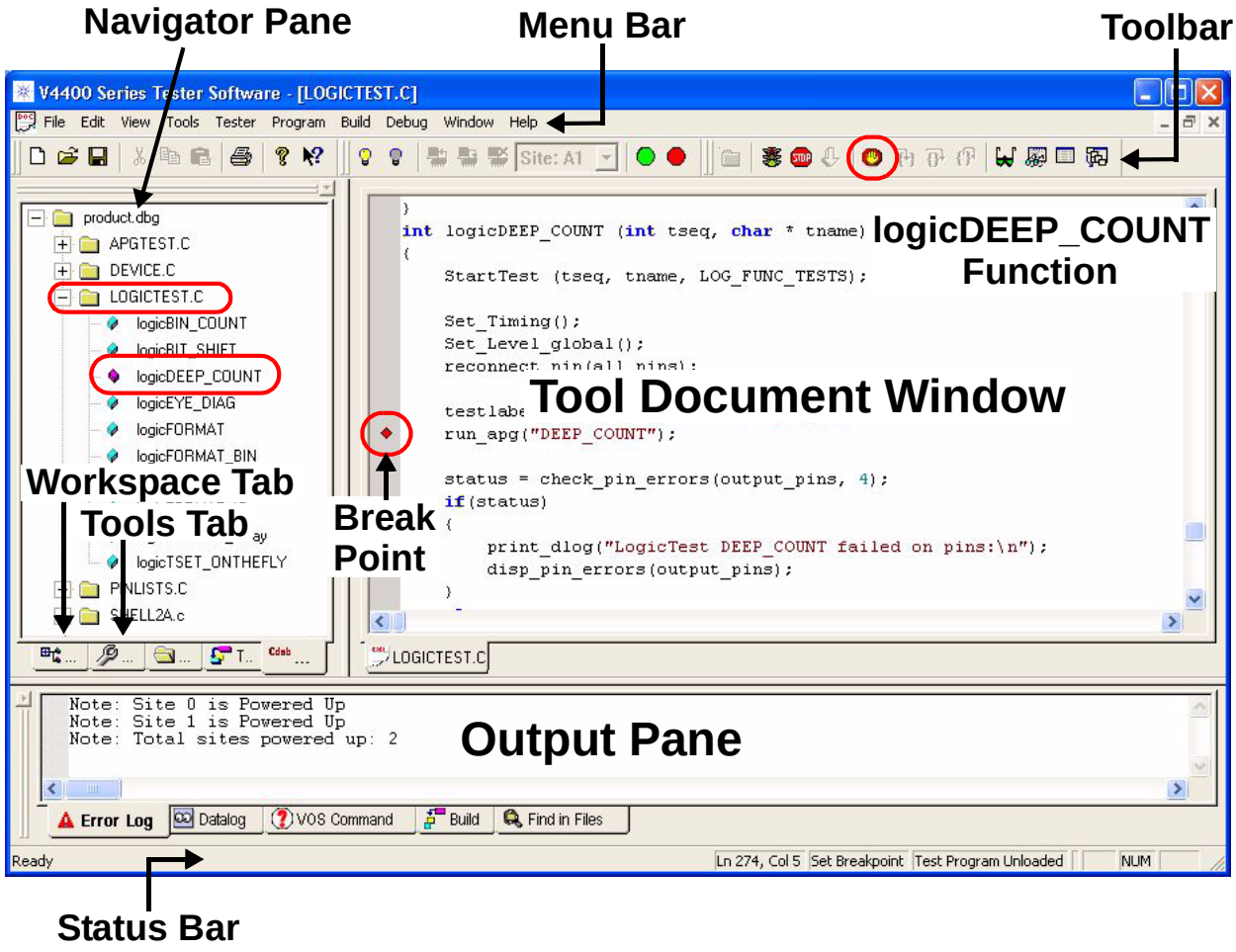


Figure 5-49. C Debugger Displaying Break Point

8 Before using the Pattern Tool, the test program has to be loaded and the break point needs to be set right before the `run_apg` command. Positioning the cursor in the source line shown in Figure 5-49 and selecting the `Debug` > `Break` command, the F9 key, or the Break Point button in the toolbar inserts a break point that displays as a red diamond tag in the gray margin on the left side of the source code. Note that the Status bar at the bottom of the window displays the line number (`Ln`) and column (`Col`) the cursor is active.

9 Selecting the `Debug` > `Run` command or the Run toolbar button launches the program and causes it to run to the break point (Figure 5-50). A green arrow displays over the break point where the program stops.

```
testlabel (tn + 1, "LogicTest DEEP_COUNT");
run_apg("DEEP_COUNT");
```

Figure 5-50. Run Test Program to Break Point

Displaying the Pattern Tool and Retrieving Pattern and Vector Information

In this section we use the Pattern Tool to perform the following tasks in preparation to run the APG to view and debug failures:

- Upload and display the pattern information in the Pattern Tool.
- Navigate to the pattern source code of an entry point.

1 Selecting the Workspace tab  in the Navigator Pane displays its tab that contains the `Pattern` icon (Figure 5-51).

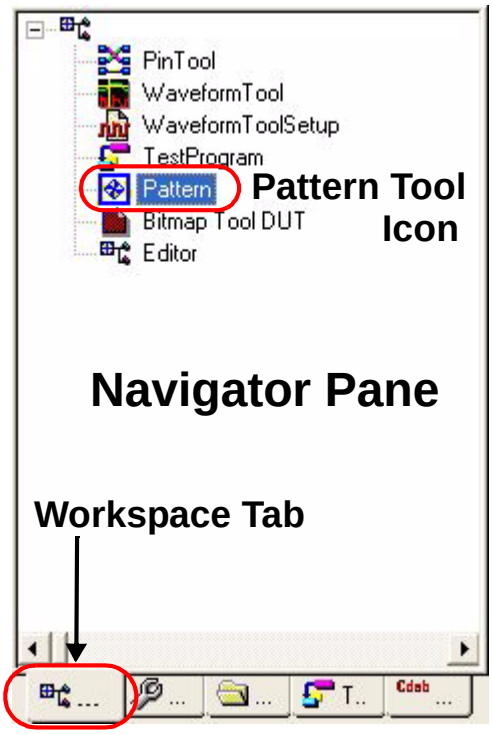


Figure 5-51. Navigator Pane's Workspace Tab

2 Double-clicking the `Pattern` icon displays a new Pattern Tool document with all the Pattern Tool window panes, menu bar, toolbar,

and other objects associated with the tool. Selecting its window's maximize button displays the IDE full-window (Figure 5-52).

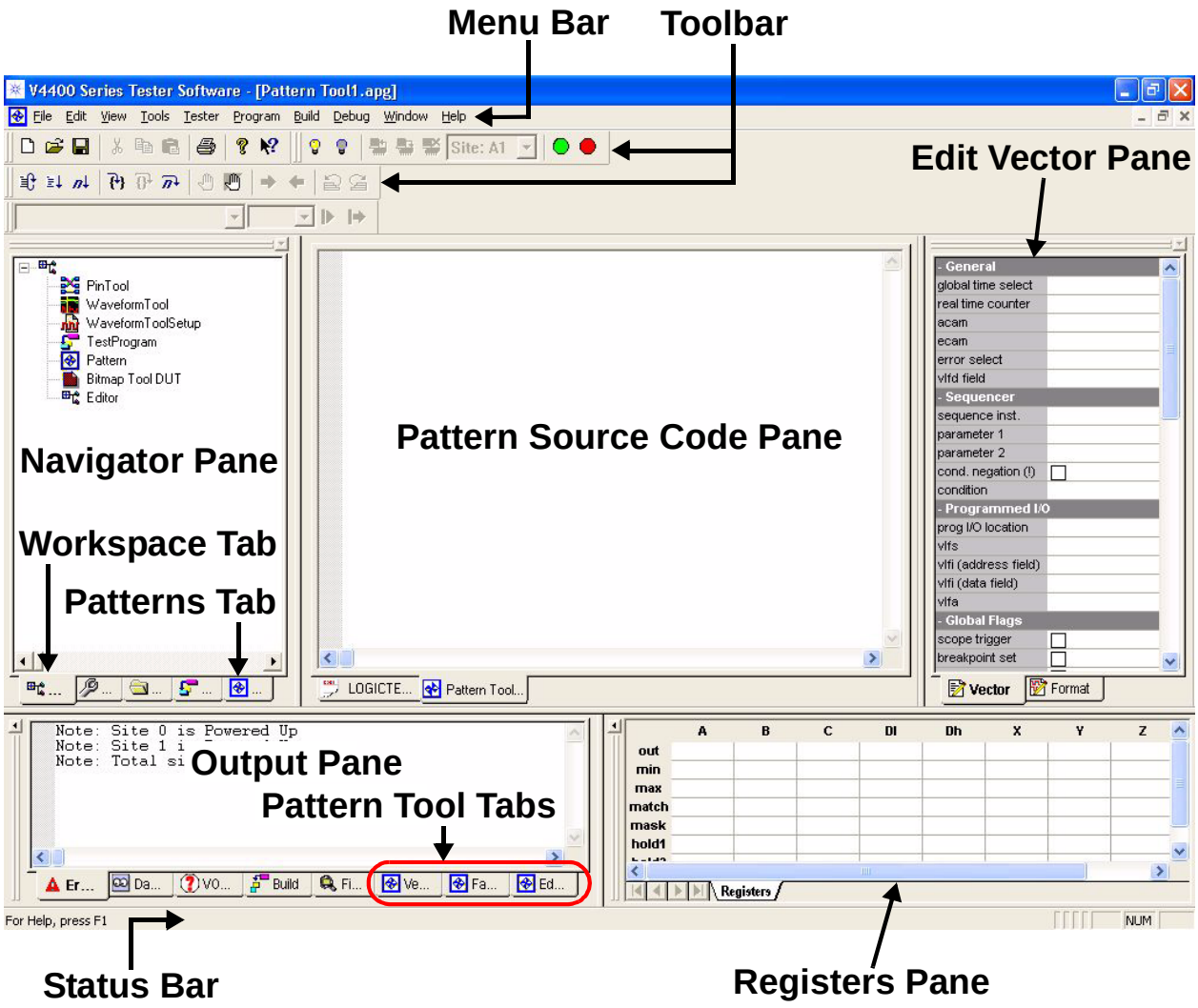


Figure 5-52. New Pattern Tool Document Window

3 Selecting the Patterns tab ... in the Navigator Pane displays the list of patterns currently in memory (similar to Figure 5-53). Under each pattern is a list of entry points.

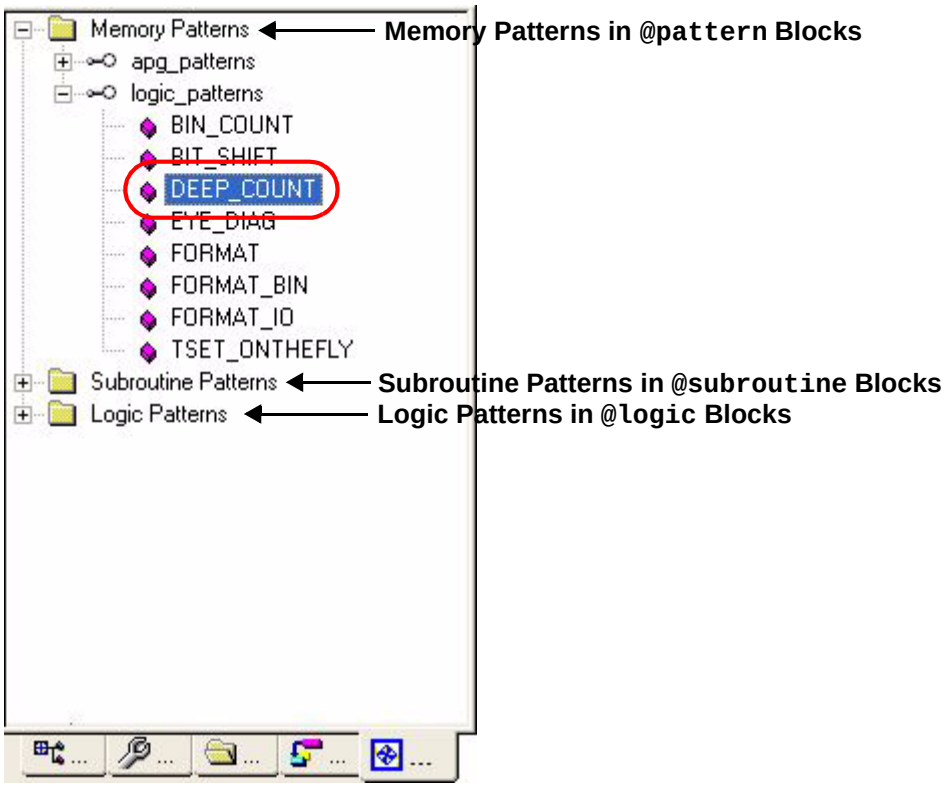


Figure 5-53. Patterns Tab Displaying Memory Contents

4 Double-clicking on the `DEEP_COUNT` entry point displays its source code in the Pattern Source Code Pane (similar to Figure 5-54). The yellow arrow in the Pattern Source Code Pane identifies the next vector to be executed. The green arrow indicates the vector we have navigated to.

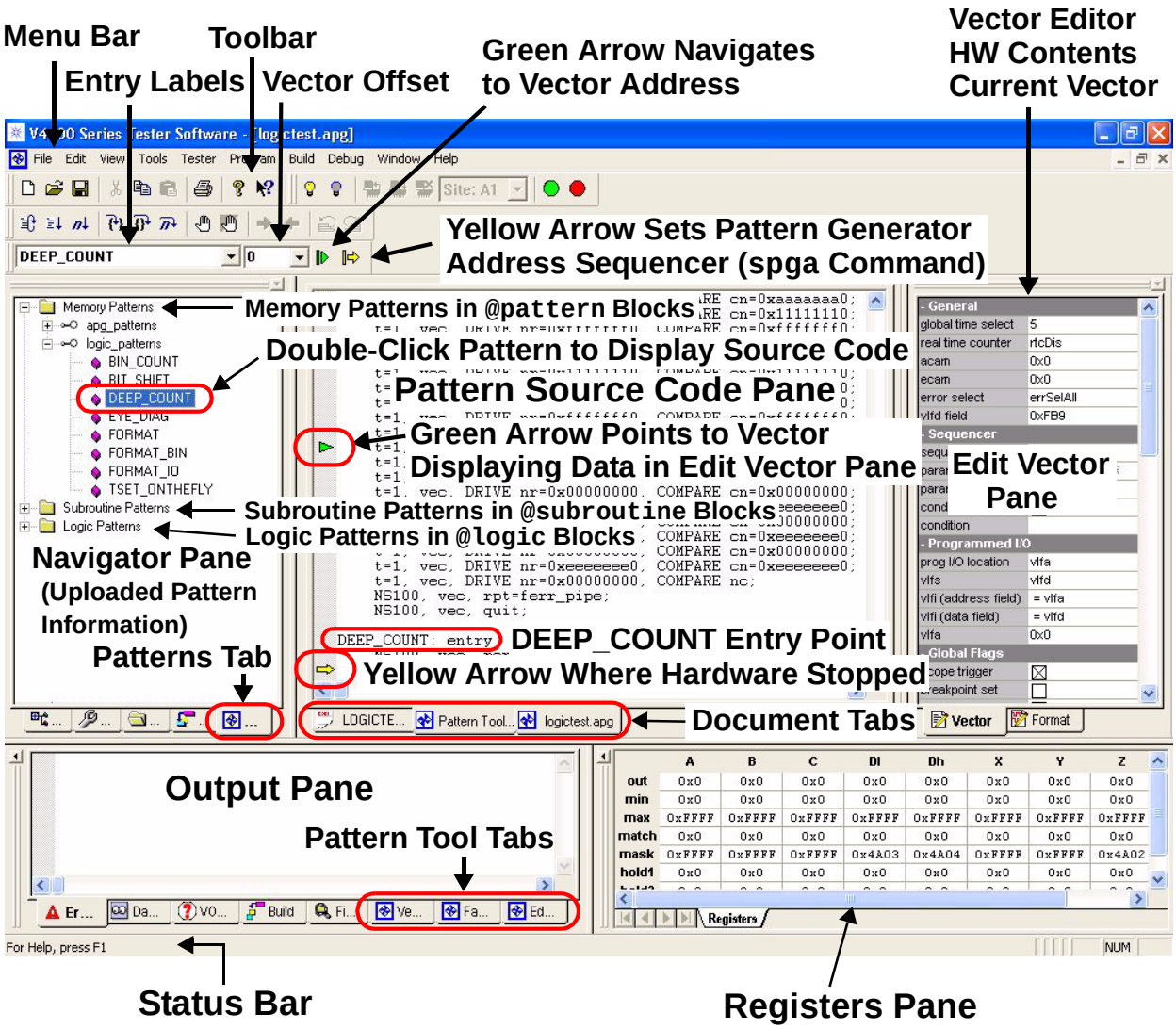


Figure 5-54. Pattern Tool Main Window

5 Positioning the cursor in a vector and right-clicking displays a pop-up menu with commands that are available in the Pattern Source Code Pane (Figure 5-55).

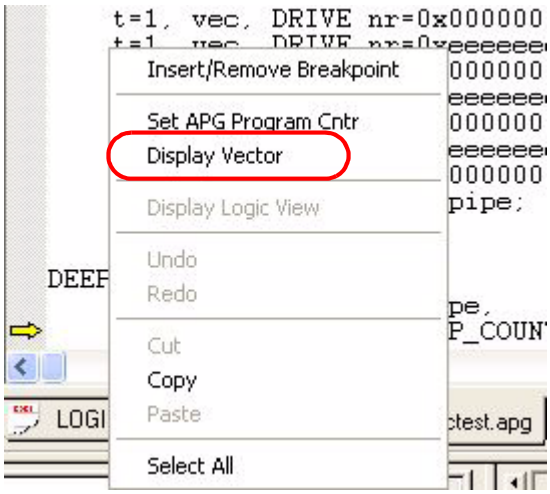


Figure 5-55. Pattern Source Code Pane Pop-Up Menu

6 Selecting the `Display Vector` command in the pop-up menu displays a green arrow at that vector and displays that vector's contents in the Edit Vector Pane (Figure 5-56).

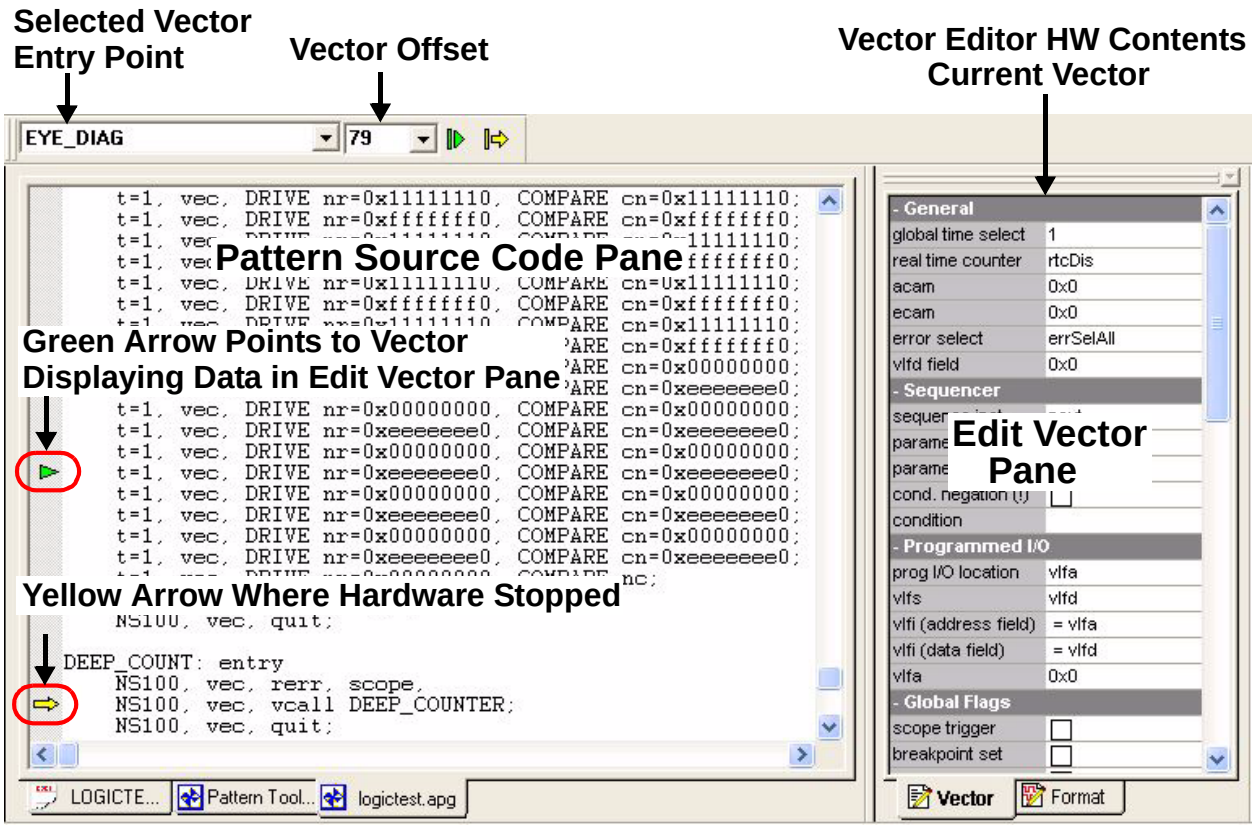


Figure 5-56. Displaying a Vector's Contents in the Edit Vector Pane

Running the APG and Viewing Failures

This section demonstrates how to run the APG and view pattern failures in preparation to debug and correct failures using the Pattern Tool.

1. Selecting the `Debug` > `Run` command or the Run toolbar button runs the APG from the current vector in the `DEEP_COUNT` entry point where the hardware is stopped at the yellow arrow.

2. Selecting the Failures tab Fail... in the Output Pane displays its tab showing a failure occurred executing the pattern (Figure 5-57). The Failures tab displays the entry point, offset, and failing pins for each failing vector.

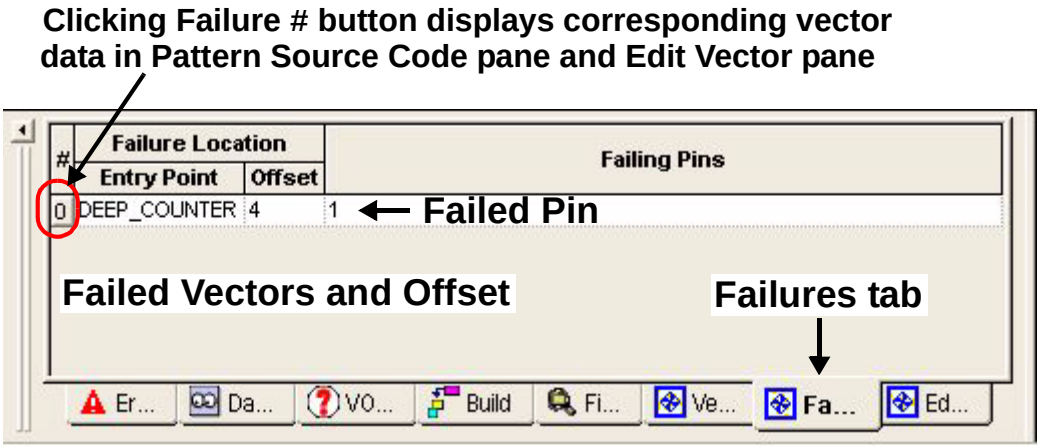


Figure 5-57. Output Pane Failures Tab

3 Clicking with the left mouse button on the failure `# 0` button navigates to a failing vector. The default behavior of navigating to failures in the Pattern Tool is to bring up the Pattern Source Code Pane view with the green arrow pointing at the selected vector and the contents of that vector displaying in the Edit Vector Pane (similar to Figure 5-58).

The failure points to the following vector:

```
t=10, DRIVE nr=0x4,  COMPARE cn=0x5; //4
```

The pin is failing because of the mismatch in the drive and compare data for the vector.

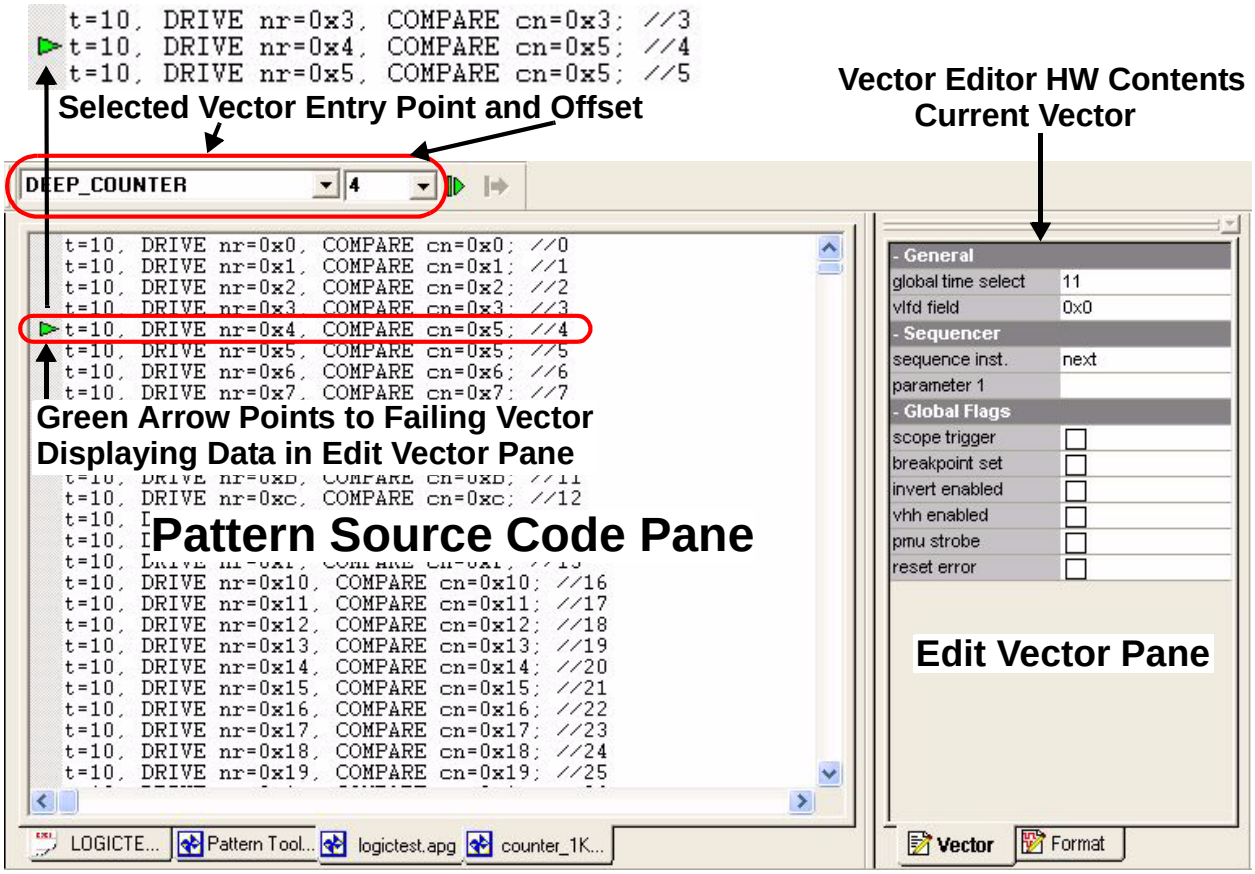


Figure 5-58. Pattern Source Code Pane Displaying Failed Vector

Using the Pattern Tool to Correct Failures

This section demonstrates how to view failures in the Logic View Display Pane with logic vectors, display the failing pin vector data on the Format tab Format in the Edit Vector Pane, correct the failing vector data, and rerun the pattern with no failures.

1 With the default behavior of navigating to failures being to bring up the Pattern Source Code Pane view (Figure 5-58), different views (logic and source code) can be selected by right clicking on a vector in the source code window to display a pop-up menu (Figure 5-59).

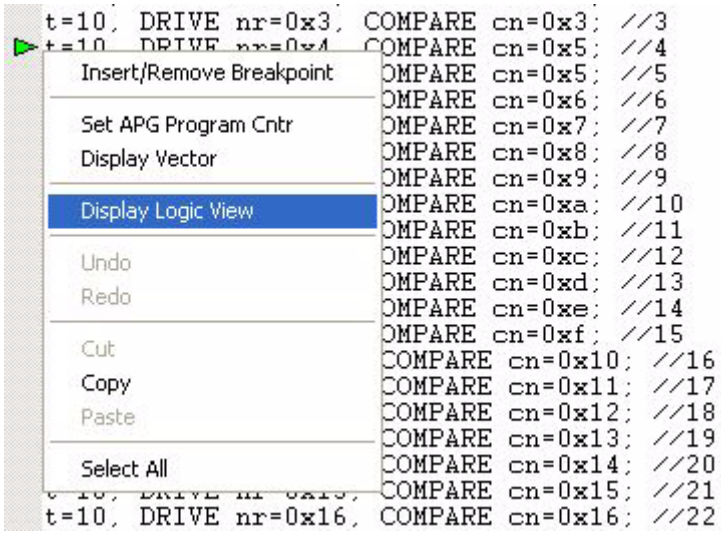


Figure 5-59. Pattern Source Code Pane Pop-Up Menu

2 If the current vector is a logic vector, then the `Display Logic View` command can be selected in the pop-up menu to display the Logic View Display Pane (Figure 5-60). The failing vector displays with a red boarder.

Tools > Properties > PatternTool Properties > Pattern Tools Properties Dialog Box > Logicview Tab Selected Display Fields

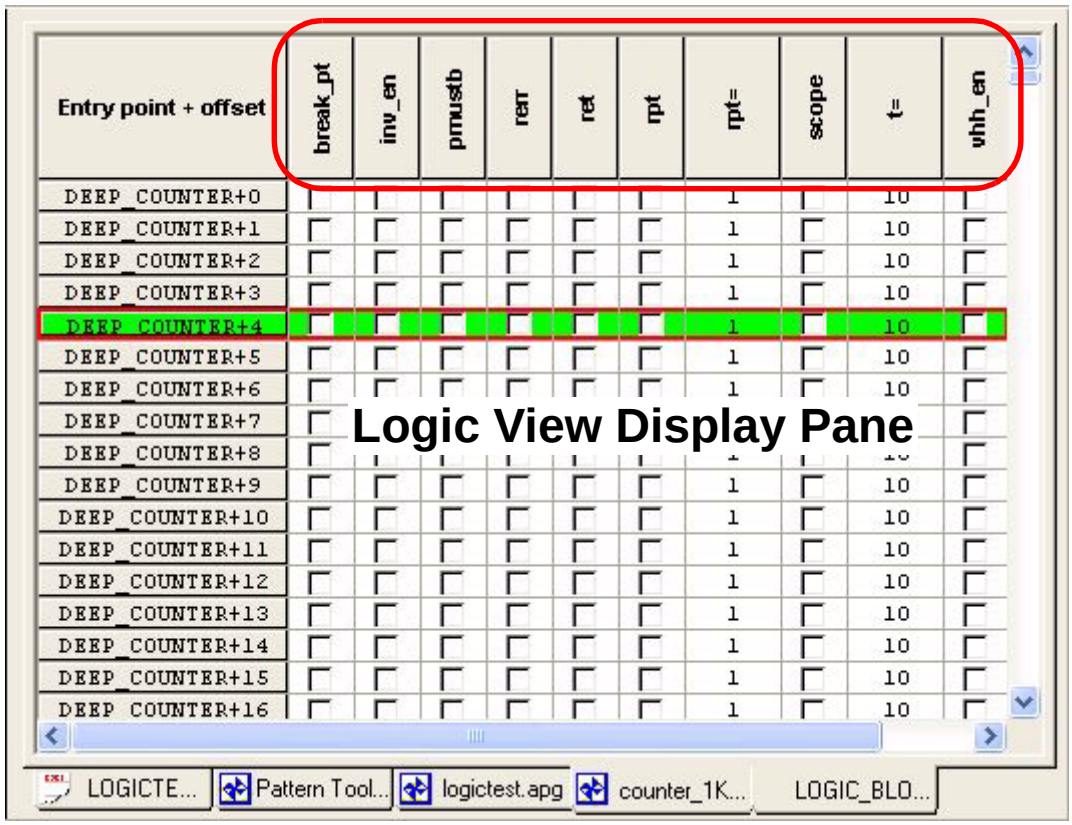


Figure 5-60. Logic View Display Grid

3 Selecting the Format tab in the Edit Vector Pane displays its tab (similar to Figure 5-61).

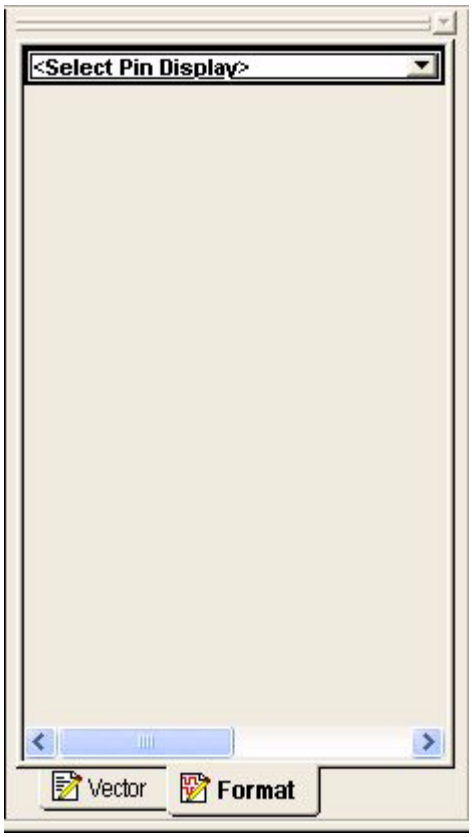


Figure 5-61. Edit Vector Pane Blank Format Tab

4 Selecting the `<Select Pin Display>` drop-down list box lists the available options (Figure 5-62).

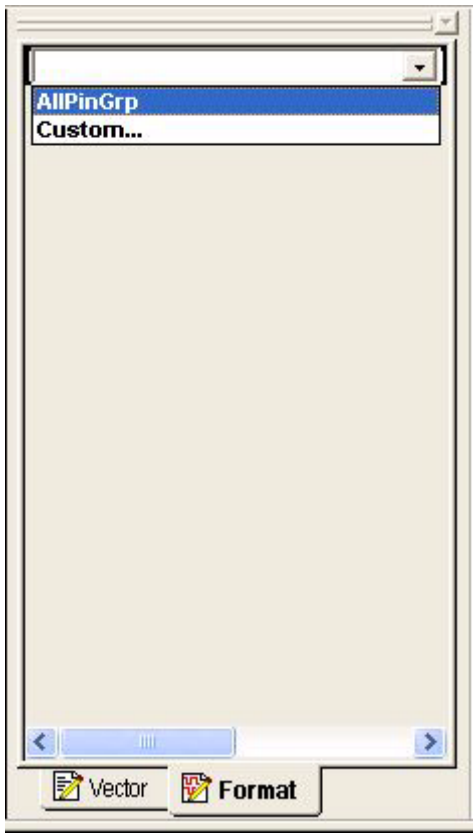


Figure 5-62. Edit Vector Pane Format Tab Drop-Down List Box

5 Selecting `AllPinGrp` displays the pin and pin group format and data information and the combined format and data information (similar to Figure 5-63). Its information comes from the .VEC file. The failing pin is in the `apg_outpins` group.

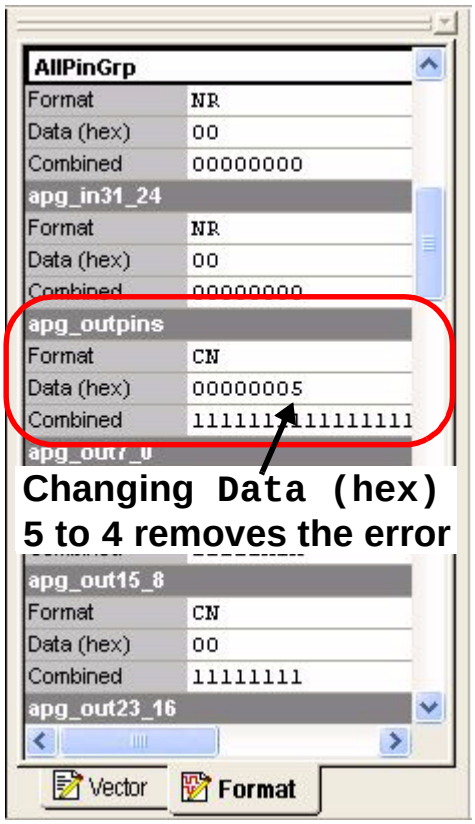


Figure 5-63. Edit Vector Pane Displaying Failure in apg_outpins Group

6 The failure is removed by changing the `Data (hex)` field `5` to a `4` (to match the drive data for that vector).

7 In the Patterns tab ... in the Navigator Pane, double-clicking the `DEEP_COUNT` entry point displays it once again in the Pattern Source Code Pane (similar to Figure 5-54 on page 197).

8 Selecting the Run toolbar button runs the APG from the current vector in the `DEEP_COUNT` entry point where the hardware is stopped at the yellow arrow.

9 Viewing the Failures tab Fail... in the Output Pane, the failure is gone (Figure 5-64).

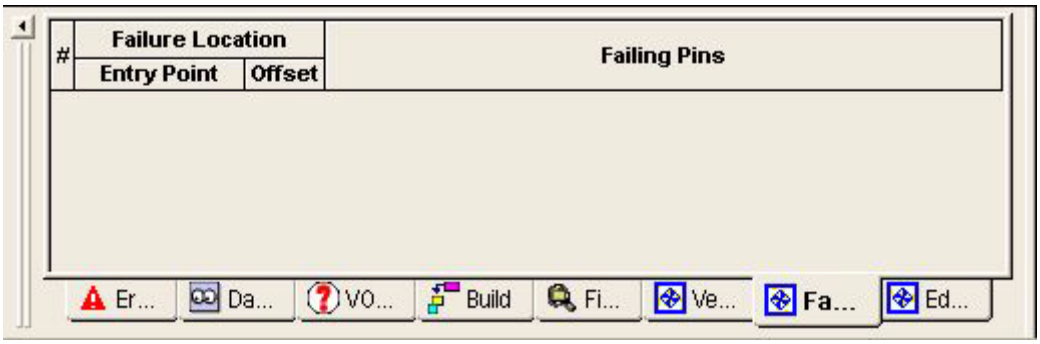


Figure 5-64. Output Pane Failures Tab

6

Waveform Tool

Introduction

This chapter provides information for the Versatest Series Waveform Tool. This tool displays the input patterns and the actual and expected output signals with pass/fail information. Its purpose is to help the test program developer to quickly debug patterns and analyze DUT behavior.

The Waveform Tool has online and offline modes. In online mode, the VK Test Station software must be running. In offline mode, the Waveform Tool can run as a stand-alone application within the IDE.

This chapter contains the following information about the Waveform Tool:

- "Waveform Tool Main Window" on page 211: Provides descriptions of the Waveform Tool main window and the Waveform Setup window functional areas, menus, menu commands, and dialog boxes.
- "Waveform Tool Getting Started" on page 255: Describes how to setup, capture, and display waveforms for analysis.

NOTE The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

Waveform Tool Main Window

The Waveform Tool consists of a Waveform Tool main window for displaying waveforms (similar to Figure 6-1) and a Waveform Setup window for setting up capture parameters (Figure 6-2 on page 212).

The Workspace tab in the Navigator pane displays two Waveform Tool icons (similar to Figure 6-1): `WaveformTool` and `WaveformToolSetup`. Double-clicking the `WaveformTool` icon displays the Waveform Tool main window. Double-clicking the `WaveformToolSetup` icon displays the default Waveform Setup window (Figure 6-2).

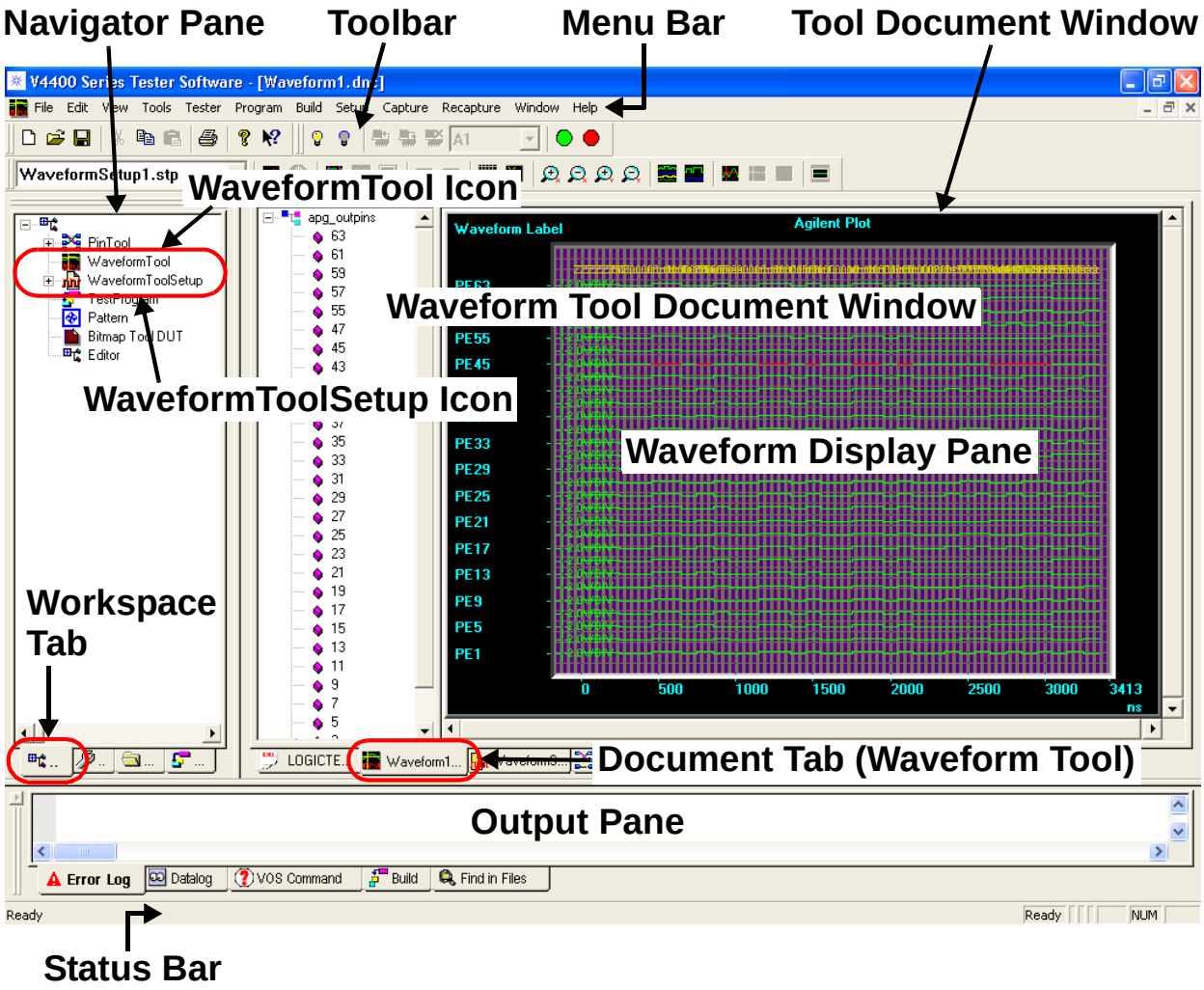


Figure 6-1. Waveform Tool Main Window

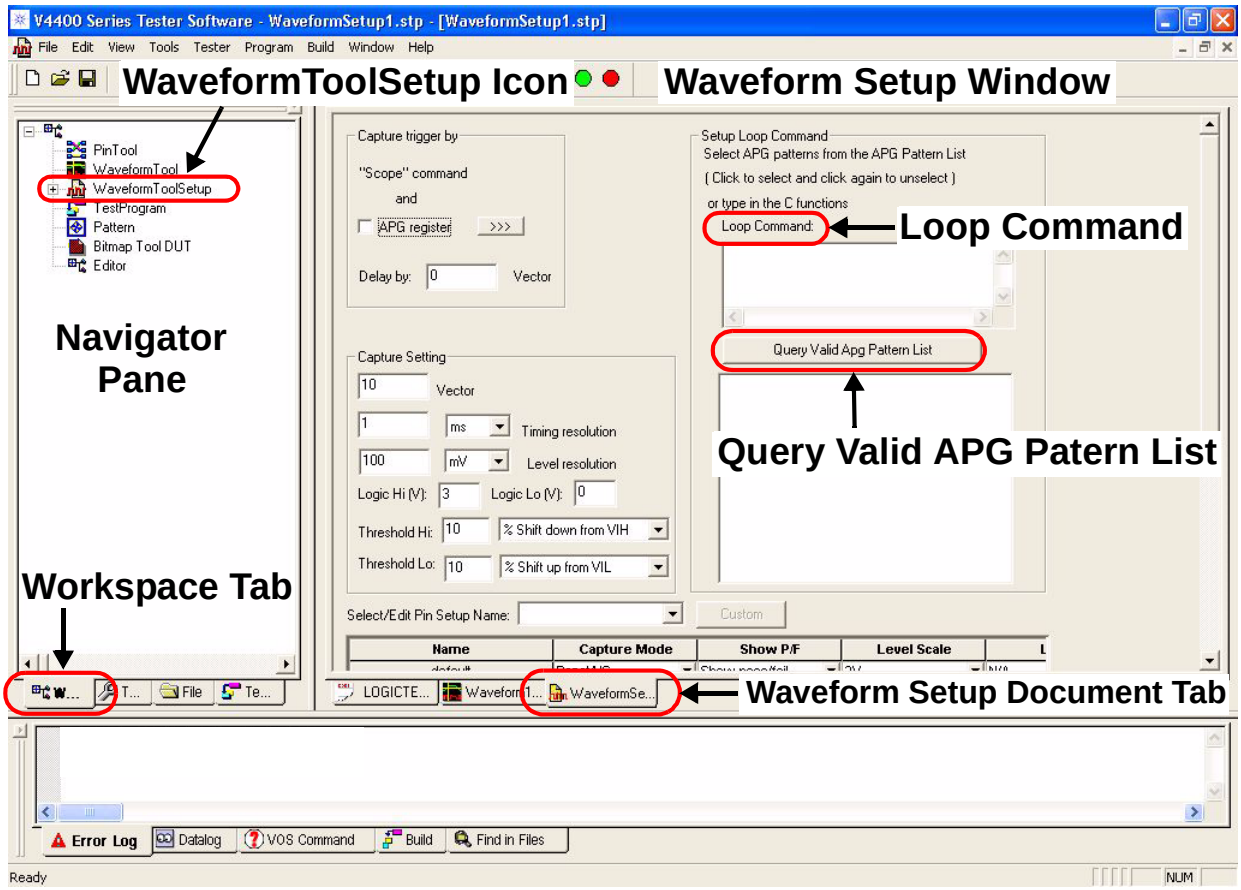


Figure 6-2. Waveform Setup Window

See the "Waveform Setup Window" section on page 244 for information about how to configure the waveform capture settings in preparation to capture the waveform in online mode.

The Waveform Tool main window (Figure 6-1) is composed of the following functional areas:

- Navigator Pane: See the `View > Navigator Pane` command on page 227
- Toolbar: See the `View > Toolbar` command on page 224
- Menu bar on page 213
- Tool Document Window (on page 242): Displays the following Waveform Tool components:
  - Tree View Pane on page 242
  - Waveform Display Pane page 243

  - Document Tabs: See the `View > Document Tabs` command on page 227

- Output Pane: See the `View > Output Pane` command on page 227
- Status Bar: See the `View > Status Bar` command on page 226

Menu Bar

The menu bar at the top of the Waveform Tool main window (Figure 6-1 on page 211) contains the following 12 pull-down menus from which you select commands for controlling functionality such as capturing waveforms and changing display features:

- File menu on page 213
- Edit menu on page 220
- View menu on page 223
- Tools menu on page 231
- Tester menu on page 234
- Program menu on page 235
- Build menu on page 236
- Setup menu on page 237
- Capture menu on page 239
- Recapture menu on page 239
- Window menu on page 240
- Help menu on page 241

File Menu

Selecting File in the menu bar opens the menu in Figure 6-3.

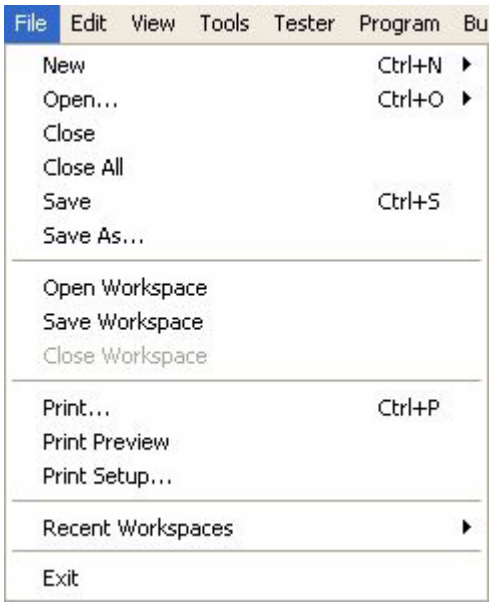


Figure 6-3. File Menu

The File menu contains the following commands:

- New command on page 215
- Open command on page 217
- Close command on page 219
- Close All command on page 219
- Save command on page 219
- Save As command on page 219
- Open Workspace command on page 219
- Save Workspace command on page 219
- Close Workspace Command on page 220
- Print command on page 220
- Print Preview command on page 220
- Print Setup command on page 220
- Recent Workspaces on page 220
- Exit command on page 220

New Command (File Menu)

Displays the New command submenu (Figure 6-4) that allows you to display a new Workspace or create new IDE documents. The New toolbar button displays a New dialog box that lists the same items to select as the submenu.

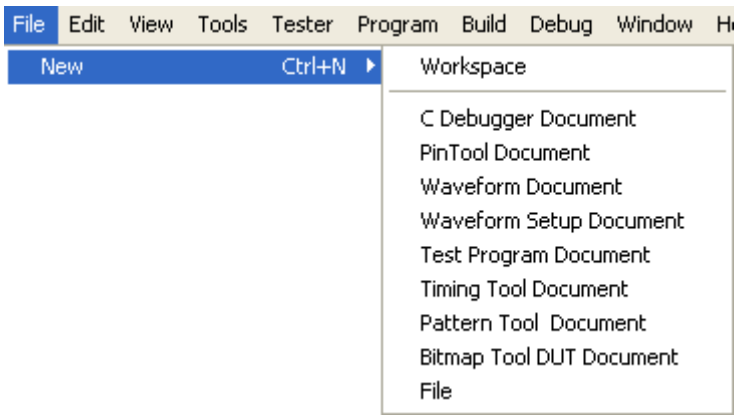


Figure 6-4. File > New Command Submenu

The New command submenu contains the following commands:

- Workspace command on page 215
- C Debugger Document command on page 216
- Pin Tool Document command on page 216
- Waveform Document command on page 216
- Waveform Setup Document command on page 216
- Test Program Document command on page 216
- Timing Tool Document command on page 216
- Pattern Tool Document command on page 216
- Bitmap Tool DUT Document command on page 216
- File command on page 216

Workspace Command (New Command Submenu)

Displays as the active Workspace its default with its corresponding Menu bar, Toolbar, Navigator pane, Output pane, and Status bar.

C Debugger Document Command (New Command Submenu)

Displays as the active document a blank C Debugger document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

PinTool Document Command (New Command Submenu)

Displays as the active document a blank PinTool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Document Command (New Command Submenu)

Displays as the active document a blank Waveform Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Setup Document Command (New Command Submenu)

Displays as the active document a blank Waveform Setup Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Test Program Document Command (New Command Submenu)

Note currently supported by the IDE.

Timing Tool Document Command (New Command Submenu)

Displays as the active document a blank Timing Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and graphical display window), Output pane, and Status bar.

Pattern Tool Document Command (New Command Submenu)

Displays as the active document a blank Pattern Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Bitmap Tool DUT Document Command (New Command Submenu)

Displays an Open dialog box from which you open a DUT Description file (.dut) to display a blank Bitmap Tool document with the loaded DUT file and corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

File Command (New Command Submenu)

Not currently supported by the IDE.

Open Command (File Menu)

Displays the Open command submenu (Figure 6-5) that allows you to open a Workspace or IDE documents from the submenu list. The Open toolbar button displays a generic Open dialog box from which you can open a selection listed in the submenu.

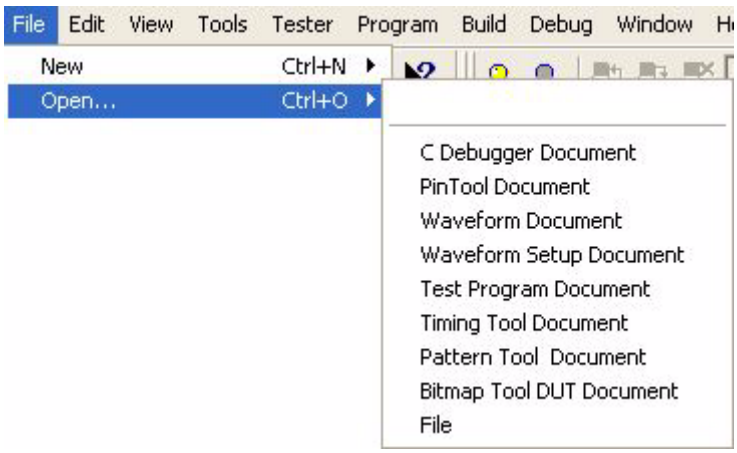


Figure 6-5. Open Command Submenu

The Open command submenu contains the following commands that display an Open dialog box similar to Figure 6-6:

- C Debugger Document command on page 218
- PinTool Document command on page 218
- Waveform Document command on page 218
- Waveform Setup Document command on page 218
- Test Program Document command on page 218
- Timing Tool Document command on page 218
- Pattern Tool Document command on page 219
- Bitmap Tool DUT Document command on page 219
- File command on page 219

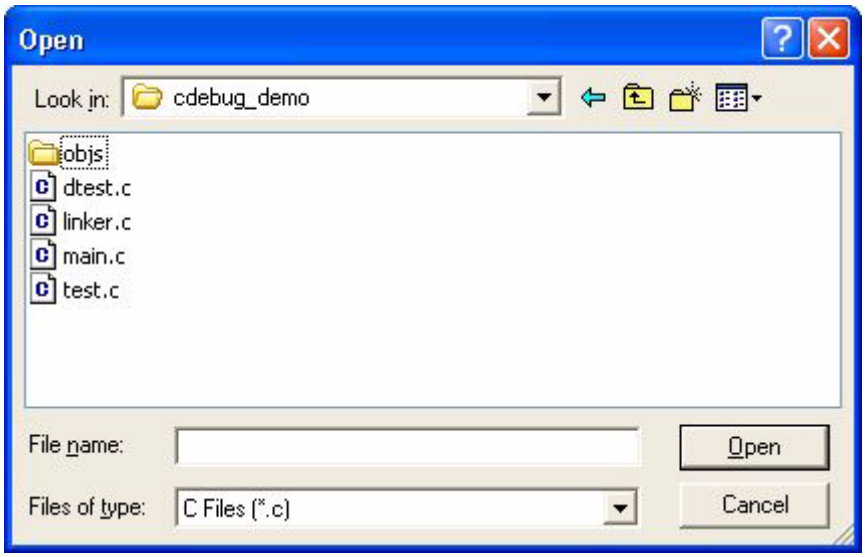


Figure 6-6. File > Open Dialog Box

C Debugger Document Command (Open Command Submenu)

Displays an Open dialog box (Figure 6-6) to select a previously saved C Debugger Tool document file with a *.cof extension.

PinTool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 6-6) to select a previously saved PinTool document file with a *.pin file extension.

Waveform Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 6-6) to select a previously saved Waveform document file with a *.dnc file extension.

Waveform Setup Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 6-6) to select a previously saved Waveform Setup document file with a *.stp file extension.

Test Program Document Command (Open Command Submenu)

Note currently supported by the IDE.

Timing Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 6-6) to select a previously saved Timing Tool document file with a *.vtt file extension.

Pattern Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 6-6) to select a previously saved Pattern Tool document file with an *.apg2 file extension.

Bitmap Tool DUT Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 6-6) to select a previously saved Bitmap Tool DUT definition document file with a *.dut file extension.

File Command (Open Command Submenu)

Note currently supported by the IDE.

Close Command (File Menu)

Closes the active tool document.

Close All Command (File Menu)

Closes all tool documents.

Save Command (File Menu)

 Saves the active document file.

Save As Command (File Menu)

Displays the Save As dialog box to save the active tool document file.

Open Workspace Command (File Menu)

Displays an Open Workspace dialog box with a *.wsp extension. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace and opening another. The Workspace consists of the tools, layout, and open documents.

Save Workspace Command (File Menu)

Saves the current workspace with a *.wsp extension. The Workspace consists of the tools, layout, and open documents. This command enables you to save the tools, layout, and open documents' current state, and later resume with the same Workspace by using the `File > Open Workspace` command.

Close Workspace Command (File Menu)

Closes the current workspace. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace.

Print Command (File Menu)

 Prints the waveform in the active waveform document window

Print Preview Command (File Menu)

Not supported by the Waveform Tool.

Print Setup Command (File Menu)

Displays a printer setup dialog box that allows you to select and configure a printer.

Recent Workspaces Command (File Menu)

Displays a Recent Workspaces submenu from which you can select a workspace.

Exit Command (File Menu)

Closes the IDE. If the workspace or any other tool document files have changed, you will be asked if you would like to save them.

Edit Menu

Selecting Edit in the menu bar opens the menu in Figure 6-7.

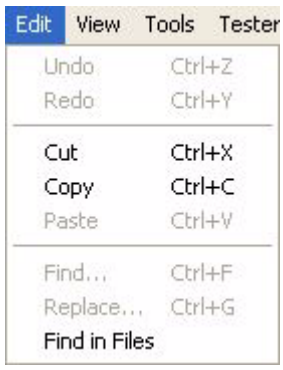


Figure 6-7. Edit Menu

The Edit menu contains the following commands:

- Undo command on page 221
- Redo command on page 221
- Cut command on page 221
- Copy command on page 221
- Paste command on page 221
- Find command on page 221
- Replace command on page 221
- Find in Files command on page 222

Undo Command (Edit Menu)

Not currently supported by the Waveform Tool.

Redo Command (Edit Menu)

Not currently supported by the Waveform Tool.

Cut Command (Edit Menu)

Cuts the selected waveform from the Waveform Tool Document window. The waveform can only be cut when it has been defined as an individual pin in the APG code and in the Waveform Setup window. It can not be part of a bus of pins (group).

Copy Command (Edit Menu)

Copies the waveform in the in the Waveform Tool Document window (similar to Figure 6-1 on page 211) to the Clipboard so it can be pasted into a Word document or other application.

Paste Command (Edit Menu)

Not currently supported by the Waveform Tool.

Find Command (Edit Menu)

Not currently supported by the Waveform Tool.

Replace Command (Edit Menu)

Not currently supported by the Waveform Tool.

Find in Files Command (Edit Menu)

Displays the Find in Files dialog box (Figure 6-8) that provides search capability based on the criteria you specify.

The dialog box contains the following fields:

- `Find What` – Enter the name of symbol or text you would like to find.
- `In files/file types` – The type of files to look in (referenced by extension), or specific files that you would like to search (for example, "*.c" or ".apg", or "p:\src\myprogram\file1"). If you would like to specify multiple types of files, separate each term by a space, for example, "*.c *.apg p:\src\myprogram\file1".
- `In folder` – Enter the name of the directories you would like to search in. If you click on the button next to this field (labeled "..."), you can select a folder through a GUI file dialog interface.
- `Match whole word only` – If you check this box, only the lines containing the target as a whole (and not as part of another word) will be displayed.
- `Match case` – If you check this box, the lines containing the target will be displayed only if the cases match.
- `Regular Expressions` – If you check this box, the text in the `Find What` field will be interpreted as a regular expression,
- `Look in subfolders` – If you check this box, in addition to searching the folders specified in the `In Folder` field, the subdirectories of the folders specified in the `In Folder` field will be searched.
- `Find in Workspace` – If you check this box, only the files contained in the workspace will be searched. The "In Folder" field will be ignored.

After clicking on the Find button, the Find in Files output tab will be brought to the front in the Output Pane, the results from the search process will be displayed as they are generated. If you double-click on any of the lines, the file specified on that line will be opened, and the file window will be scrolled to the location specified by the line you double-clicked.

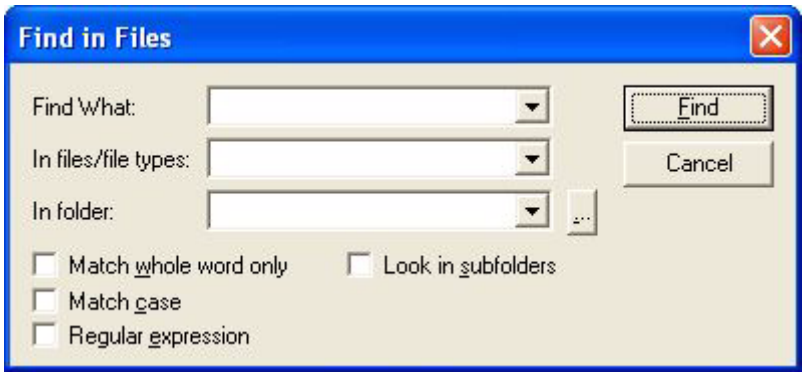


Figure 6-8. Find in Files Dialog Box

View Menu

Selecting View in the menu bar opens the menu in Figure 6-9.

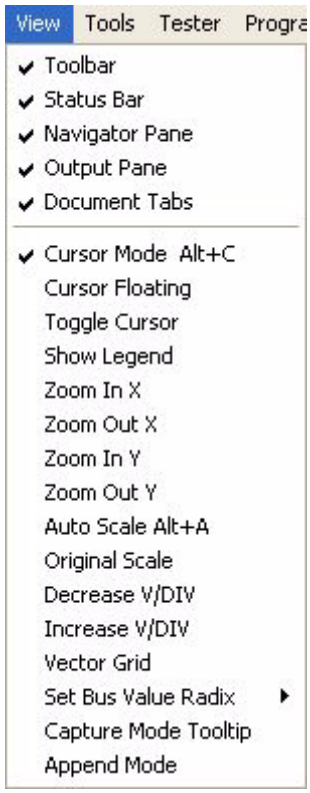


Figure 6-9. View Menu

The View menu contains the following commands:

Toolbar Command (View Menu)

Displays or hides the toolbar shown in Figure 6-10. The toolbar displays at the top of the Waveform Tool main window when a ✓ displays in front of its command in the View menu. Clicking on the buttons in the toolbar give you quick access to many of the menu bar commands. Clicking in the Display pane activates the associated toolbar buttons.

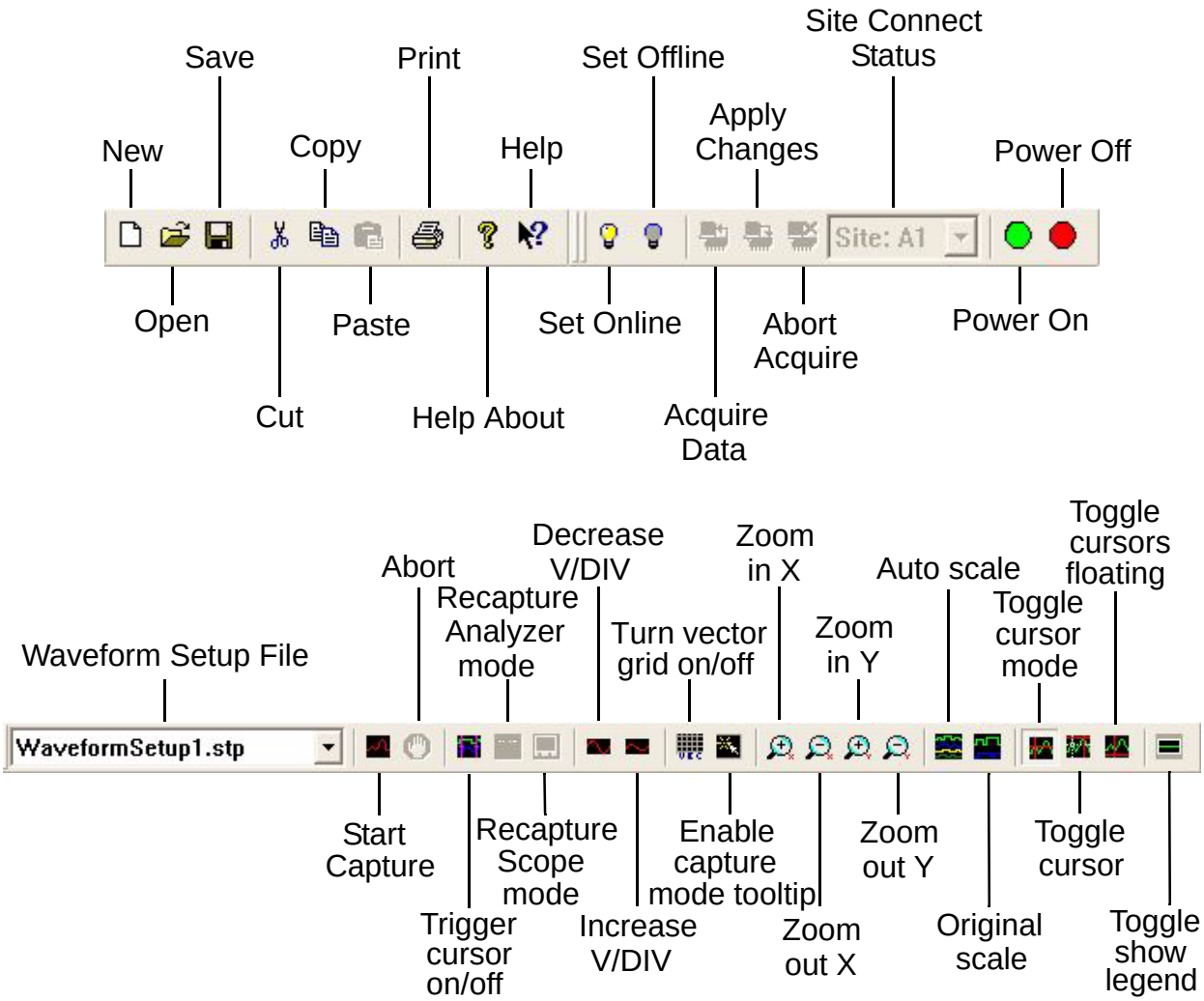


Figure 6-10. Waveform Tool Toolbar

The toolbar contains the following command buttons:

- File > New on page 215
- File > Open on page 217
- File > Save on page 219
- Edit > Cut on page 221
- Tester > Set Online on page 234
- Tester > Set Offline on page 235
- Tester > Acquire Data on page 235 (not supported by Waveform Tool)
- Tester > Apply Changes on page 235 (not supported by Waveform Tool)

 Edit > Copy the plot on page 221

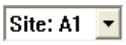
 Edit > Paste on page 221

 File > Print on page 220

 Help > About on page 241

 Help > Help on page 241

 Tester > Abort Acquire on page 235 (not supported by Waveform Tool)



IDE Site Connect Status

 Tester > Power On on page 235

 Tester > Power Off on page 235

Waveform Setup File

 Capture > Start capture on page 239

 Capture > Abort on page 239

 Setup > Recapture setting (Trigger cursor on/off) on page 238

 Recapture > Recapture with Logic Analyzer mode on page 240

 Recapture > Recapture with Scope mode on page 240

 View > Decrease V/DIV on page 229

 View > Increase V/DIV on page 229

 View > Turn vector grid on/off on page 230

 View > Enable capture mode tooltip on page 230

 View > Zoom In X on page 229

 View > Zoom Out X on page 229

 View > Zoom In Y on page 229

 View > Zoom Out Y on page 229

 View > Auto scale on page 229

 View > Original scale on page 229

 View > Toggle cursor mode on page 227

 View > Toggle cursor on page 228

 View > Toggle cursors floating on page 228

 View > Toggle show legend on page 229

Status Bar Command (View Menu)

Displays or hides the Status Bar (Figure 6-1 on page 211). The Status Bar displays at the bottom of the Waveform Tool main window when a ✓ displays in front of its command in the View menu. The Status Bar provides information about the current state of what you are viewing in the window and any other status-oriented information.

Navigator Pane Command (View Menu)

Displays the Navigator Pane (similar to Figure 6-1 on page 211) when a ✓ displays in front of its command in the View menu.

The Waveform Tool is associated with the `WaveformTool` and `WaveformToolSetup` icons on the Workspace Tab in the Navigator Pane.

Output Pane Command (View Menu)

Displays the Output Pane (similar to Figure 6-1 on page 211) when a ✓ displays in front of its command in the View menu. The Waveform Tool is associated with the following tabs in the Output Pane:

- `VOS Command` tab: The `VOS Command` tab is enabled when the IDE is set online by the selecting the yellow Set Online toolbar button or the corresponding `Tester > Set Online` command. The VOS Command tab allows you to enter VOS terminal commands and display the results on the tab and in the corresponding test site window in the VK Test Station main window. See the "VOS Terminal Commands" chapter in the *Command Reference Volume 2* for the available commands.
- `Find in Files` tab: This tab displays output from a Find In Files process as it is generated from the results of the `Edit > Find In Files` command dialog box (Figure 6-8 on page 223).

Document Tabs Command (View Menu)

Displays the Document Tabs at the bottom of the Tool Document Window (similar to Figure 6-1 on page 211) when a ✓ displays in front of its command in the View menu.

Cursor Mode Command (View Menu)

 Displays a red horizontal cursor line (y = voltage) and a red vertical cursor line (x = time) through the waveform plot (similar to Figure 6-11). It also displays in white text in the lower left corner of the document window the voltage and time at the plot coordinates where the two lines intersect. Pressing the left ← and right → arrow keys moves the red vertical cursor line, and pressing the up ↑ and down ↓ arrow keys moves the horizontal red cursor line, and the voltage/time values displayed in the lower left change as the cursors move.

Selecting a waveform to highlight it moves the red horizontal and vertical cursors to beginning of that waveform. Pressing the Ctrl key and clicking and dragging the mouse cursor allows you to zoom in on the selected region.

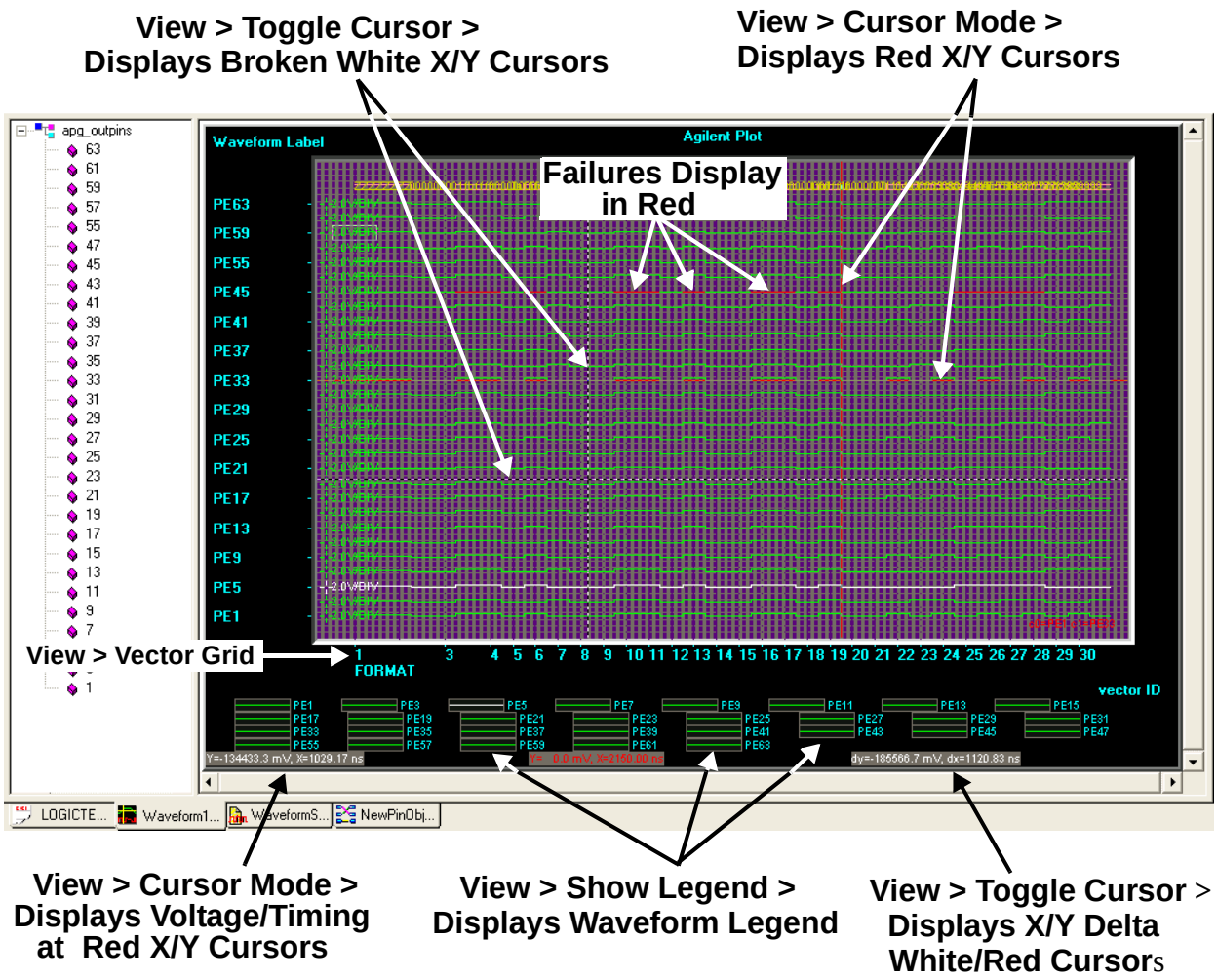


Figure 6-11. Waveform Tool Display Features

Cursor Floating Command (View Menu)

Floats the various horizontal and vertical cursors that can display in the document window (Figure 6-11) when a ✓ displays in front of the command. Otherwise, the cursors attach to waveform capture data points.

Toggle Cursor Command (View Menu)

Displays a broken white horizontal cursor line and a broken white vertical line through the plot (similar to Figure 6-11 on page 228). The corresponding x/y delta from the red horizontal lines displays in white text in the lower right corner of the document window.

Show Legend Command (View Menu)

 Displays the legend for all of the waveforms at the bottom of the document window that identifies the channels with the corresponding channel number (similar to Figure 6-11 on page 228). Selected waveforms display with white lines in the legend.

Zoom In X Command (View Menu)

 Zooms in on the waveform document window to magnify the waveform X axis

Zoom Out X Command (View Menu)

 Zooms out in the waveform document window to reduce the magnification of the waveform X axis

Zoom In Y Command (View Menu)

 Zooms in on the waveform document window to magnify the waveform Y axis V/DIV.

Zoom Out Y Command (View Menu)

 Zooms out in the waveform document window to reduce the magnification of the waveform Y axis V/DIV.

Auto Scale Command (View Menu)

 Displays all waveform data in the waveform document window.

Original Scale Command (View Menu)

 Returns the waveform document window to its original scale when the plot was captured.

Decrease V/DIV Command (View Menu)

 Decreases the voltage/division for a selected waveform.

Increase V/DIV Command (View Menu)

 Increases the voltage/division for a selected waveform.

Vector Grid Command (View Menu)

Toggles the X-axis scale display at the bottom of the waveform document window to display in either a time scale in ns or vectors. The X axis displays in vectors when a ✓ displays in front of the command (similar to Figure 6-11 on page 228). The first vector on the left end of the X axis is the entry point in the pattern, and the vectors to the right on the X axis are offset from the entry point. The X axis displays a time scale in ns when a ✓ does not display in front of the command (similar to Figure 6-1 on page 211).

Set Bus Value Radix Command (View Menu)

Displays the Set Bus Value Radix submenu (Figure 6-12). The selection in this submenu specifies whether bus values in the waveform document window display in hex, binary, or octal.

Figure 6-12. Set Bus Value Radix Submenu

Capture Mode Tooltip Command (View Menu)

Displays a small blue diamond-shaped vector boundary and ground marker on each waveform plot, and also displays the capture mode for a waveform vector when you position the cursor over a blue marker (Figure 6-13).

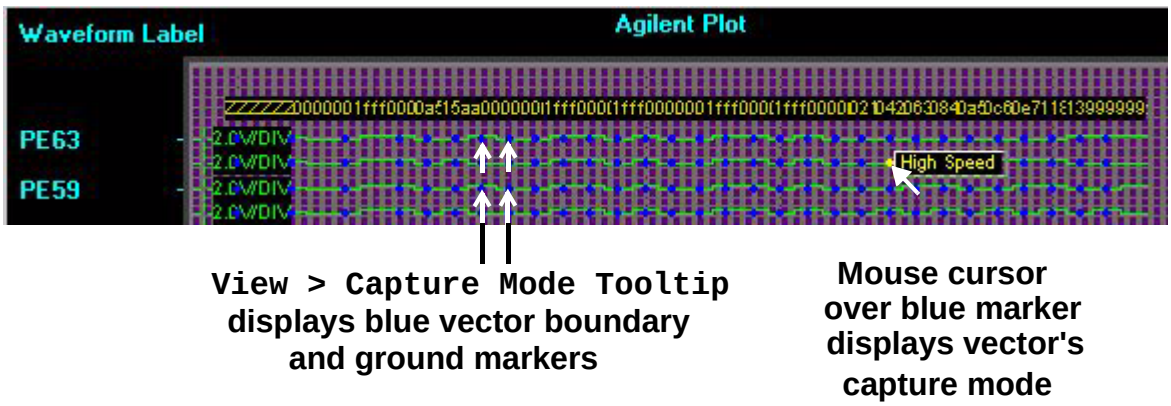


Figure 6-13. Capture Mode Tooltip

Append Mode Command (View Menu)

Appends by adding to the bottom of an existing waveform document window its next waveform capture, rather than clearing the existing capture and replacing it with the new capture. You can scroll up and down to see multiple waveform captures in the same waveform document window.

Tools Menu

Selecting Tools in the menu bar opens the menu in Figure 6-14. The commands in the Tools menu are only for Agilent-internal use for the Waveform Tool.

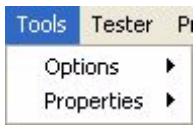


Figure 6-14. Tools Menu

The Tools menu contains the following commands:

- Options command on page 231
- Properties command on page 232

Options Command (Tools Menu)

Displays the Options submenu shown in Figure 6-15.

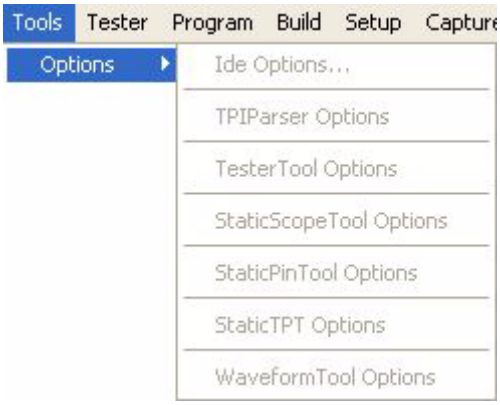


Figure 6-15. Options Submenu

The Options command submenu contains the following commands:

Ide Options Command (Options Command Submenu)

Not currently supported by the IDE.

TPIParser Options Command (Options Command Submenu)

Not currently supported by the IDE.

TesterTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticPinTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticTPT Options Command (Options Command Submenu)

Not currently supported by the IDE.

WaveformTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

Properties Command (Tools Menu)

Displays the Properties submenu shown in Figure 6-16.

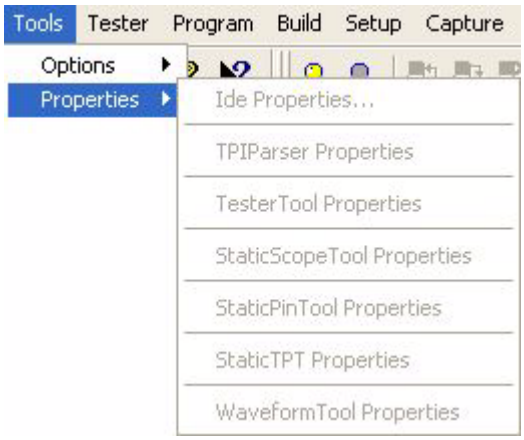


Figure 6-16. Properties Submenu

The Properties command submenu contains the following commands:

- Ide Properties command on page 233
- TPIParser Properties command on page 233
- TesterTool Properties command on page 233
- StaticScopeTool Properties command on page 233
- StaticPinTool Properties command on page 233
- StaticTPT Properties command on page 234
- WaveformTool Properties command on page 234

Ide Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TPIParser Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TesterTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticPinTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticTPT Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

WaveformTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

Tester Menu

Selecting Tester in the menu bar opens the menu in Figure 6-17.

Figure 6-17. Tester Menu

The Tester menu contains the following commands:

- Set Online command on page 234
- Set Offline command on page 235
- Acquire Data command on page 235
- Apply Changes command on page 235
- Abort Acquire command on page 235
- Tester Power On command on page 235
- Tester Power Off command on page 235

Set Online Command (Tester Menu)

Connects the IDE to the tester for the following tools that support online mode:

- C Program Debugger (currently has no offline capability)
- Pattern Tool (currently has no offline capability)
- Waveform Tool
- Timing Tool

Set Offline Command (Tester Menu)

 Disconnects the IDE from the tester. The following tools support offline mode:

- Pin Tool (currently has no online capability)
- Waveform Tool (viewing saved files only)
- Timing Tool (viewing saved files only)
- Bitmap Tool (currently has no online capability)

Acquire Data Command (Tester Menu)

 Not supported by the Waveform Tool. The Timing Tool supports this command.

Apply Changes Command (Tester Menu)

 Not supported by the Waveform Tool. The Timing Tool supports this command.

Abort Acquire Command (Tester Menu)

 Not supported by the Waveform Tool. The Timing Tool supports this command.

Tester Power On Command (Tester Menu)

 Same as the VK Test Station main window `Utilities > Power On` command and its corresponding  toolbar button. Resets and powers up the test sites (Test Head).

Tester Power Off Command (Tester Menu)

 Same as the VK Test Station main window `Utilities > Power Off` command and its corresponding  toolbar button. Turns off power to the test sites (Test Head).

Program Menu

Selecting Program in the menu bar opens the menu in Figure 6-18. The Program menu is not currently supported by the IDE.

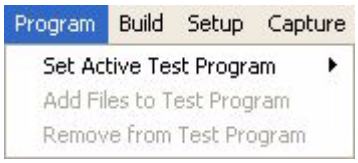


Figure 6-18. Program Menu

The Program menu contains the following commands:

- Set Active Test Program command on page 236
- Add Files to Test Program command on page 236
- Remove from Test Program command on page 236

Set Active Test Program Command (Program Menu)

Not currently supported by the IDE.

Add Files to Test Program Command (Program Menu)

Not currently supported by the IDE.

Remove from Test Program Command (Program Menu)

Not currently supported by the IDE.

Build Menu

Selecting Build in the menu bar opens the menu in Figure 6-19. The Build menu is not currently supported by the IDE.

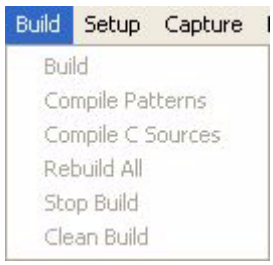


Figure 6-19. Build Menu

The Build menu contains the following commands:

- Build command on page 237
- Compile command on page 237

- Compile Patterns command on page 237
- Compile C Sources command on page 237
- Rebuild All command on page 237
- Stop Build command on page 237
- Clean Build command on page 237

Build Command (Build Menu)

Not currently supported by the IDE.

Compile Command (Build Menu)

Not currently supported by the IDE.

Compile Patterns Command (Build Menu)

Not currently supported by the IDE.

Compile C Sources Command (Build Menu)

Not currently supported by the IDE.

Rebuild All Command (Build Menu)

Not currently supported by the IDE.

Stop Build Command (Build Menu)

Not currently supported by the IDE.

Clean Build Command (Build Menu)

Not currently supported by the IDE.

Setup Menu

Selecting Setup in the menu bar opens the menu in Figure 6-20.

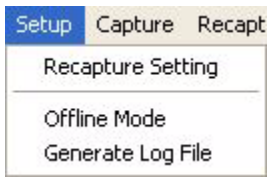


Figure 6-20. Setup Menu

The Setup menu contains the following commands:

- Recapture Setting command on page 238
- Offline Mode command on page 238
- Generate Log File command on page 239

Recapture Setting Command (Setup Menu)

 Displays the Recapture Setting cursors in the waveform tool window (similar to Figure 6-21 that shows no previous waveform capture) when a ✓ displays in front of the command. These cursors set the boundaries for recapturing a *selected waveform* using the `Recapture > Logic Analyzer Mode` command (on page 240) or the `Recapture > Scope Mode` command (on page 240). The cursors can be moved by placing the mouse cursor over a handle, pressing the middle mouse button to select it, and dragging the cursor using the mouse ball.

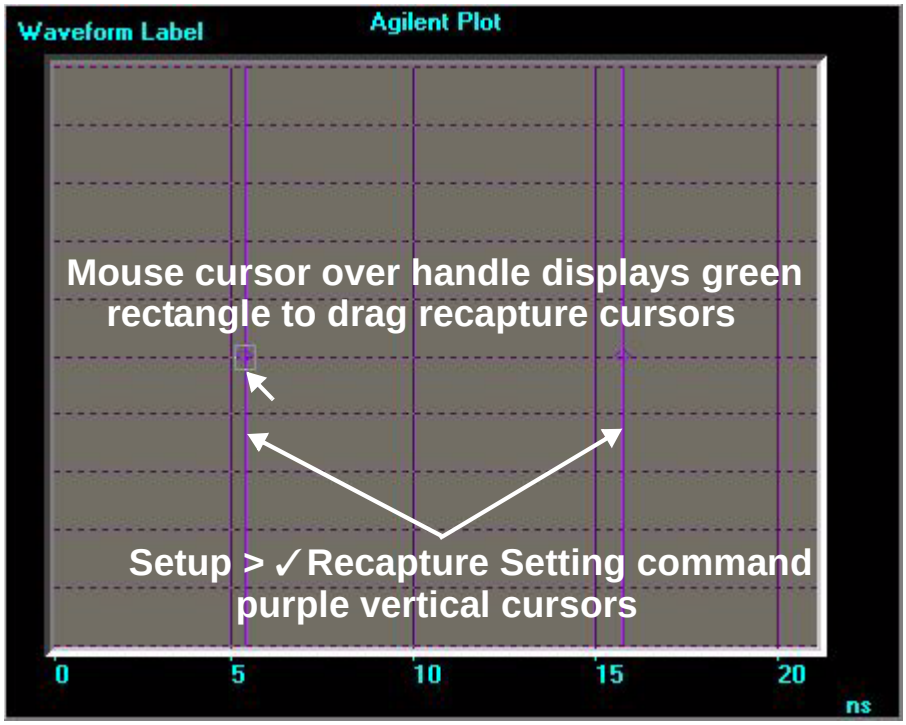


Figure 6-21. Recapture Setting Cursors

Offline Mode Command (Setup Menu)

For internal Agilent use.

Generate Log File Command (Setup Menu)

For internal Agilent use.

Capture Menu

Selecting Capture in the menu bar opens the menu in Figure 6-22.

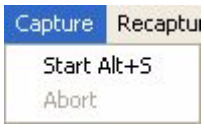


Figure 6-22. Capture Menu

The Capture menu contains the following commands:

- Start command on page 239
- Abort command on page 239

Start Command (Capture Menu)

Captures and displays the waveform plot. Prior to executing the `Capture > Start` command, see the "Waveform Setup Window" on page 244 or "Configuring the Waveform Tool Setup" on page 270 for details about how to configure the capture settings, trigger conditions, capture modes, and display settings in preparation to capture a waveform plot in online mode.

Abort Command (Capture Menu)

After selecting the `Capture > Start` command, stops the capture if you would like to stop it before it is complete.

Recapture Menu

Selecting Recapture in the menu bar opens the menu in Figure 6-23. This menu is enabled when a waveform is selected and the `Setup > Recapture Setup` command (on page 238) is selected.

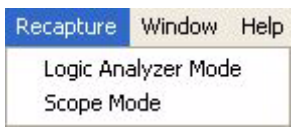


Figure 6-23. Recapture Menu

The Recapture menu contains the following commands:

- Logic Analyzer Mode command on page 240
- Scope Mode command on page 240

Logic Analyzer Mode Command (Recapture Menu)

Recaptures the plot of the selected waveform in the waveform document window using Logic Analyzer mode. This command is enabled when a waveform is selected and the `Setup > Recapture Setup` command (on page 238) is selected. The section of the selected waveform that is recaptured is between the `Setup > Recapture Setup` command cursors (similar to Figure 6-21 on page 238).

Scope Mode Command (Recapture Menu)

Recaptures the plot of the selected waveform in the waveform document window using Scope mode. This command is enabled when a waveform is selected and the `Setup > Recapture Setup` command (on page 238) is selected. The section of the selected waveform that is recaptured is between the `Setup > Recapture Setup` command cursors (similar to Figure 6-21 on page 238).

Window Menu

Selecting Window in the menu bar opens the menu in Figure 6-24.

Figure 6-24. Window Menu

The Window menu contains the following commands:

- New Window command on page 241
- Close command on page 241
- Close All command on page 241
- Cascade command on page 241
- Tile command on page 241
- Minimize All command on page 241

New Window Command (Window Menu)

Displays a blank copy of the active waveform tool window with the same waveform setup.

Close Command (Window Menu)

Closes the active tool document window.

Close All Command (Window Menu)

Closes all tool document windows with their corresponding tabs.

Cascade Command (Window Menu)

Cascades all open tool document windows in an overlapping fashion one on top of another with the title bar of each visible.

Tile Command (Window Menu)

Tiles all open tool document windows in a non-overlapping fashion.

Minimize All Command (Window Menu)

Not currently supported by the IDE.

Help Menu

Selecting Help in the menu bar opens the menu in Figure 6-25.

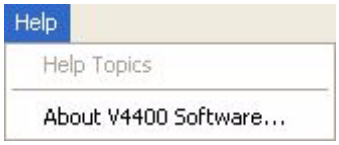


Figure 6-25. Help Menu

The Help menu contains the following two commands:

Help Topics Command (Help Menu)

 Not currently supported.

About V4400 Software Command (Help Menu)

 Displays the About V4400 Series Tester Software dialog box that contains software component version and copyright information (similar to Figure 6-26).

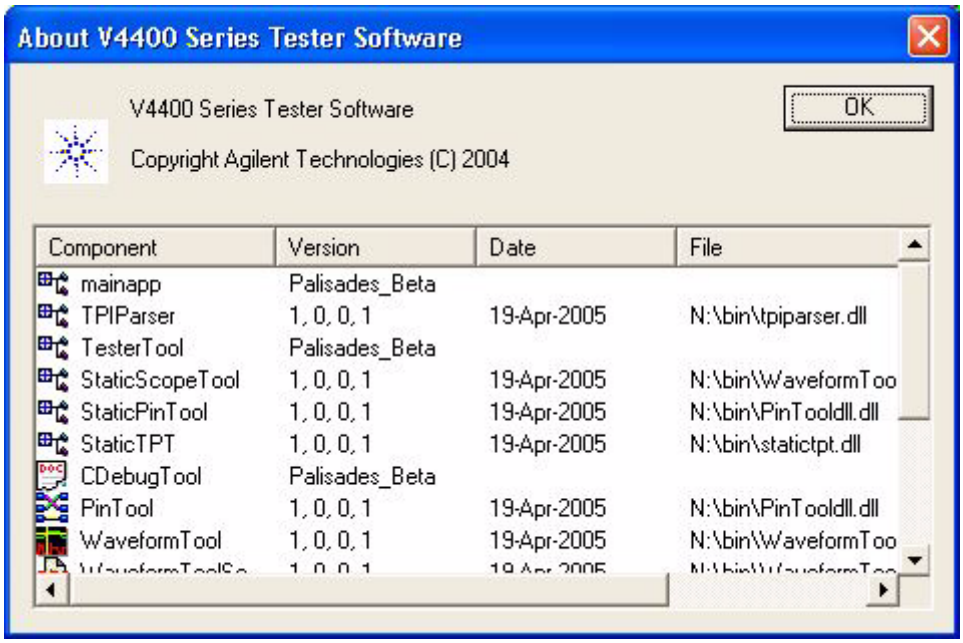


Figure 6-26. About V4400 Software Dialog Box

Tool Document Pane

The Tool Document Pane for the Waveform Tool is the Waveform Tool Document Window (Figure 6-1 on page 211). The Waveform Tool Document Window consists of two parts. The left part contains the Tree View Pane and the right part is the Waveform Display Pane.

Tree View Pane

The Tree View Pane (Figure 6-1 on page 211) displays the pin group list defined in the Waveform Setup Window (Figure 6-28 on page 244).

In the Tree View Pane, selecting the ⊟ button for a pin group causes the tree for that group to collapse to display just the pin group name, and the Waveform Display Pane also collapses to display only the waveform for the group (bus), rather than for the group and each individual channel in the group. Similarly, selecting the ⊞ button for a collapsed group causes that group's tree to expand, and the corresponding individual channel waveforms are added to the display pane.

Clicking to select one or multiple pins (Ctrl + click) in the Channel List Tree pane and then pressing the right mouse button displays a pop-up menu (Figure 6-27) that allows you to perform the waveform display actions listed in the menu for the selected pins.

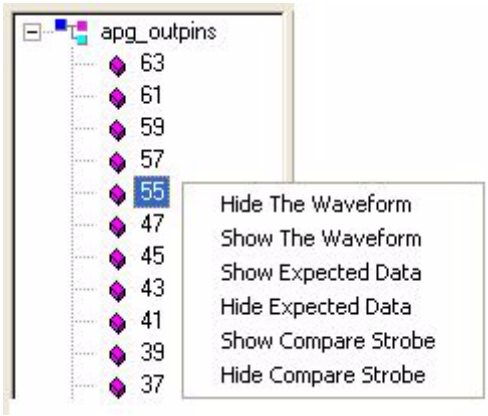


Figure 6-27. Selected Pins Pop-Up Menu

Waveform Display Pane

The Waveform Display Pane on the right side of Figure 6-1 on page 211 displays the captured waveform plots. After completing the setup parameters in the Waveform Setup Window, selecting the `Capture` > `Start` command or the Start Capture toolbar button captures and displays the waveform plot. Waveform green color indicates pass vectors and red indicates fail vectors.

Selecting the `View` > `Vector Grid` command toggles the X-axis scale display at the bottom of the document window to display in either a time scale in ns or vectors. The X axis displays in vectors when a ✓ displays in front of the command. The first vector on the left end of the X axis is the entry point in the pattern, and the vectors to the right on the X axis are offset from the entry point. The X axis displays a time scale in ns when a ✓ does not display in front of the command.

Selecting a channel's waveform to highlight it and then selecting `View` > `Increase V/DIV` increases the voltage/division for that waveform. Similarly, selecting a channel's waveform to highlight it and then selecting `View` > `Decrease V/DIV` decreases the voltage/division for that waveform.

Selecting `View` > `Show Legend` displays the legend for all of the waveforms at the bottom of the document window that identifies the channels with the corresponding PE channel numbers. Selected waveforms display in white in both the plot and the legend. To select channels, run the cursor over the `V/DIV` label at the beginning of each waveform. The label becomes highlighted with a rectangular box. Left click here and an asterisk (*) will appear. This indicates that channel has been selected. Multiple channels can be selected this way.

To move a waveform, right-click on the `V/DIV` label and drag the mouse.

Waveform Setup Window

The default Waveform Setup Window is shown in Figure 6-28. This window is used to configure capture settings.

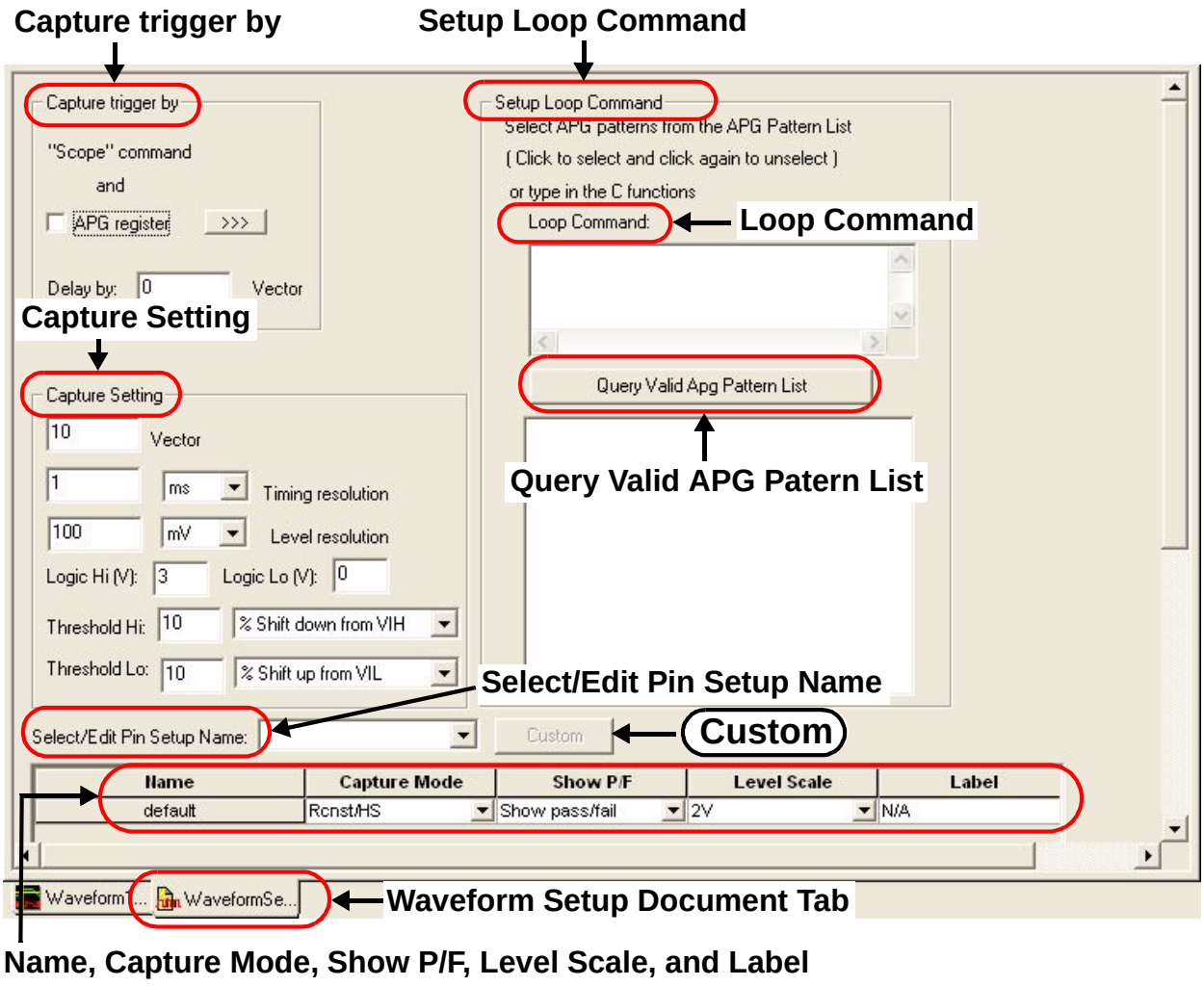


Figure 6-28. Waveform Setup Window

The Waveform Setup Window contains the following fields:

- `Capture Trigger By` (Figure 6-29 on page 245): Trigger by the `scope` vector command in the pattern file is always required. It means the waveform capture (when activated by selecting `Capture > Start`) is triggered by the next `scope` instruction in the pattern file.

- `APG register`: Triggering by the APG register is optional. Selecting this check box and its button displays the Trigger Condition Setting dialog box (Figure 6-30 on page 246) that allows you to also specify triggering by the contents of the x, y, and z address generators, the a, b, and c counters, and/or the dlo and dhi data generators. It supports multiple choices and the "AND" operation will be applied to the multiple choices. A value must be specified for a register whose check box is selected. For example, if x=0, y=3, and z=0 are the selected conditions, this means the waveform capture is started when (x=0)&(y=3)&(z=0).

NOTE

When using generator conditions to gate a scope trigger, unless you need to "scope" the vectors at the beginning of the pattern where initial generator conditions are established, you should put the `scope` command after all initial generator condition commands are completed. Successive entries into the pattern with unknown generator values can result in unexpected triggers and data display.

- `Delay by Vector`: Specifies the number of vectors to delay from where the `scope` vector command before triggering.

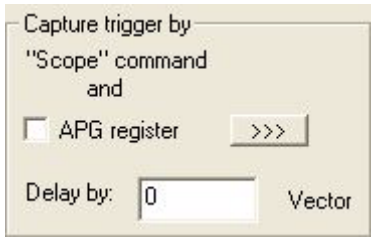


Figure 6-29. Waveform Setup Capture Trigger By Pane

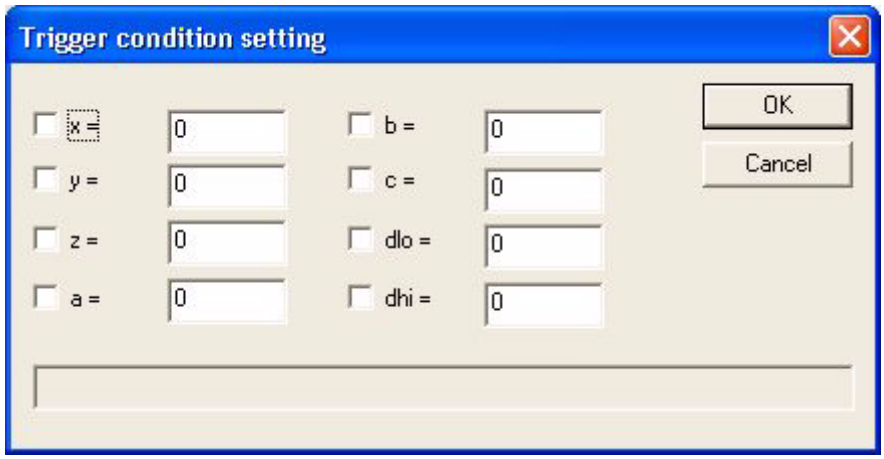


Figure 6-30. Trigger Condition Setting Dialog Box

- `Capture Setting` (Waveform Setup window Figure 6-31 on page 246):
  - `Vector`: Specifies the number of vectors you want to capture.
  - `Timing Resolution`: For Scope mode and Logic Analyzer mode, specifies the timing resolution of the sampling rate.
  - `Level Resolution`: Specifies the voltage resolution of the sampling.
  - `Logic Hi (V)`: For display purposes only, specifies the voltage level that will display for PEL level = 1 (pin electronics logic level).
  - `Logic Lo (V)`: For display purposes only, specifies the voltage level that will display for PEL level = 0.

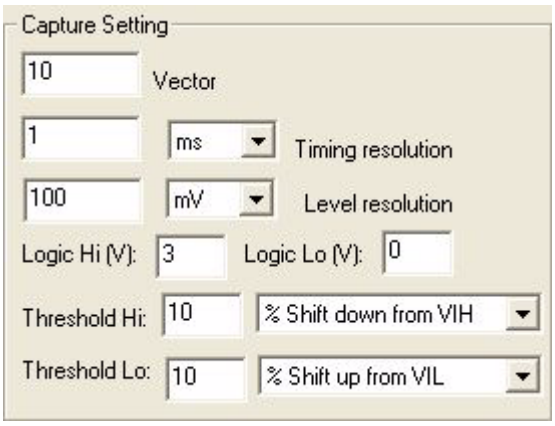


Figure 6-31. Waveform Setup Capture Setting Pane

- `Setup Loop Command` (Waveform Setup window: Figure 6-34 on page 248):
  - `Loop Command`: Tells the tool which APG patterns and C atomics will be looped in order to capture the waveform. You can type in the APG pattern name here or press the Query Valid APG Pattern List button to give you a selection list of the APG patterns.

  You can type atomics and pattern names into the `Loop Command` pane (Figure 6-34) to setup for the pattern you want to capture the waveform. To loop on the pattern you want to capture the waveform, the `scope` vector command must be included where the waveform capture will be triggered (similar to Figure 6-32).

```
@pattern    logic_patterns
{
FORMAT: entry           //Waveform Tool
    NS200, vec, rerr, scope,
                format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 1
    NS200, vec, format apg_inpins nr=0xffffffff, format apg_outpins cn=0xffffffff;  // 2
    NS200, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 3
    NS200, vec, format apg_inpins nr=0xffffffff, format apg_outpins cn=0xffffffff;  // 4
    NS100, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 5
    NS100, vec, format apg_inpins nr=0x55555555, format apg_outpins cn=0x55555555;  // 6
    NS100, vec, format apg_inpins nr=0xaaaaaaaa, format apg_outpins cn=0xaaaaaaaa;  // 7
    NS100, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 8
    NS100, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 9
           .
           .
           .
```

Figure 6-32. APG Pattern Scope Vector Command Entry

The following C code shown in Figure 6-33 is an example of code to enter into the `Loop Command` pane to setup with atomics and a pattern and then loop on the `FORMAT` pattern shown in Figure 6-32.

```
atomic;
atomic;
   .
   .
   .
run_apg("setup");

atomic;
atomic;
   .
   .
   .
run_apg("FORMAT");
```

Figure 6-33. Example Loop Command Pane C Code

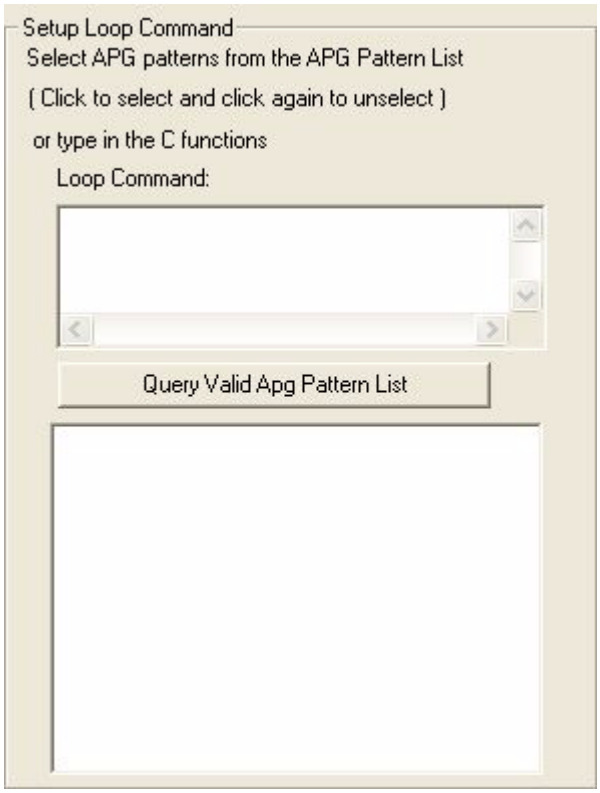


Figure 6-34. Waveform Setup Loop Command

- `Select/Edit Pin Setup Name` and Custom button (Waveform Setup window: Figure 6-35):

Figure 6-35. Waveform Setup Select/Edit Pin Setup Name

To select pins for display, first specify the pin set name to be shared by all the other tools by typing a name in the `Select/Edit Pin Setup Name` text box and then selecting the Custom button to display a window with a list of the pin groups defined in the test program in the `Valid Selection List` (similar to panel on the right of Figure 6-36). This example types `pinset1` in the `Select/Edit Pin Setup Name` text box and then selects the Custom button.

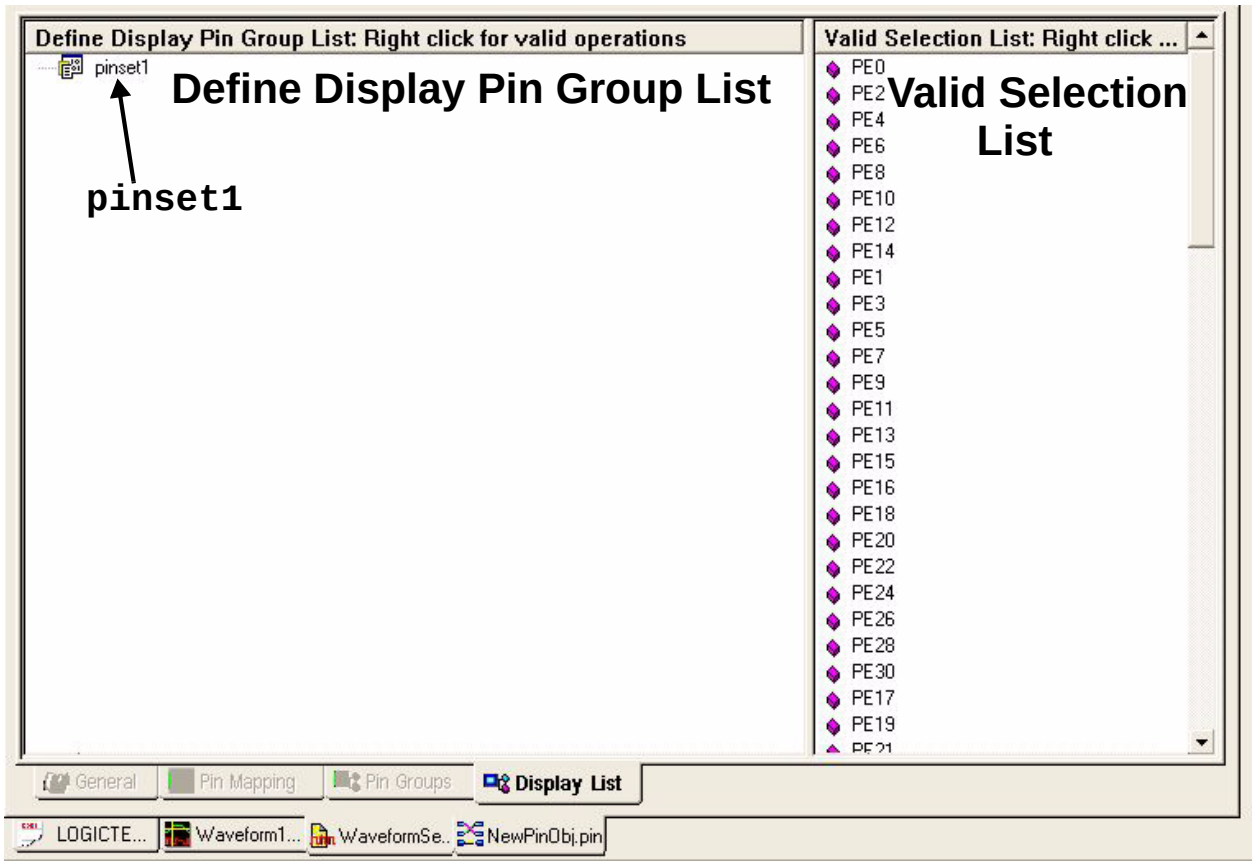


Figure 6-36. Pin Selection List

Scrolling down the `Valid Selection List` and double-clicking on a pin or group adds and displays it in the `Define Display Pin Group List` panel on the left (similar to Figure 6-37).

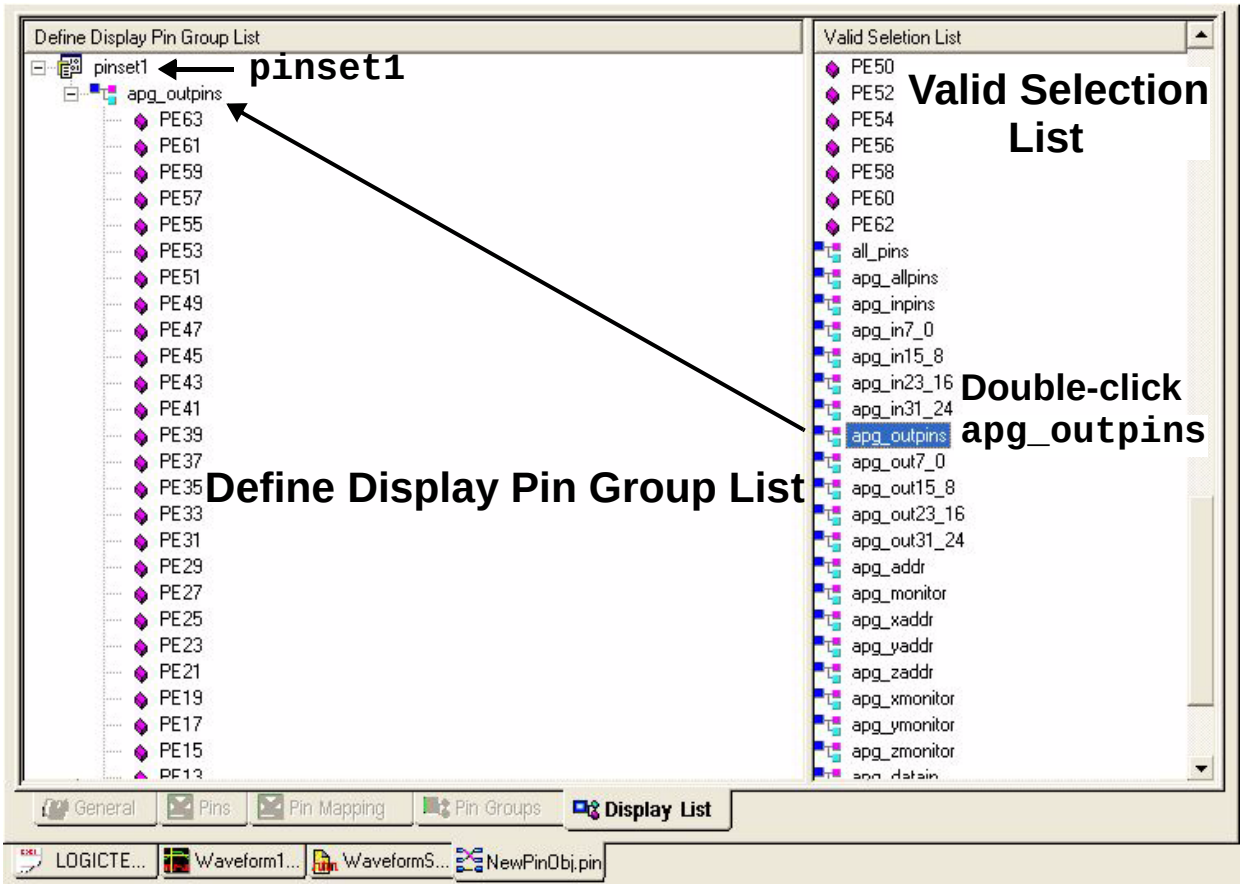


Figure 6-37. Adding Pins or Groups for Display

You can also filter out pins you do not want by first selecting them, right-clicking to display a pop-up menu, and then selecting the `Delete` command in the menu (similar to Figure 6-38).

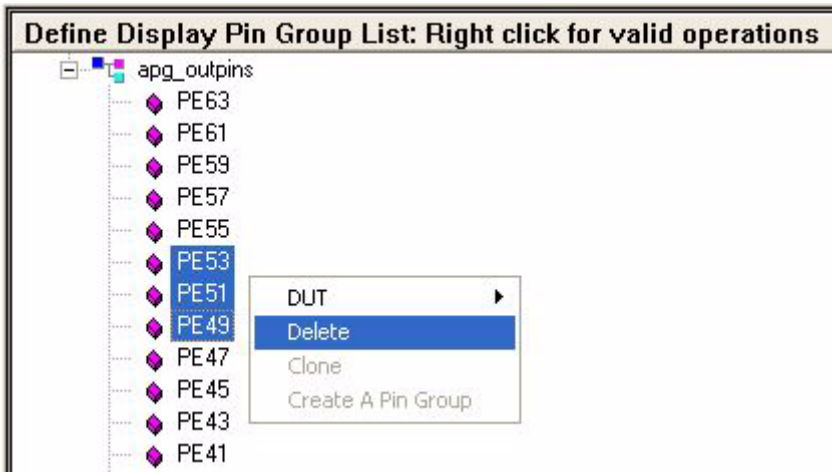


Figure 6-38. Cutting Pins from the Define Display Pin Group List

- `Name` (similar to Waveform Setup window Figure 6-39): Selecting the Waveform Setup Document tab displays the Waveform Setup window with the pin or group `Name` (`+apg_outpins`) added to the bottom of the setup window (Figure 6-39). The `+` (plus) symbol indicates that it is a pin group that can be opened to display the pins in the group.

Name	Capture Mode	Show P/F	Level Scale	L
default	Rcnst/HS	Show pass/fail	2V	N/A
+apg_outpins	Rcnst/HS	Show pass/fail	2V	N/A

Figure 6-39. Pin Group Added to Waveform Setup

Placing the cursor next to the added pin group (`+apg_outpins`) changes the cursor to a right arrow (Figure 6-39) that you can left-click and open `+apg_outpins` group to display all of the pins in the group (Figure 6-40). Note that when the group name opens to display all of the pins in the group, the `+apg_outpins` changes to `–apg_outpins` to indicate the branch has expanded. You can close the `–apg_outpins` group by placing the cursor at one of the pins in the group to display the right arrow again and left-click the pin.

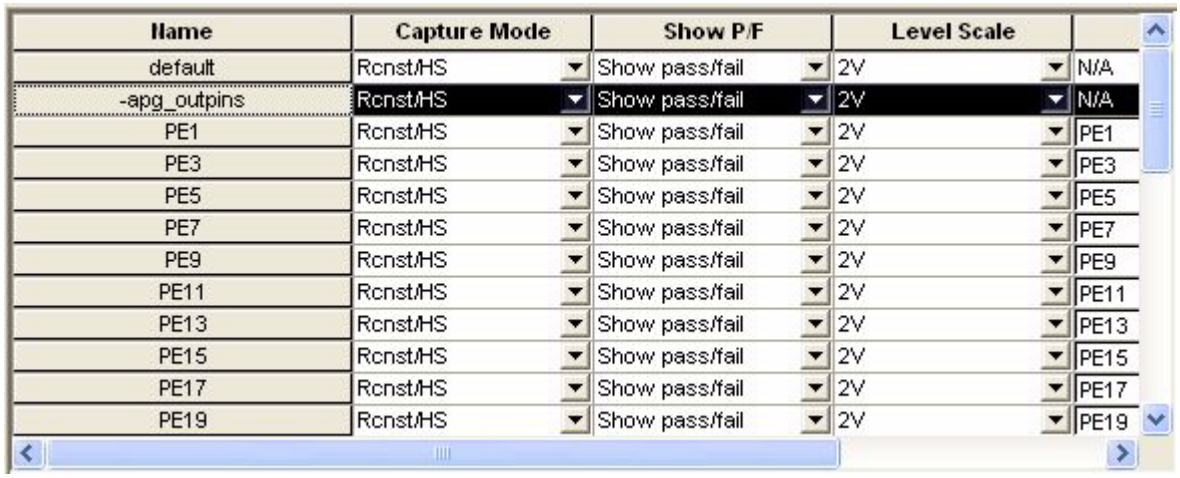


Figure 6-40. Waveform Setup Displaying Individual Group Pins

- `Capture Mode` (Waveform Setup window Figure 6-41): Selecting the `Capture Mode` column down arrow in the drop-down list box displays the following six different waveform capture modes (Figure 6-68):

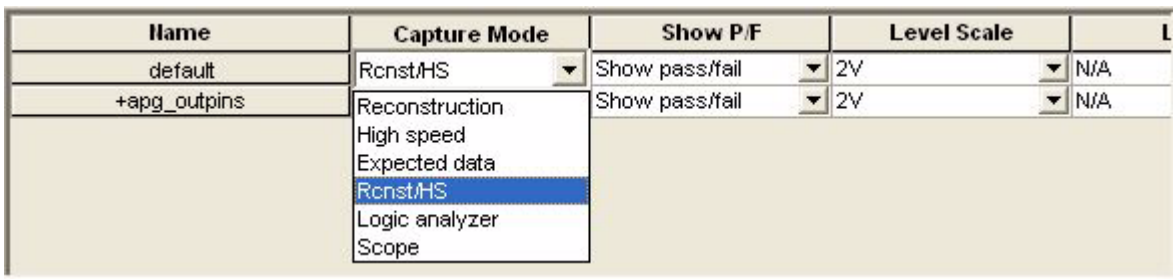


Figure 6-41. Waveform Setup Capture Modes

- `Reconstruction` mode: Can be used only for input pins. The tool gets the logic values by translating the pattern files and the values are categorized at four levels: VHH, VIH, VIL and HiZ. This draws a digital waveform that illustrates what the DUT inputs should be seeing.
- `High Speed` mode: Can be used only for output pins. This mode constructs the waveform by a single-shot capture based on the captured value during the strobe edge/period. The main reason to use this mode is for high speed. This draws a digital waveform created by examining the pattern for expected behavior and running the pattern to gather actual pass/fail

information at comparisons to illustrate the DUT output behavior.

- `Expected Data` mode: Can be used only for output pins. The tool gets the programmed expected data from the test program. This draws a digital waveform that illustrates what the DUT outputs are expected to be driving (not what they are actually driving). Think of this mode as drawing a picture of the compare cycles in the pattern.
- `Rcnst/HS` (Reconstruction and High Speed) mode: A combination of these two modes to capture both input and output pins simultaneously.
- `Logic Analyzer` mode: Available for both input pins and output pins. The signals captured in this mode are the measured signals (applied to both input and output pins). They are constructed by multiple samples per cycle based on the timing resolution that is set. For the output pins, the waveforms are the logic values using VOH and VOL as thresholds. For the input pins, the waveform data are categorized as four levels: VHH, VIH, VIL and HiZ. This mode provides the speed between High Speed mode and Scope mode. It provides more information about the waveform transition timing, but does not display the real voltage. It is scope mode with special voltage thresholds used to create a digitized-analog waveform in a shorter amount of time but sacrificing voltage accuracy.
- `Scope` mode: This mode is used for both DUT input pins and output pins, but *it is important to note that the measurement is made at the tester comparator not at the DUT*. This mode constructs the waveforms with the actual voltage levels and timing. It is high resolution and slow speed. It draws an analog waveform that runs the pattern numerous times, measuring voltage at the comparator at discreet times and voltage resolutions defined by the user.

- `Show P/F` (Waveform Setup window Figure 6-42): Selecting the `Show P/F` column down arrow in the drop-down list box displays the following two display options:
  - `Show pass/fail`: Displays failures in red.
  - `Not show pass/fail`: No display change for failures.

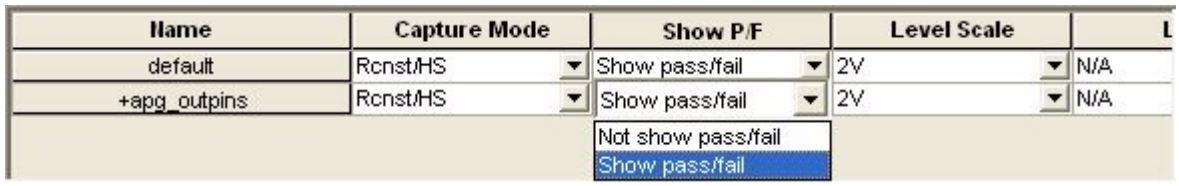


Figure 6-42. Waveform Setup Show Pass/Fail

- `Level Scale`: Specifies the level scale per division.
- `Label` (Waveform Setup window Figure 6-43): Specifies a label for the selected channel settings.
- `Enter the Note` (Waveform Setup window Figure 6-43): Allows you to record notes about this waveform plot that are saved with the waveform file.

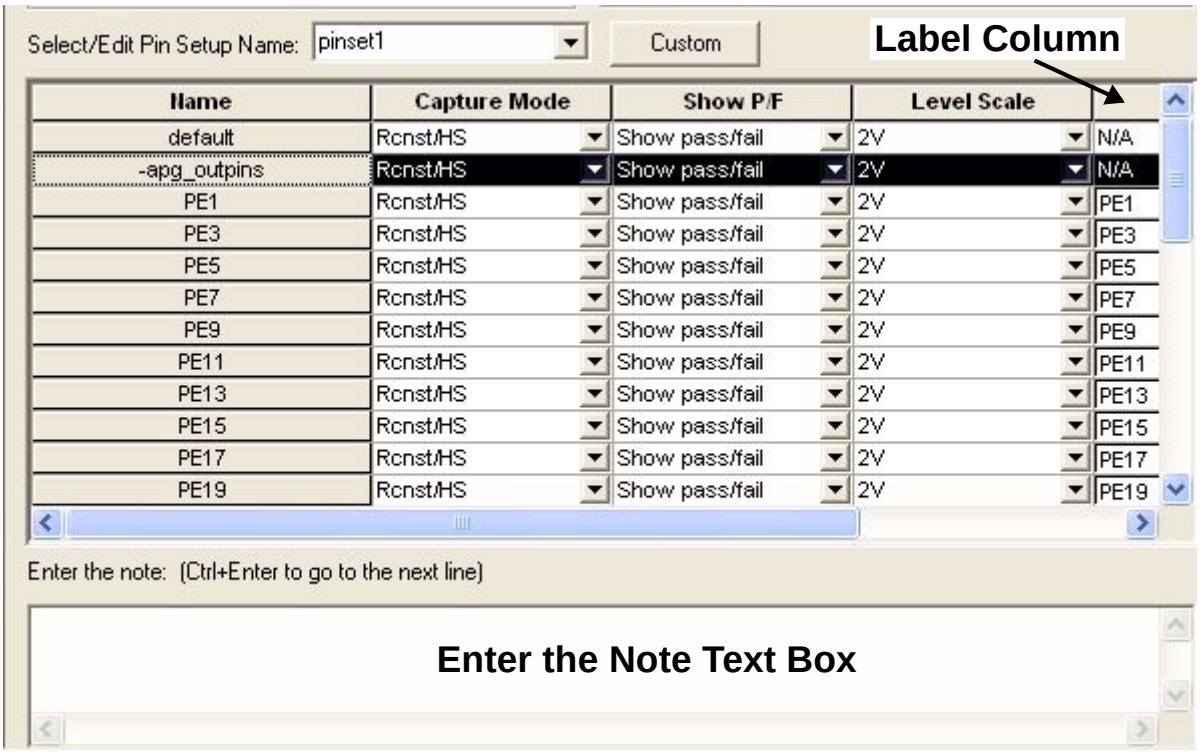


Figure 6-43. Waveform Setup Enter the Note Text Box

Waveform Tool Getting Started

Waveform Tool is to capture, display, and analyze waveforms in a fashion similar to oscilloscopes and logic analyzers for test program debugging. It supports both online and offline modes. Waveform capture has to be performed online. Offline capability gives you the convenience to review and analyzing the waveform without connecting to the tester.

This section demonstrates how to setup, capture, and display waveforms for analysis. For additional information about the Waveform Tool, see the "Waveform Tool Main Window" section on page 211 that provides descriptions of all the menus, menu commands, and dialog boxes that make up the tool's interface.

Getting Started Contents

This Getting Started contains the following examples:

NOTE

The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

Loading the Test Program

In this section of the Getting Started we will perform the following tasks in preparation to capture waveforms and debug failing vectors using the C Program Debugger and Waveform Tool:

- Launch the VK Test Station application and display its VK Test Station main window.
- Load a plan file, power on the test sites (test head), and download the test program files specified in the plan file to the test sites.

1 Selecting start > `All Programs` > `Versatest Test System Software` > `VK Test Station` displays the VK Test Station main window (similar to Figure 6-44). Note that the Status Bar displays `Station Status: Idle Ready  NO PHYSICAL SITE CONFIGURED` that indicates the test sites are powered off and no plan file is loaded.

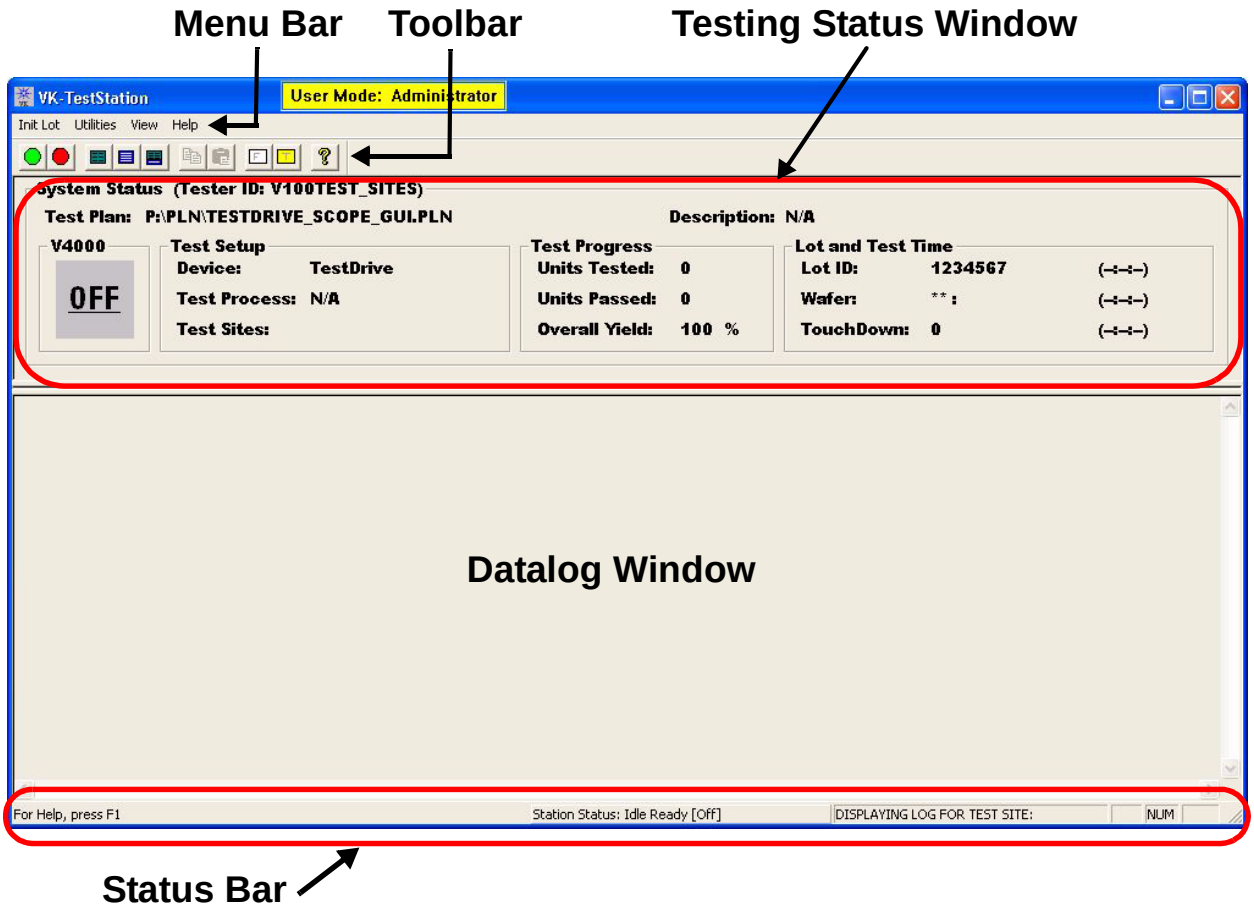


Figure 6-44. VK Test Station Main Window

2 In the menu bar, selecting `Init Lot > Enter Lot Information` displays the Initialize Test Station Setup dialog box (Figure 6-45) that is used to set up each lot for testing.

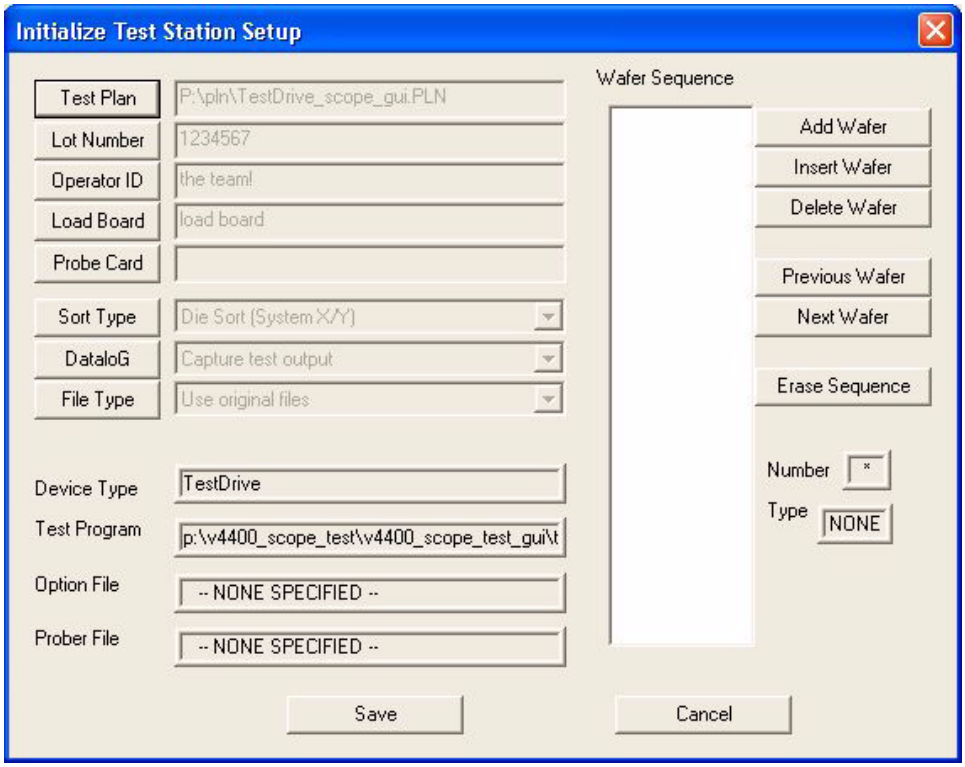


Figure 6-45. Initialize Test Station Setup Dialog Box

3 Selecting the Test Plan button displays the Open dialog box (Figure 6-46) that lists the available plan files. Test plan files define the tester setup that is used. The `TestDrive_scope_gui.PLN` plan file will be used for this example.

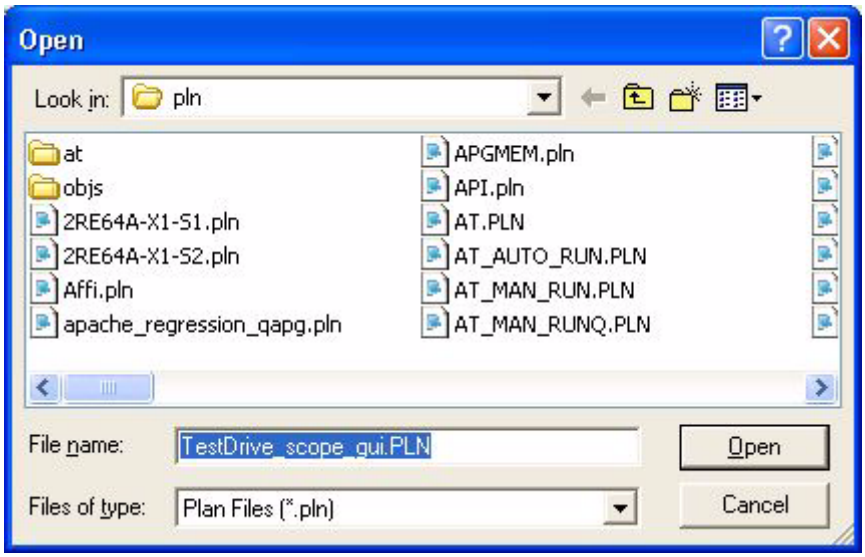


Figure 6-46. Select Test Plan Dialog Box

4 Selecting the `TestDrive_scope_gui.PLN` plan file and then selecting Open displays the Initialize Test Station Setup dialog box with the plan file displayed in the Test Plan field (Figure 6-44 on page 256).

5 Selecting the Save button in the dialog box displays a Red Hand Alert dialog box that warns about the loss of summary data (Figure 6-47). The TEST_PLAN_WARNING plan file configuration switch controls whether this dialog box displays. The default is for it to display.

Figure 6-47. Red Hand Alert Are You Sure Dialog Box

6 Selecting OK displays another Red Hand Alert dialog box (Figure 6-48) that warns to Z down the wafer and disconnect all DUTs prior to initialization of the test sites. The TEST_PLAN_WARNING plan file switch also controls whether this dialog box displays.

Figure 6-48. Red Hand Alert Z-Down Dialog Box

7 Selecting OK displays the Test Plan Validation dialog box (Figure 6-49). The `VALIDATE 0x10` plan file test switch controls whether this dialog box displays. It displays the corresponding checksums and adds them to the summary file.

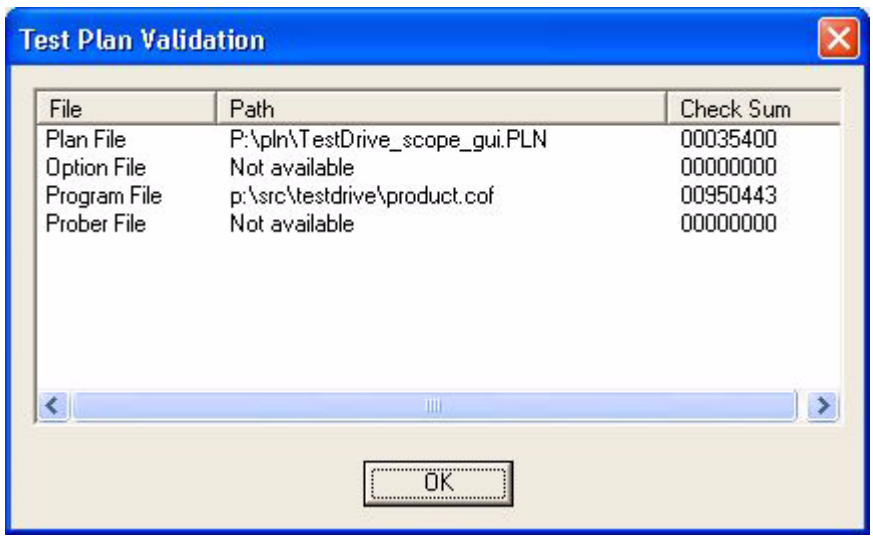


Figure 6-49. Test Plan Validation Dialog Box

8 Selecting OK begins the test head power on and downloads the Versatest Operating System (VOS) and the test program files specified in the plan file. The power on is complete when the terminal prompt `A1>` displays in the Datalog window (Figure 6-50). Note that the Status Bar displays `Station Status: Ready DISPLAYING LOG FOR TEST SITE: 1 (A1)` that indicates the test sites are powered on and ready to run the downloaded test program.

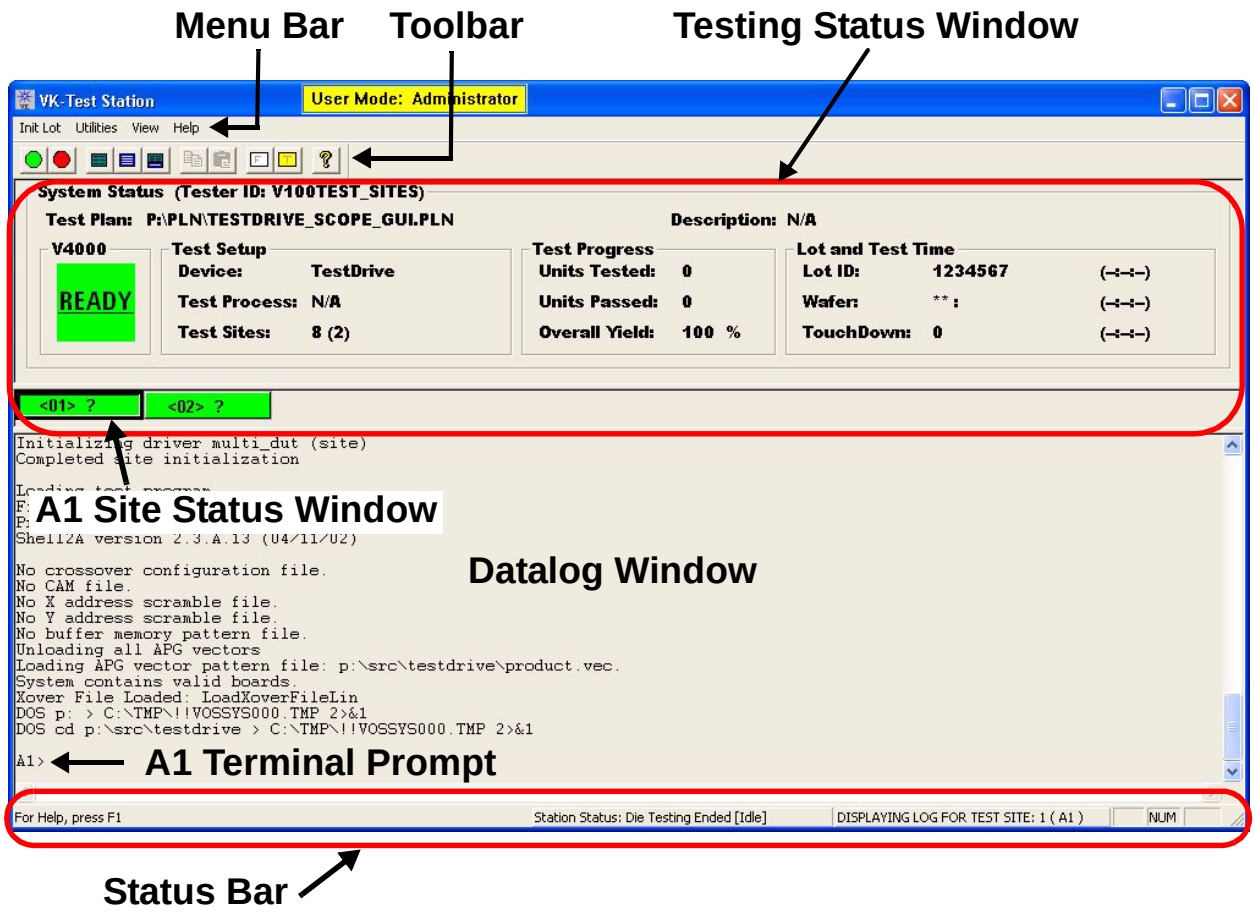


Figure 6-50. VK Test Station Main Window After Power On

Using the C Program Debugger to Control Program Execution

The C Program Debugger allows you to control the execution and inspect the status at the C language source code level. In this section of the Getting Started, we will use the C Program Debugger to perform the following tasks:

- Download a device test program.
- Set a break point.

1 Selecting  > `All Programs` > `Versatest Test System Software` > `Integrated Development Environment` displays the default V4400 Series Tester Software main window that contains the Integrated Development Environment or IDE (similar to Figure 6-51). The Menu bar and Toolbar are context sensitive and change for the selected active tool or document. The menus and

Toolbar show and enable only the commands and buttons that are relevant to the tool or document you have selected.

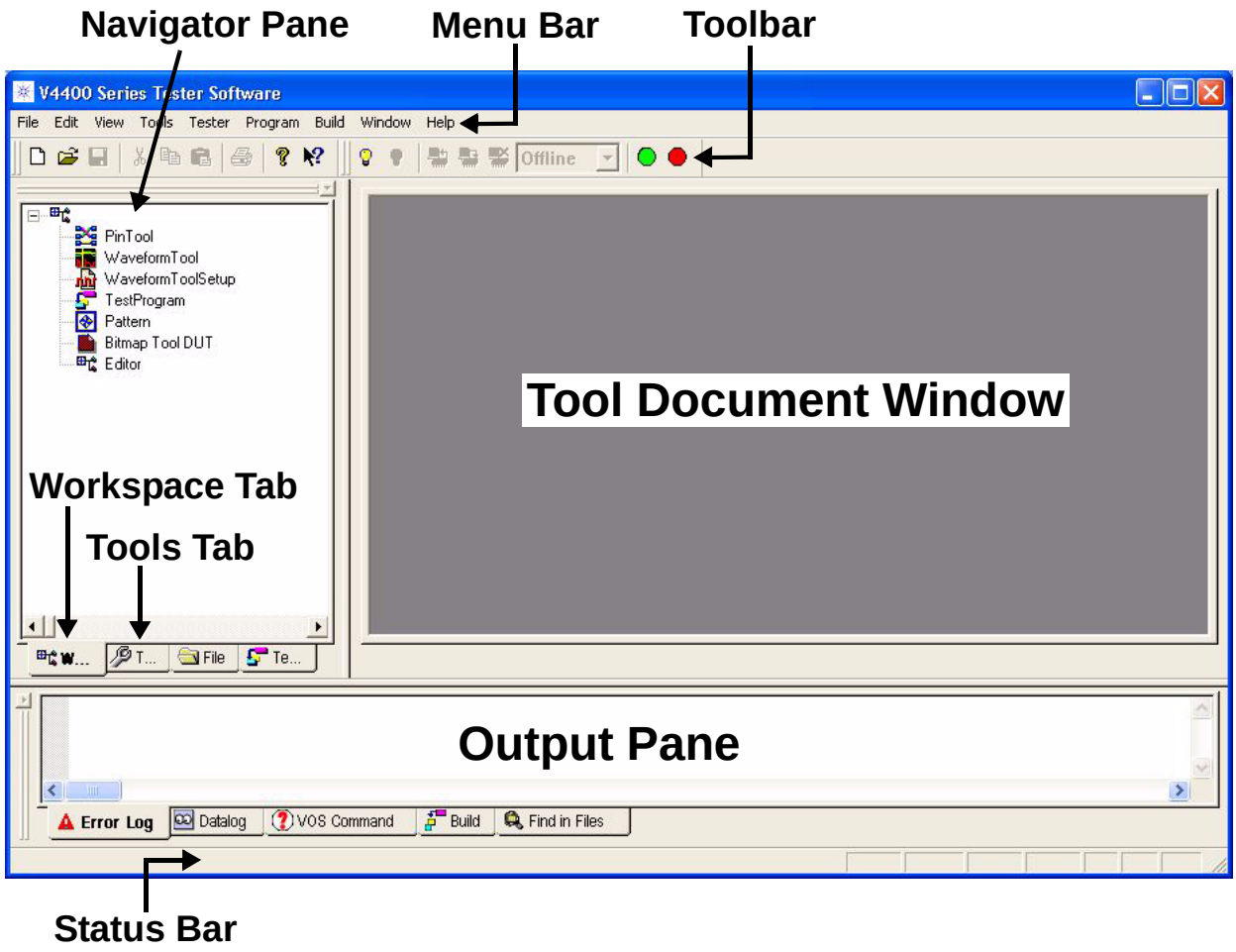


Figure 6-51. V4400 Series Tester Software IDE Main Window

2 Selecting the yellow light bulb Set Online toolbar button or corresponding `Tester > Set Online` command enables the IDE to connect to the tester when the Site Connect Status drop-down list box `Site: A1` Site: A1 is enabled as shown in the toolbar in Figure 6-52.

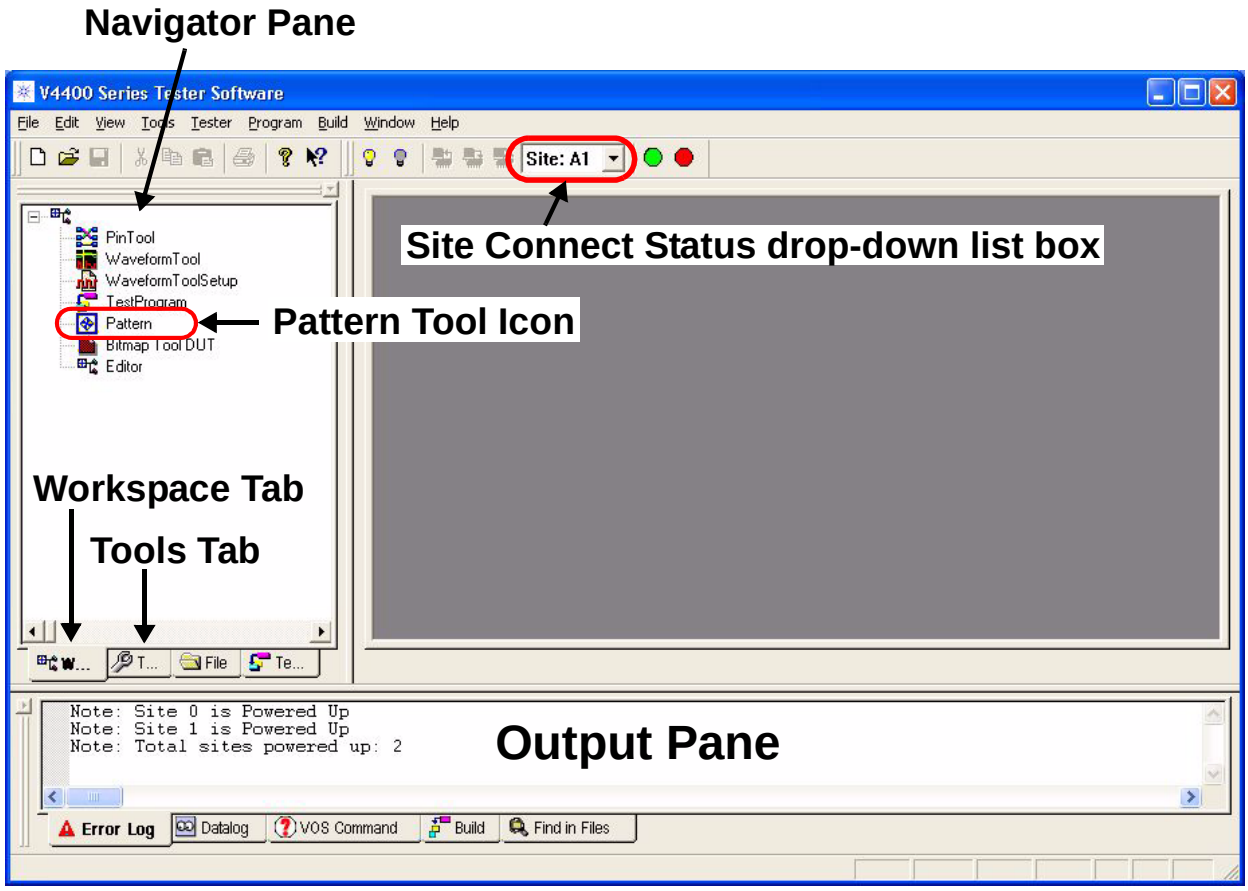


Figure 6-52. IDE Main Window Set Online

3 Choosing the site that the IDE connects to is done by selecting the down-arrow button on the right side of the Site Connect Status drop-down list box to display the available sites and selecting from the list (similar to Figure 6-53). Selecting a tool makes the connection to that site and disables the Site Connect Status drop-down list box.

Figure 6-53. Site Connect Status Drop-Down List Box

4 Selecting the Navigator pane Tools tab icon displays its tab (Figure 6-54).

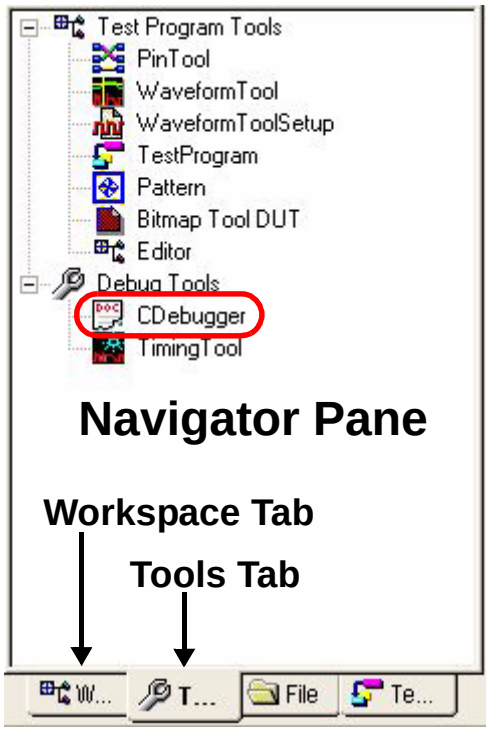


Figure 6-54. Navigator Pane Tools Tab

5 Double-clicking `CDebugger` under `Debug Tools` (Figure 6-54) displays the C Debugger as the active tool in the Tool Document window (Figure 6-55). Selecting the tool makes the connection to that site and disables the Site Connect Status drop-down list box. This also adds the C Debugger Cdeb (`Cdeb`) tab to the Navigator pane, its menu bar and toolbar, and displays the Workspace in the Navigator Pane.

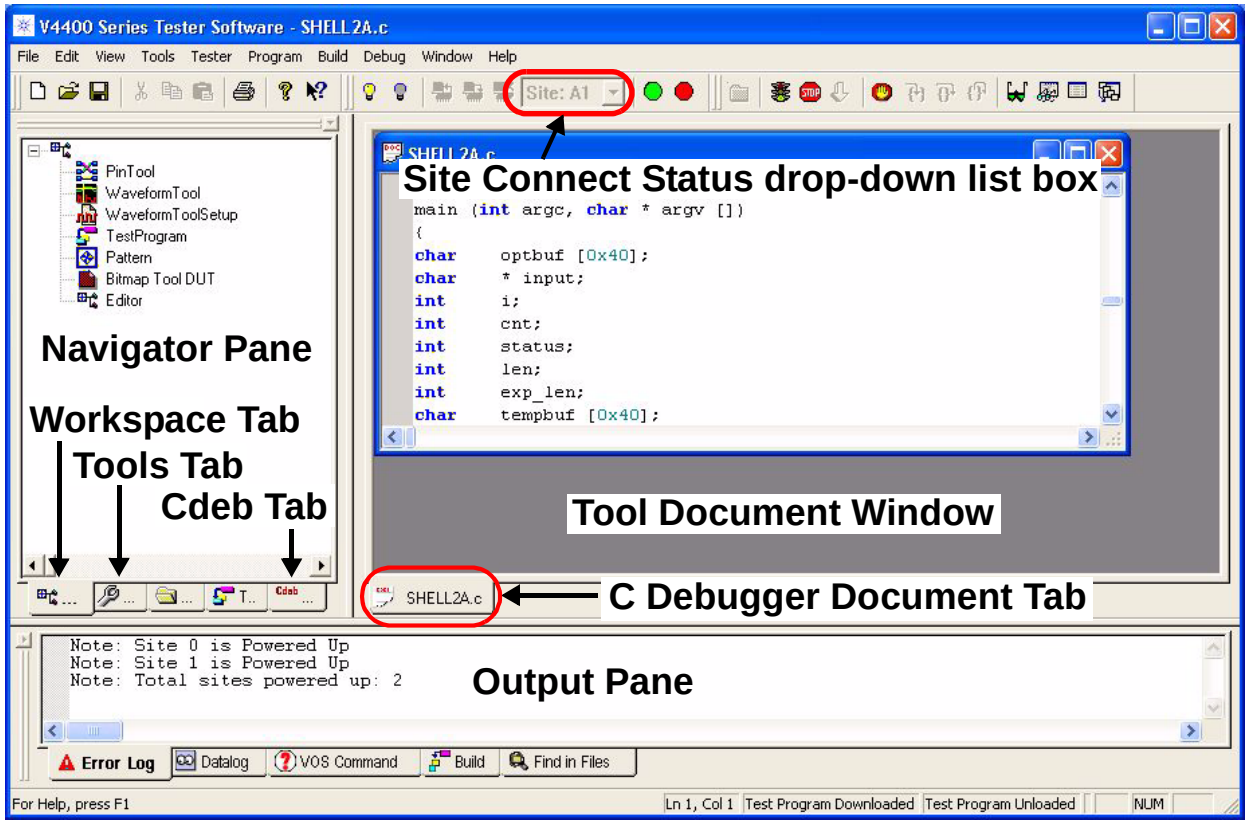


Figure 6-55. IDE Displaying C Debugger

6 Selecting the Cdeb Cdeb tab in the Navigator pane displays its tab that lists all the source code file names and function names for the loaded test program (similar to Figure 6-56).

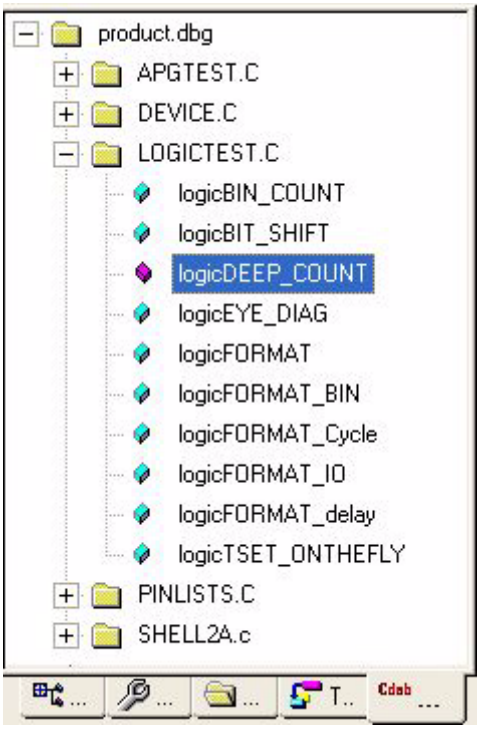


Figure 6-56. C Debugger Cdeb Tab

7 Navigating to and double-clicking the `LOGICTEST.C` > `logicFORMAT` function displays it in a window in the Tool Document Window (similar to Figure 6-57).

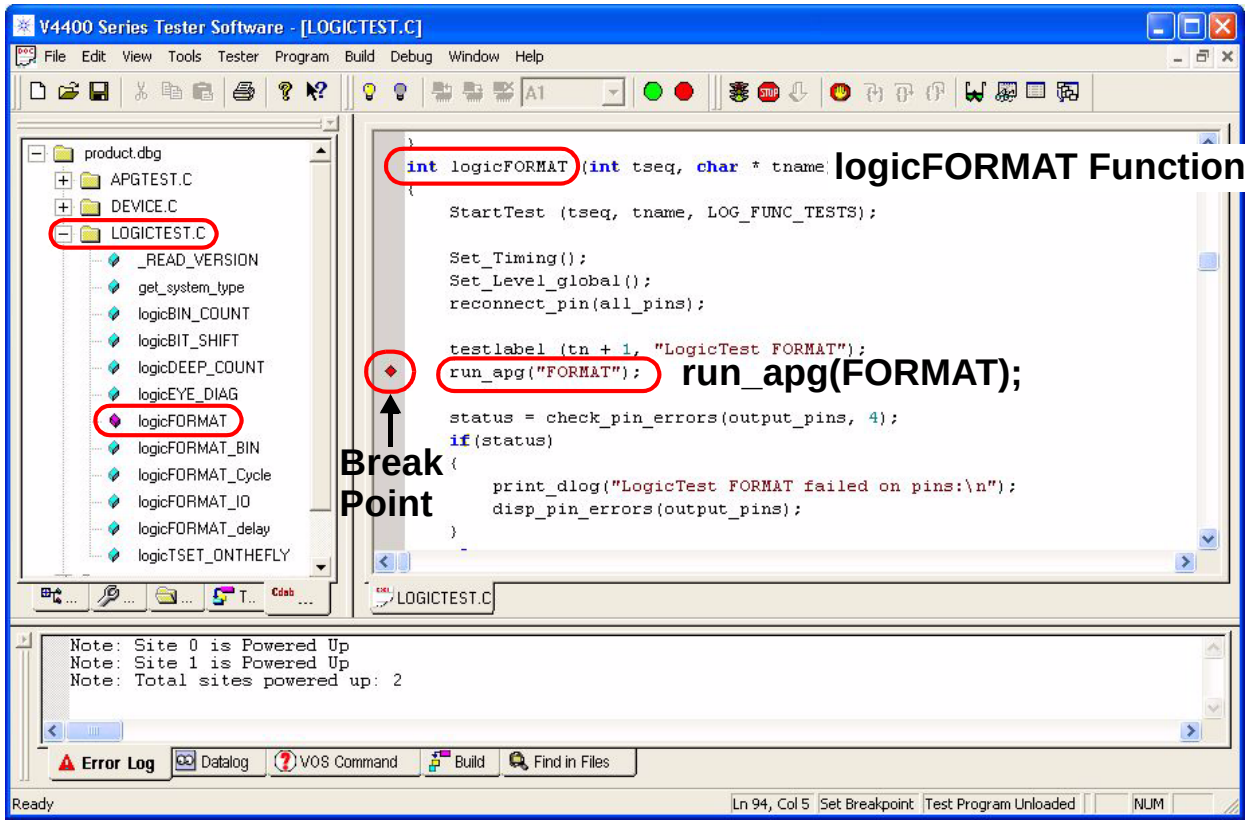


Figure 6-57. C Debugger Displaying Break Point

8 Before using the Waveform Tool, the test program has to be loaded and the break point needs to be set right before the `run_apg` command. Positioning the cursor in the source line shown in Figure 6-57 and selecting the `Debug` > `Break` command, the F9 key, or the Break Point button in the toolbar inserts a break point that displays as a red diamond tag in the gray margin on the left side of the source code. Note that the Status bar at the bottom of the window displays the line number (`Ln`) and column (`Col`) the cursor is active.

Displaying the Waveform Tool Document Window

The Workspace tab in the Navigator pane displays two Waveform Tool icons (similar to Figure 6-58): `WaveformTool` and `WaveformToolSetup`. The `WaveformTool` icon displays the main interface for displaying waveforms. The `WaveformToolSetup` icon displays an interface for setting up capture parameters.

Double-clicking the `WaveformTool` icon displays the default Waveform Tool document tab window (Figure 6-58). Selecting its window's maximize button displays it full-window.

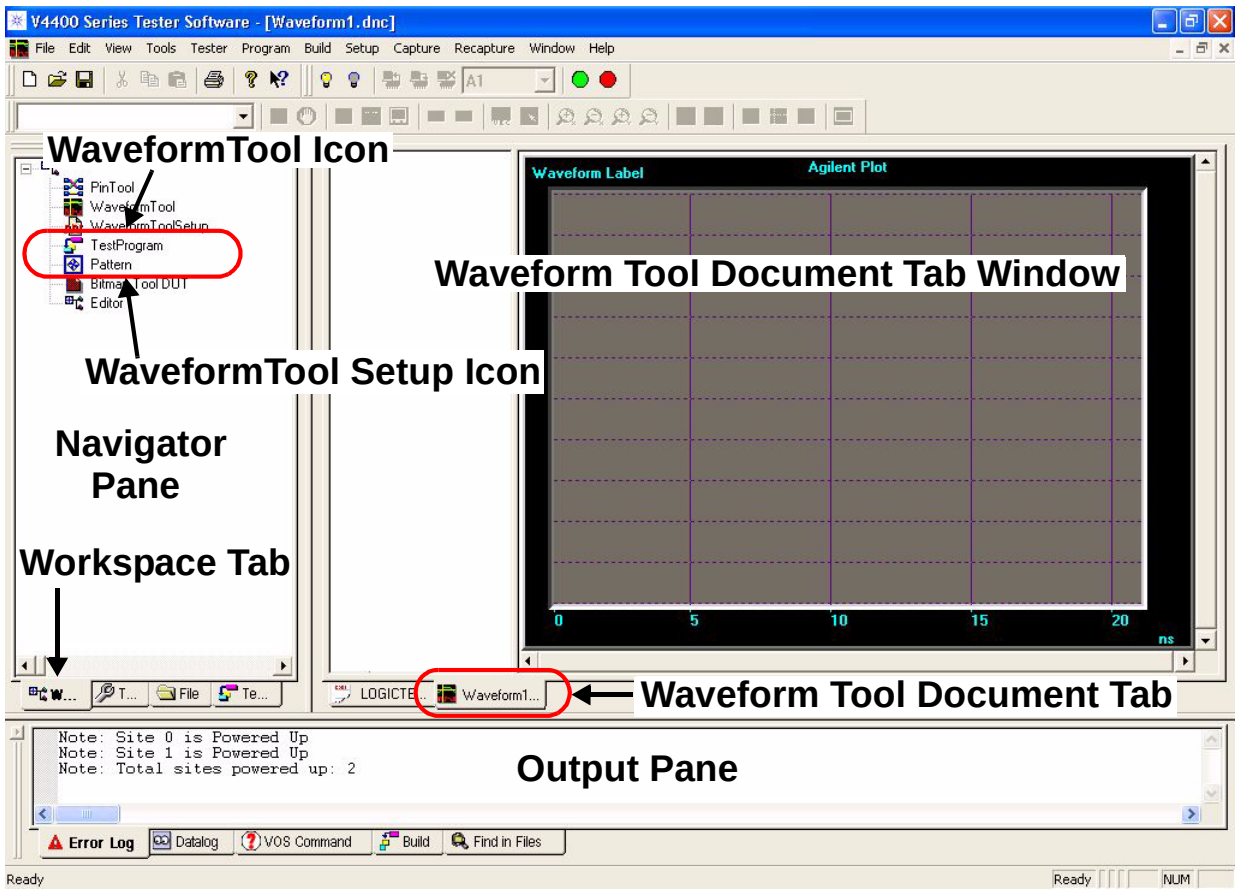


Figure 6-58. Default Waveform Tool Document Tab Window

Setting Up the Waveform Capture Trigger

A `scope` entry needs to be set in the APG patterns you would like to analyze. This is where the waveform capture will be triggered. Before using the Waveform Tool, the test program has to be loaded and the break point needs to be set right before the `run_apg` command. The following APG pattern code (Figure 6-59) shows the `scope` vector command entry set for this example. This is where the waveform capture will be triggered.

```
@pattern    logic_patterns
{
FORMAT: entry           //Waveform Tool
    NS200, vec, rerr, scope,
                format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 1
    NS200, vec, format apg_inpins nr=0xffffffff, format apg_outpins cn=0xffffffff;  // 2
    NS200, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 3
    NS200, vec, format apg_inpins nr=0xffffffff, format apg_outpins cn=0xffffffff;  // 4
    NS100, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 5
    NS100, vec, format apg_inpins nr=0x55555555, format apg_outpins cn=0x55555555;  // 6
    NS100, vec, format apg_inpins nr=0xaaaaaaaa, format apg_outpins cn=0xaaaaaaaa;  // 7
    NS100, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 8
    NS100, vec, format apg_inpins nr=0x00000000, format apg_outpins cn=0x00000000;  // 9
           .
           .
           .
```

Figure 6-59. APG Pattern Scope Vector Command Entry

Configuring the Waveform Tool Setup

This section describes how to configure the waveform capture settings using the Waveform Tool Setup in preparation for capturing the waveform plot in online mode using the Waveform Tool.

1 Double-clicking the `WaveformToolSetup` icon displays the default Waveform Tool Setup document tab window called Waveform Setup (similar to Figure 6-60).

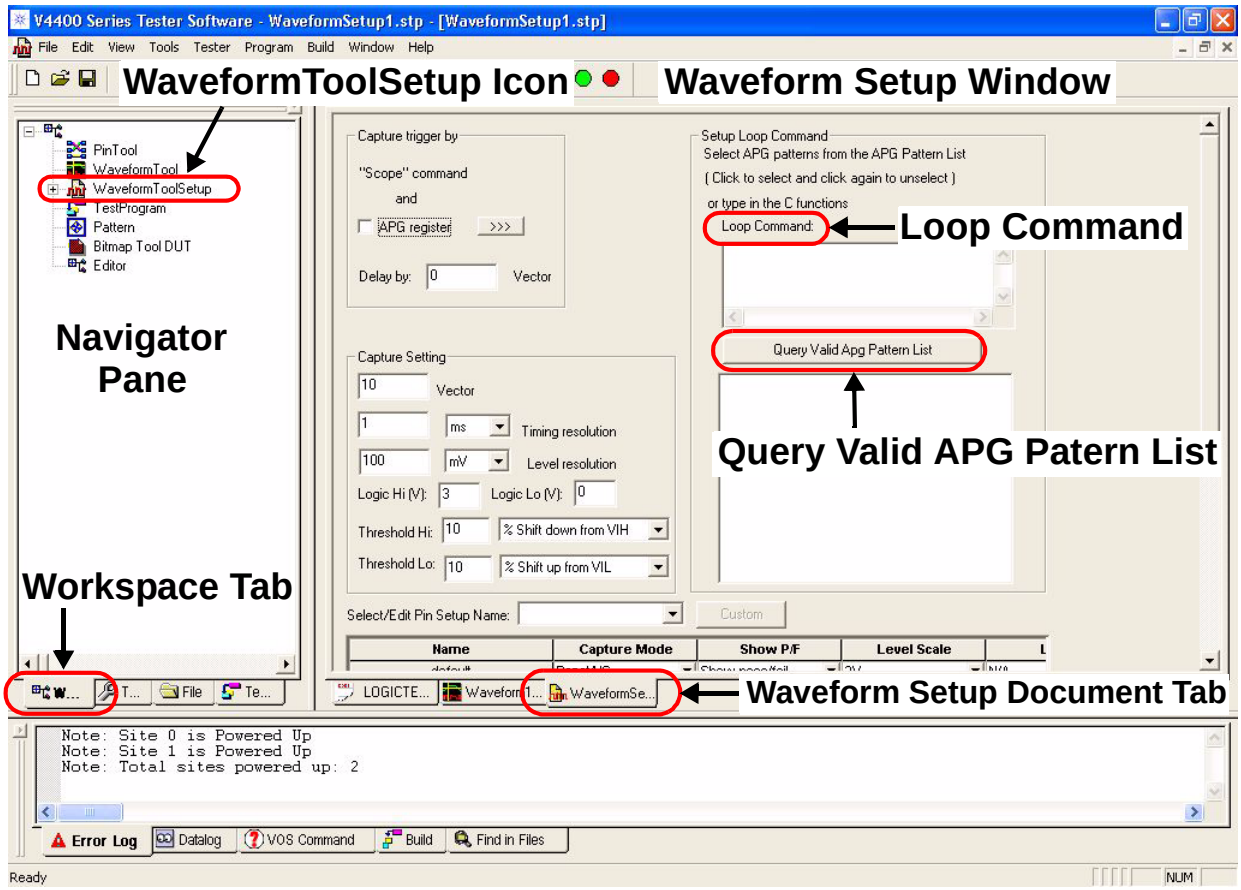


Figure 6-60. Default Waveform Setup Document Tab Window

2 One of the more important parameters in the Waveform Setup is the `Loop Command` (Figure 6-60). This tells the tool which APG patterns and C modules will be looped in order to capture the waveform. You can type in the APG pattern name in the text box or press the Query Valid APG Pattern List button to display a selection list of the APG patterns. For this example, we will select the Query Valid APG Pattern List button to display the list and then select the `FORMAT` pattern to display it in the `Loop Command` text box (similar to Figure 6-61): `run_apg(FORMAT)`.

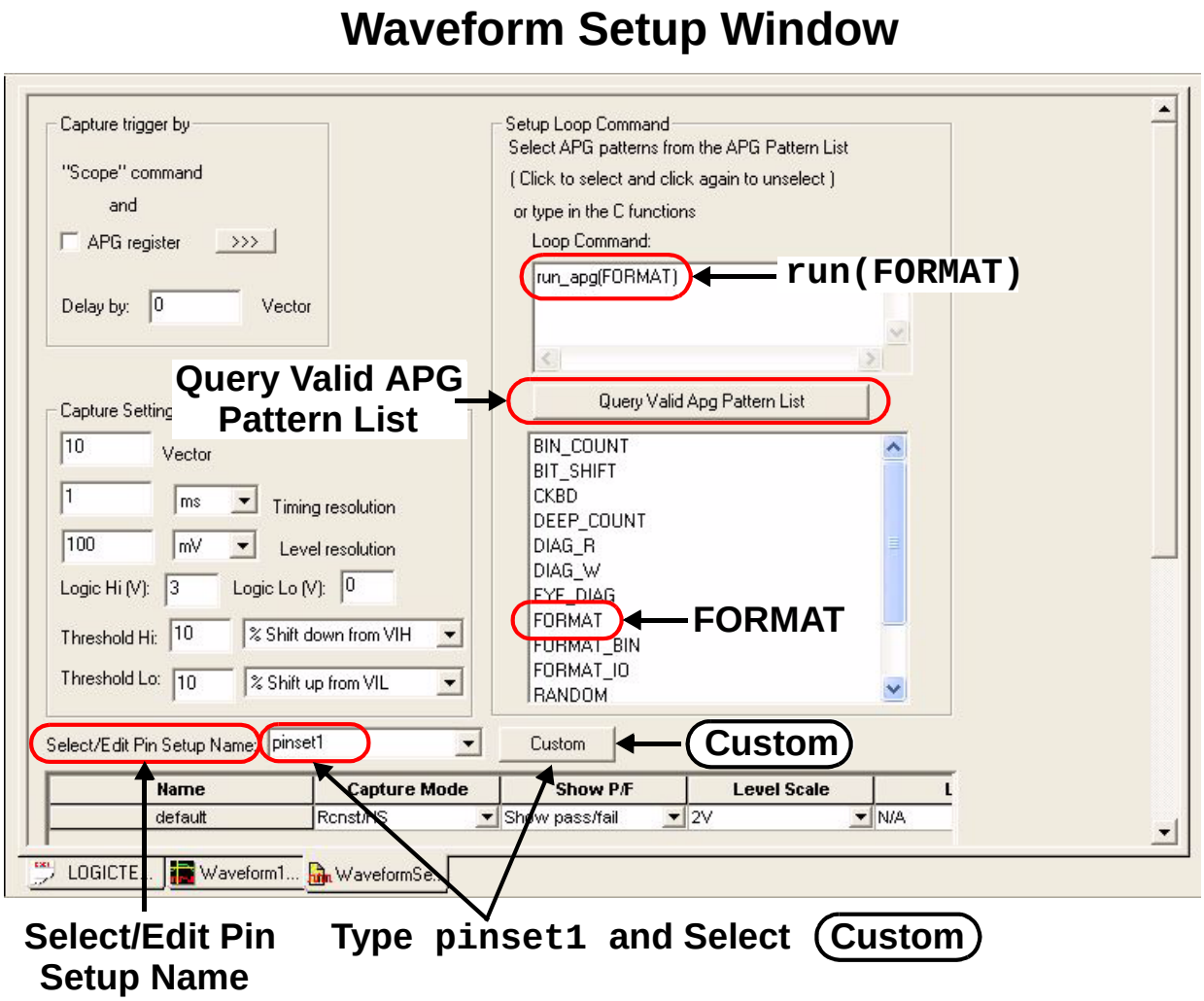


Figure 6-61. Waveform Setup Displaying Selected APG Pattern

3 To select pins for display, first specify the pin set name to be shared by all the other tools by typing `pinset1` in the `Select/Edit Pin Setup Name` text box (Figure 6-61).

4 Selecting the Custom button displays a window with a list of the pin groups defined in the test program in the `Valid Selection List` (panel on the right of Figure 6-62).

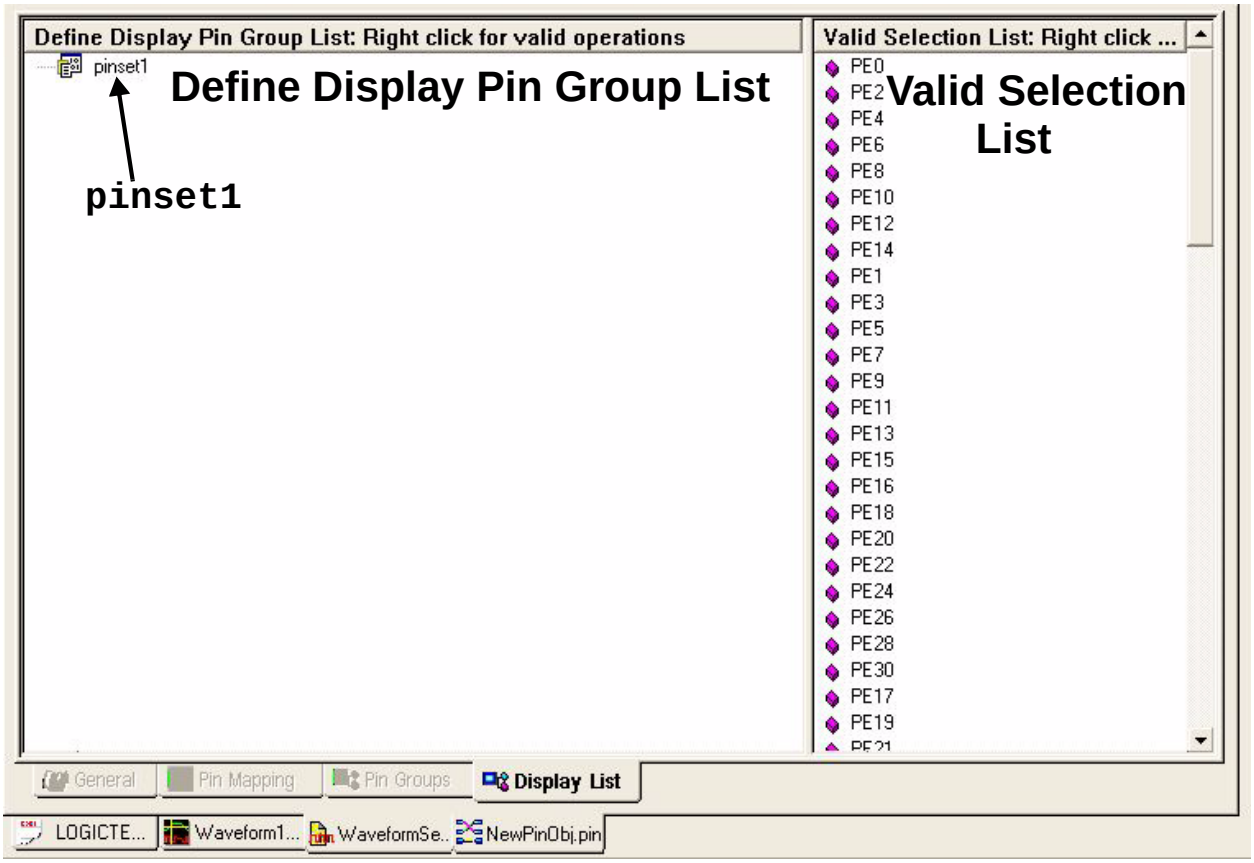


Figure 6-62. Pin Selection List

5 Scrolling down the `Valid Selection List` and double-clicking on the `apg_outpins` group adds and displays that pin group to `pinset1` in the `Define Display Pin Group List` panel on the left (Figure 6-63).

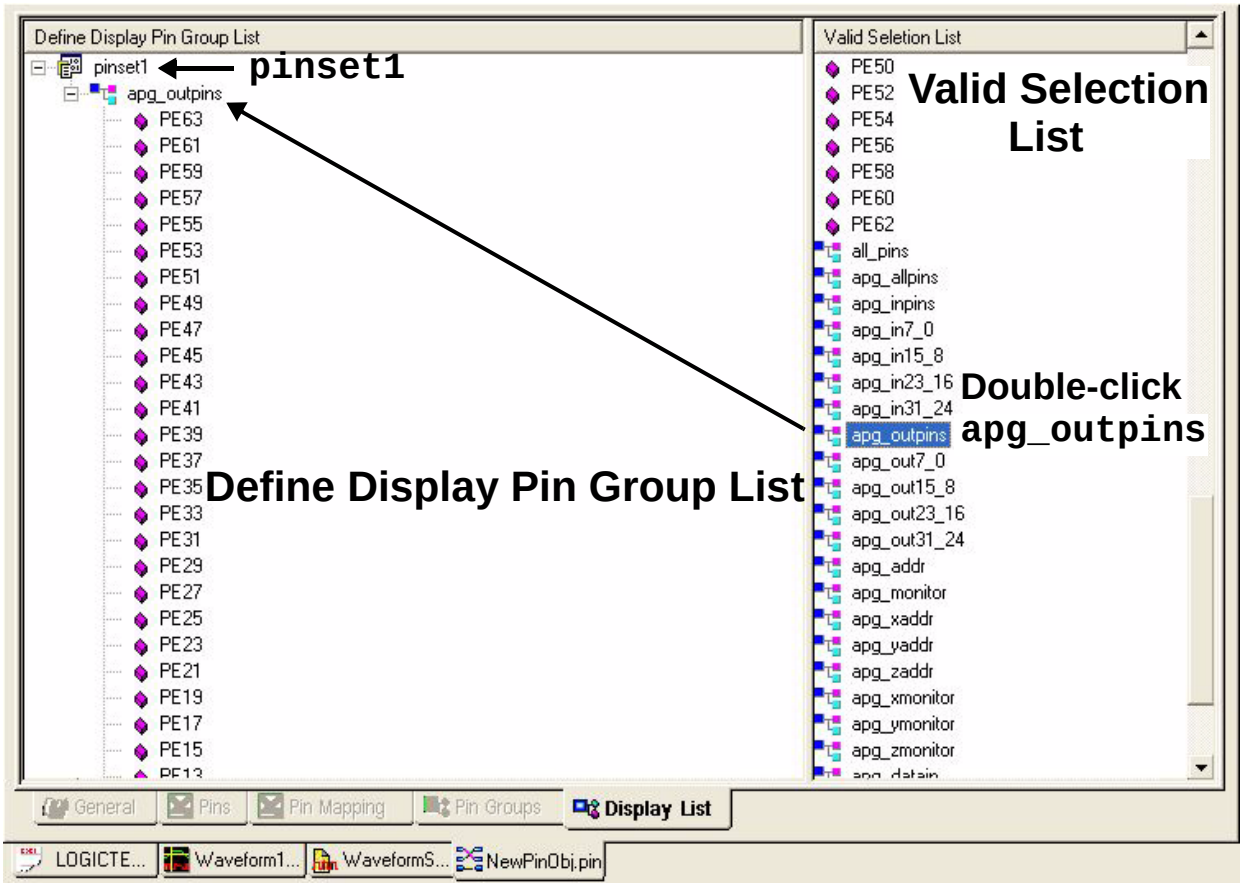


Figure 6-63. Adding `apg_outpins` to `pinset1` for Display

6 You can also filter out pins you do not want by first selecting them, right-clicking to display a pop-up menu, and then selecting the `Delete` command in the menu (Figure 6-64).

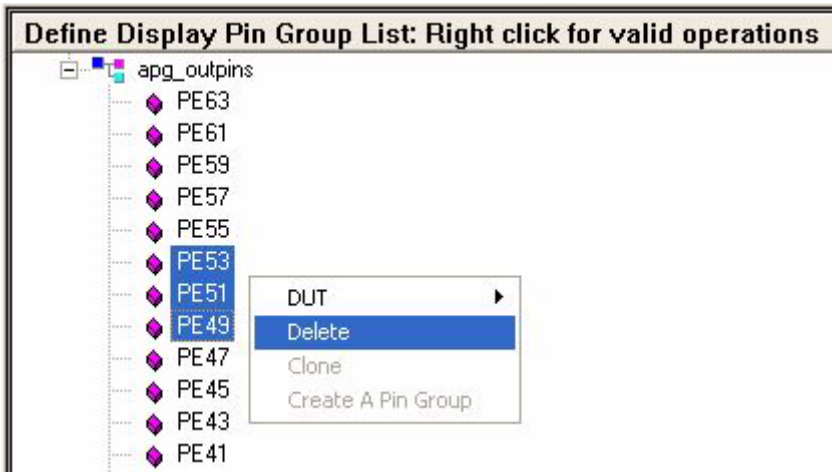


Figure 6-64. Deleting Pins from the `pinset1` Display Group

7 Selecting the Waveform Setup Document tab displays the Waveform Setup Window with the `+apg_outpins` added to the botton of the setup window (Figure 6-65). The `+` (plus) symbol indicates that this is a pin group that can be opened to display the pins in the group.

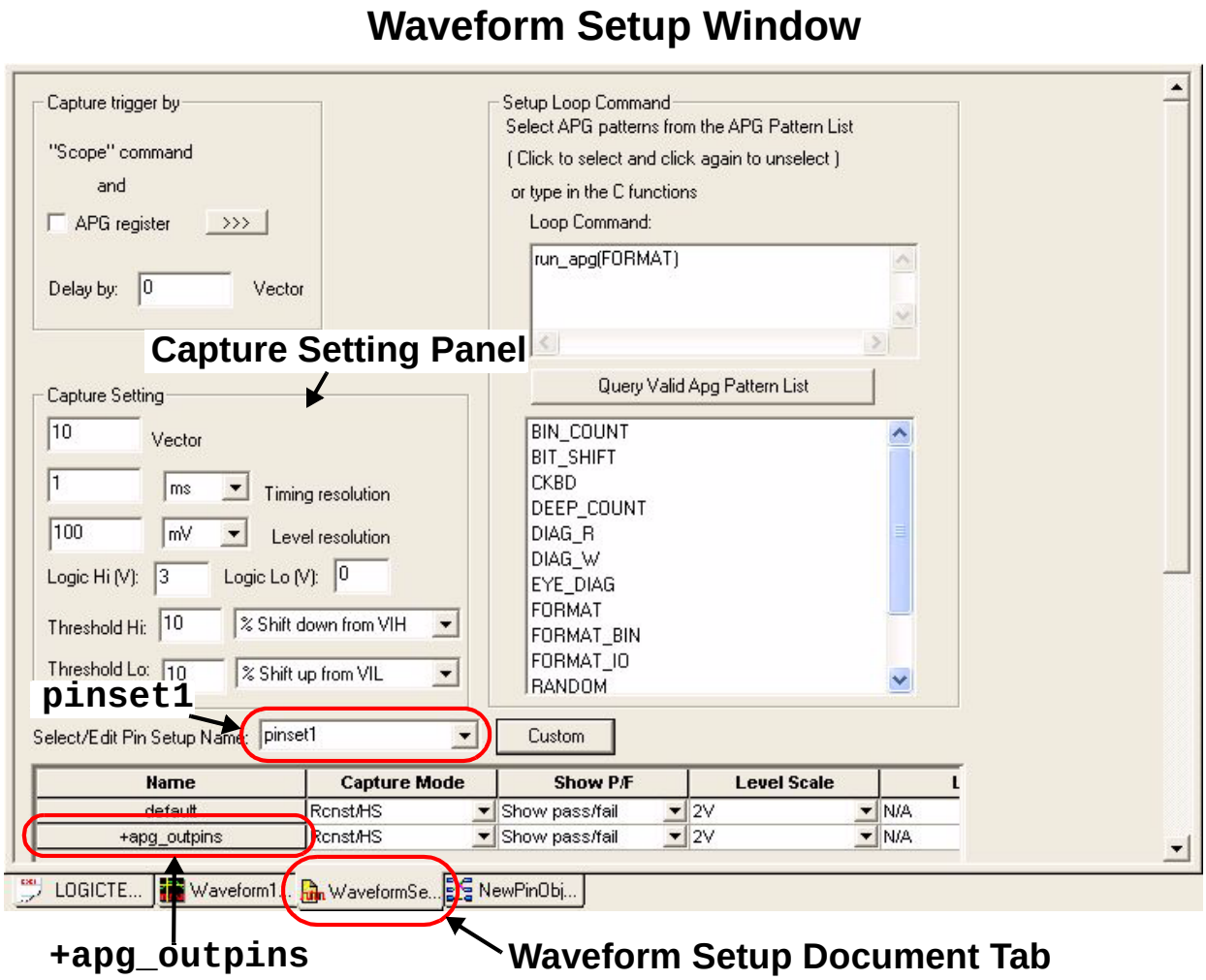


Figure 6-65. Waveform Setup Window Displaying `apg_outpins` Group

8 Placing the cursor next to the `+apg_outpins` changes the cursor to a right arrow (Figure 6-66) that you can left-click and open `+apg_outpins` group to display all of the pins in the group (Figure 6-67). Note that when the group name opens to display all of the pins in the group, the `+apg_outpins` changes to `–apg_outpins` to indicate the branch has expanded. You can close the `–apg_outpins` group by placing the cursor at one of the pins in the group to display the right arrow again and left-click the pin.

Figure 6-66. Cursor Displays Right Arrow Next to `apg_outpins` Group

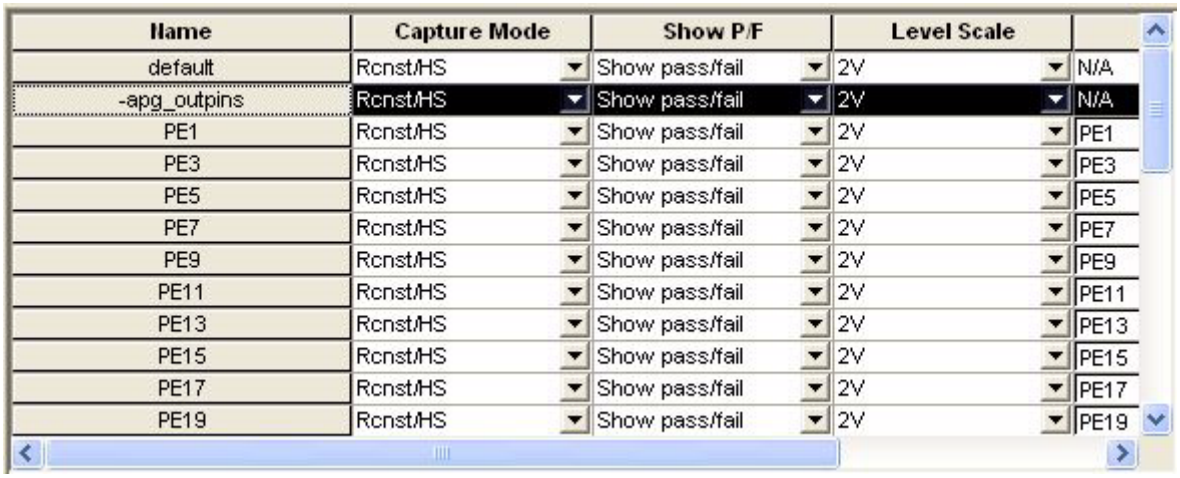


Figure 6-67. Displaying `–apg_outpins` Group Individual Pins

9 Selecting the `Capture Mode` column down-arrow in the `+apg_outpins` drop-down list box displays the following six different waveform capture modes (Figure 6-68):

- Reconstruction mode: Can be used only for input pins. The tool gets the logic values by translating the pattern files and the values are categorized at four levels: VHH, VIH, VIL and HiZ. This draws a digital waveform that illustrates what the DUT inputs should be seeing.
- High Speed mode: Can be used only for output pins. This mode constructs the waveform by a single-shot capture based on the captured value during the strobe edge/period. The main reason to use this mode is for high speed. This draws a digital waveform created by examining the pattern for expected behavior and running the pattern to gather actual pass/fail information at comparisons to illustrate the DUT output behavior.
- Expected Data mode: Can be used only for output pins. The tool gets the programmed expected data from the test program. This draws a digital waveform that illustrates what the DUT outputs are expected to be driving (not what they are actually driving). Think of this mode as drawing a picture of the compare cycles in the pattern.
- Rcnst/HS (Reconstruction and High Speed) mode: A combination of these two modes to capture both input and output pins simultaneously.
- Logic Analyzer mode: Available for both input pins and output pins. The signals captured in this mode are the measured signals (applied to both input and output pins). They are constructed by multiple samples per cycle based on the timing resolution that is set. For the output pins, the waveforms are the logic values using VOH and VOL as thresholds. For the input pins, the waveform data are categorized as four levels: VHH, VIH, VIL and HiZ. This mode provides the speed between High Speed mode and Scope mode. It provides more information about the waveform transition timing, but does not display the real voltage. It is scope mode with special voltage thresholds used to create a digitized-analog waveform in a shorter amount of time but sacrificing voltage accuracy.
- Scope mode: This mode is used for both DUT input pins and output pins, but *it is important to note that the measurement is made at the tester comparator not at the DUT*. This mode constructs the waveforms with the actual voltage levels and timing. It is high resolution and slow speed. It draws an analog waveform that runs the pattern numerous times, measuring voltage at the comparator at discreet times and voltage resolutions defined by the user.

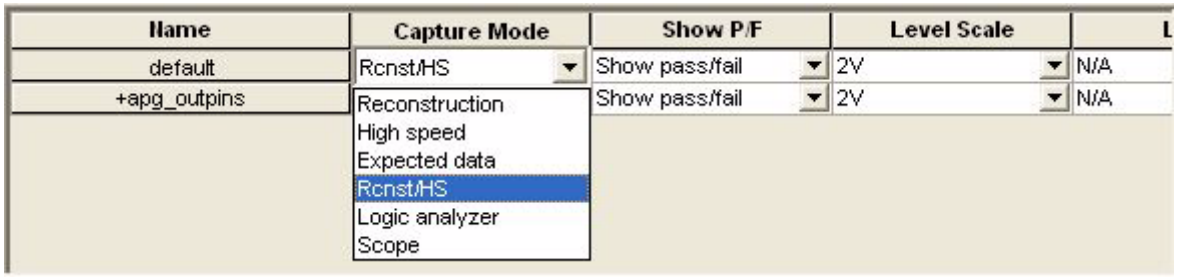


Figure 6-68. Displaying the `+apg_outpins` Capture Modes

10 To get a rough idea of the failure analysis, it is recommended that Reconstruction, High Speed, or Reconstruction/High Speed mode be used. Reconstruction mode is for the pure input pins. High Speed mode is for pure output pins. The Reconstruction/High speed mode is for IO pins. In general these modes are faster but the timing and levels measurements will not be as accurate. To get more accurate timing information, you could use Logic Analyzer mode. And to get accurate timing and level information, you could use Scope mode. The Expected Data mode is purely for output cycles.

It is recommended starting with the default `Rcnst/HS` (Reconstruction and High Speed) mode and leave the default `Show Pass/Fail` in its column to give you a quick view (Figure 6-69).

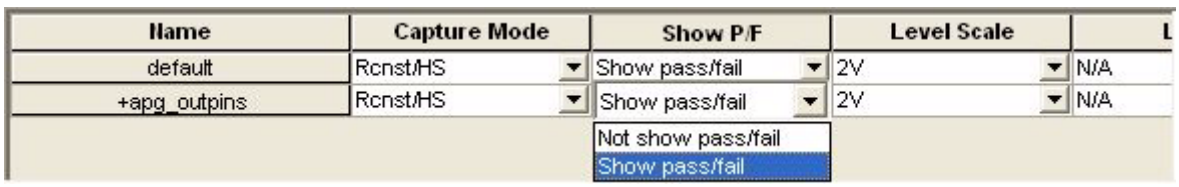


Figure 6-69. Show Pass/Fail Drop-Down List Box

11 In the Capture Setting panel (Figure 6-65 on page 276), the following fields are changed from their defaults (Figure 6-70):

- Vector: 30 – Specifies the number of vectors to capture.
- Timing Resolution: 10 ns – For Scope mode and Logic Analyzer mode, specifies the timing resolution of the sampling rate.

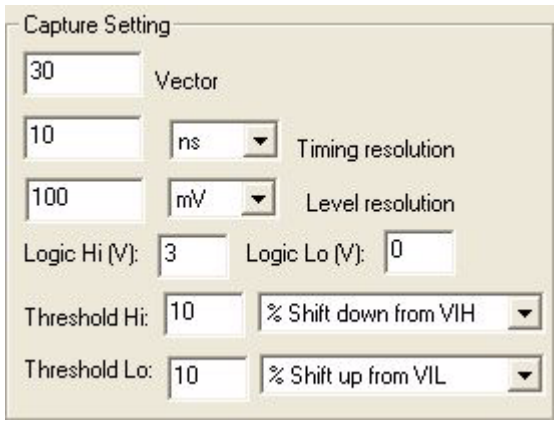


Figure 6-70. Waveform Setup Capture Setting Panel

Capturing the Waveform Plot

This section describes how to capture the waveform plot in online mode after configuring the waveform setup.

After configuring the waveform setup, the C Debugger is used to run the test program to the break point that was set (Figure 6-57 on page 268).

1 Selecting the `LOGICTEST.C` document tab displays the C Debugger document window with its context-sensitive menu bar and toolbar (Figure 6-57 on page 268).

2 Selecting the `Debug` > `Run` command or the Run toolbar button launches the program and causes it to run to the break point (Figure 6-71). A green arrow displays over the break point where the program stops.

Selecting Debug > Run to Break Point

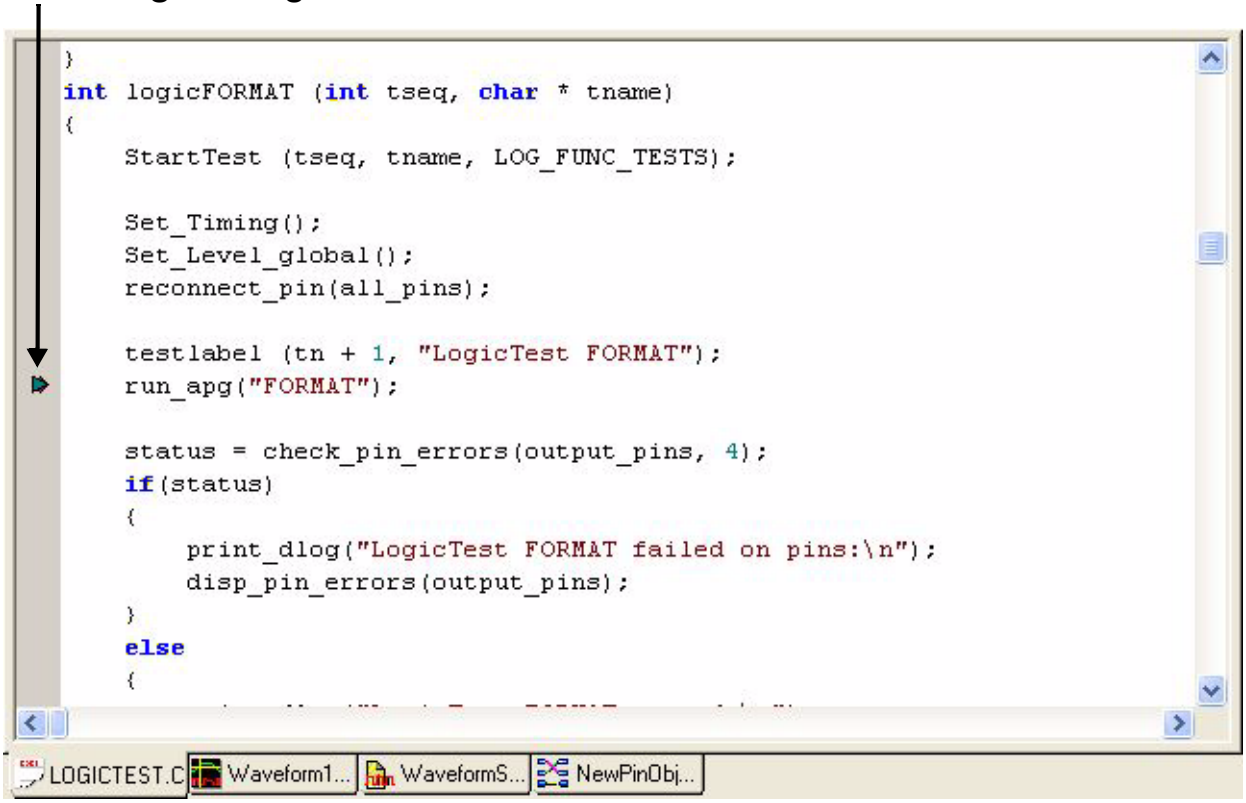


Figure 6-71. Run Program to Break Point

3 Selecting the Waveform Tool Document tab displays its window with its corresponding menus and toolbars (Figure 6-72).

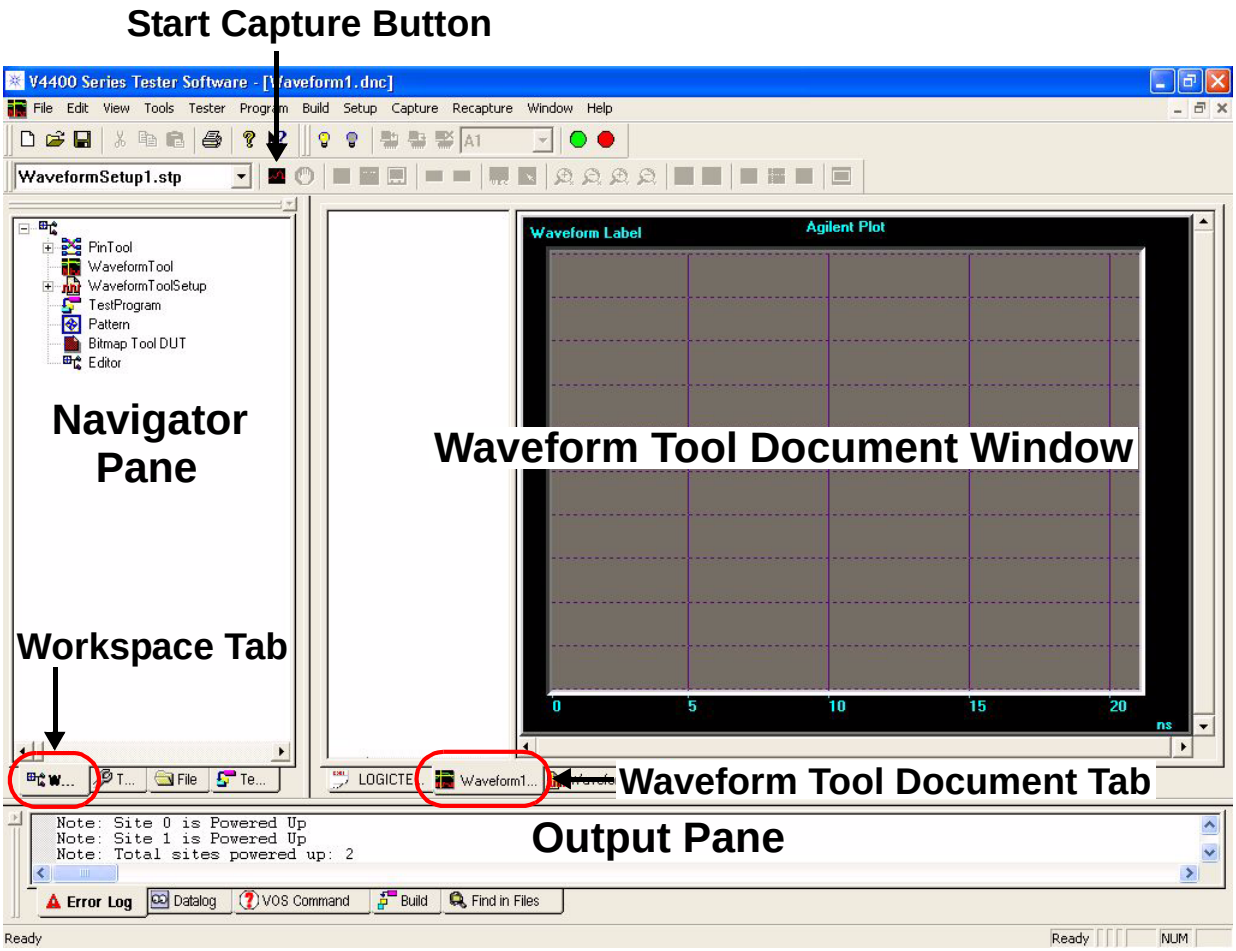


Figure 6-72. Waveform Tool Document Window Prior to Capture

4 Selecting the `Capture > Start` command or the Start Capture  toolbar button captures and displays the waveform plot (similar to Figure 6-73).

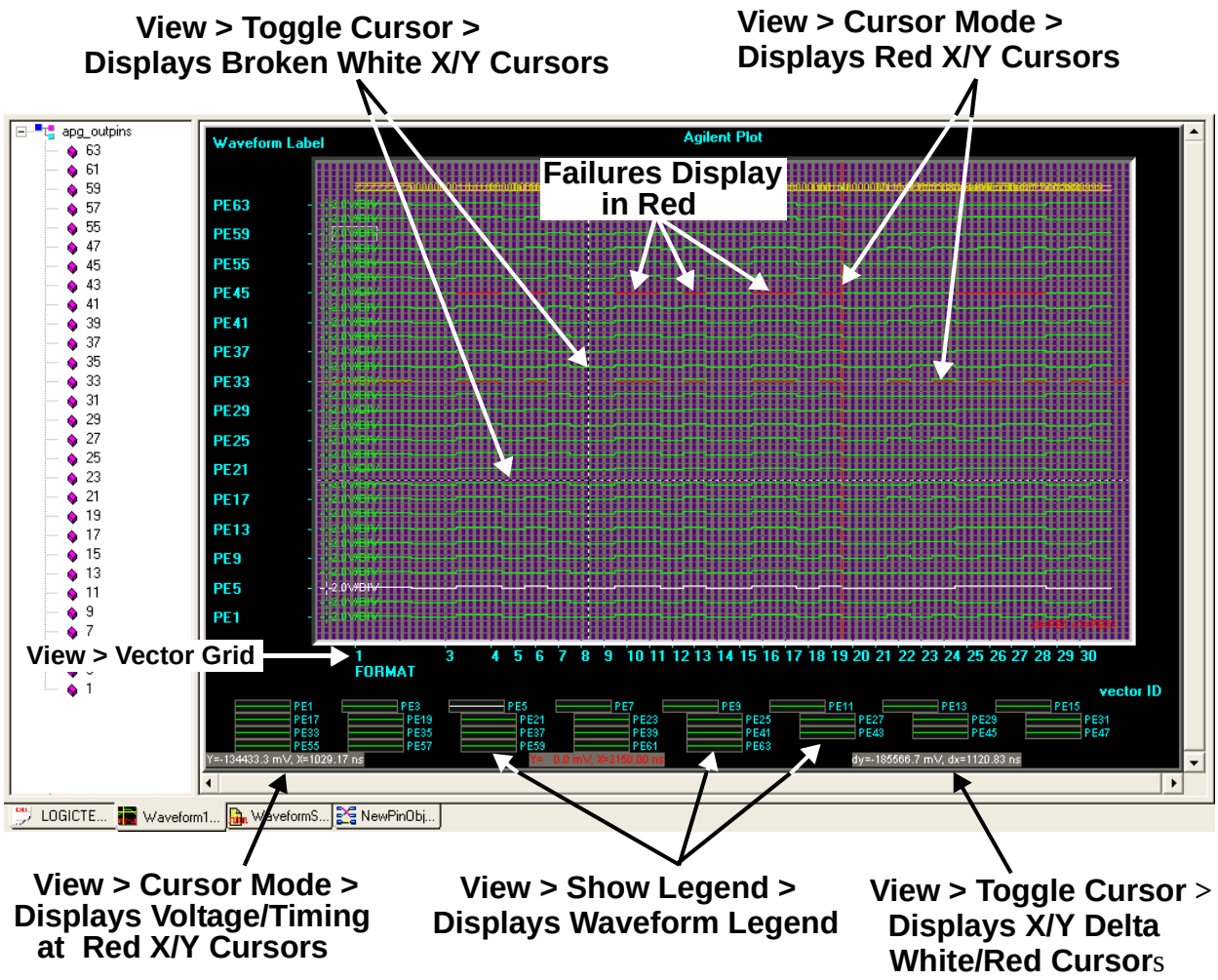


Figure 6-73. Captured Waveform Plot

Using the Display Features

This section describes some of the Waveform Tool display features that can be used for viewing and analyzing waveform data.

1. Selecting ⊟ button for the `apg_outpins` group causes the tree to collapse to display just the pin group name, and the waveform document plot also collapses to display only the waveform for the group (bus) and displays the bus value for all the individual pins, rather than for the group and each individual channel in the group. Similarly, selecting the ⊞ button for a collapsed group causes that group's tree to expand, and the corresponding individual channel waveforms are added to the waveform document plot.

2. Selecting the `View` > `Vector Grid` command toggles the X-axis scale display at the bottom of the document window to display in either a time scale in ns or vectors. The X axis displays in vectors when a ✓ displays in front of the command. The first vector on the left end of the X axis is the entry point in the pattern, and the vectors to the right on the X axis are offset from the entry point. The X axis displays a time scale in ns when a ✓ does not display in front of the command (similar to Figure 6-73).

3. Selecting `View` > `Cursor Mode` displays a red horizontal cursor line (y = voltage) and a red vertical cursor line (x = time) through the plot (Figure 6-73). It also displays in white text in the lower left corner of the document window the voltage and time at the plot coordinates where the two lines intersect. Pressing the left ← and right → arrow keys moves the red vertical cursor line, and pressing the up ↑ and down ↓ arrow keys moves the horizontal red cursor line, and the voltage/time values displayed in the lower left change as the cursors move.

4. Selecting `View` > `Toggle Cursor` displays a broken white horizontal cursor line and a broken white vertical line through the plot (Figure 6-73). The corresponding x/y delta from the red horizontal lines displays in white text in the lower right corner of the document window.

5. Selecting `View` > `Show Legend` displays the legend for all of the waveforms at the bottom of the document window that identifies the channels with the corresponding PE channel numbers (Figure 6-73). Selected waveforms display in white in both the plot and the legend. To select channels, run the cursor over the `V/DIV` label at the beginning of each waveform. The label becomes highlighted with a rectangular box. Left click here and an asterisk (*) will appear. This indicates that channel has been selected. Multiple channels can be selected this way.

6 Selecting a channel's waveform to highlight it and then selecting `View > Increase V/DIV` increases the voltage/division for that waveform. Similarly, selecting a channel's waveform to highlight it and then selecting `View > Decrease V/DIV` decreases the voltage/division for that waveform.

7 Moving waveforms is also supported. To move a waveform, right-click on the `V/DIV` label and drag the mouse.

8 Selecting items in the tree view pane displays a pop-up menu that provides additional display options (Figure 6-74).

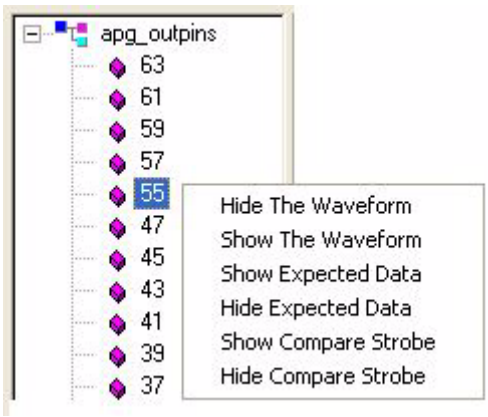


Figure 6-74. Selected Pins Pop-Up Menu

7

Timing Tool

Introduction

This chapter provides information for the Versatest Series Timing Tool. This tool displays global time set (GTS), local time set (LTS), and timing edge information in a graphical and tabular format. Its purpose is to help the test program developer to quickly debug timing patterns.

Chapter Contents

This chapter contains the following information about the Timing Tool:

- "Timing Tool Overview" on page 289: Provides a summary of the features, display information, the data used, pattern rule checking capabilities, online and offline modes, and related test program and VOS terminal commands.
- "Timing Tool Main Window" on page 291: Provides descriptions of the application interface functional areas, display formats, menus, menu commands, and dialog boxes.
- "Timing Tool Getting Started" on page 323: Describes how to load a test program, launch the IDE, connect to a test site, display the Timing Tool Document Window, and acquire and display the timing data in the Timing Tool graphical and tabular views. It also describes how to run the Timing Tool in offline mode.

NOTE The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

Timing Tool Overview

The Timing Tool displays GTS, LTS, and timing edge information in a graphical and tabular format.

The graphical display currently shows all of the theoretical vector information related to timing that includes the global time sets, formats, cycle times, and the following six edge settings:

- IO Start
- IO End
- Drive Start
- Drive End
- Strobe Start
- Strobe End

The tabular format displays selected pins in a tabular format. It shows the GTS currently set up for the selected pins and the corresponding LTS mapped to the GTS.

The Timing Tool also provides the capability to test the given timing data for Pattern Language Programming Rules violations and display errors in both the graphical and tabular views.

The Timing Tool has online and offline modes. In online mode, the timing data is acquired from the a specified physical test site and the vector data is from the current test program. In offline mode, the data comes from a previously saved Timing Tool file. The Timing Tool file is created in online mode after the data has been acquired. After the data is acquired in online mode or the Timing Tool file is opened in offline mode, the features are currently the same for both modes, except offline mode can not interact with the hardware.

The following commands set up timing in the test program. See the *Versatest Series Command Reference Volume 1* for command descriptions.

- `get_drive_time_ps`
- `get_io_time_ps`
- `get_strobe_time_ps`
- `set_cycle_time`
- `set_cycle_time_ps`

- `set_drive_time`
- `set_drive_time_ns`
- `set_drive_time_ps`
- `set_io_time`
- `set_io_time_ns`
- `set_io_time_ps`
- `set_strobe_time`
- `set_strobe_time_ns`
- `set_strobe_time_ps`
- `set_tsmap`

The following VOS terminal commands are used for timing debug. See the *Versatest Series Command Reference Volume 2* for command descriptions.

- dgts
- dt
- dtw
- mtde
- mtds
- mtie
- mtis
- mtse
- mtss
- mtswin
- sts

The initial release of the Timing Tool does not support all of the menu commands and features described in this chapter. The application's capabilities are being released in phases. The initial phase focuses on debug. This phase will have little development capability. Later releases will incorporate features to assist in developing of test program timing as well as additional enhancements to debug resulting from tools integration.

Timing Tool Main Window

The Timing Tool graphical view is similar to that shown in Figure 7-1. The Timing Tool tabular view is similar to that shown in Figure 7-2 on page 293.

Selecting `View` > `Mode` > `Graphical` displays Figure 7-1 as the active view.

Selecting `View` > `Mode` > `Tabular` displays Figure 7-2 as the active view.

These two views of the Timing Tool are the application interface. The interface is composed of the following functional areas:

- Navigator Pane: See the `View` > `Navigator Pane` command on page 304
- Menu bar on page 293
  - File menu on page 294
  - Edit menu on page 299
  - View menu on page 301
  - Tools menu on page 311
  - Tester menu on page 314
  - Data menu on page 317
  - Window menu on page 320
  - Help menu on page 321
- Toolbar: See the `View` > `Toolbar` command on page 302
- Pin List Tree Pane on page 322
- Tool Document Window: Displays the following Timing Tool views:
  - Graphical View Pane: See the `View` > `Mode` > `Graphical` command on page 306
  - Tabular View Pane: See the `View` > `Mode` > `Tabular` command on page 305
- Output Pane: See the `View` > `Output Pane` command on page 304
- Status Bar: See the `View` > `Status Bar` command on page 304

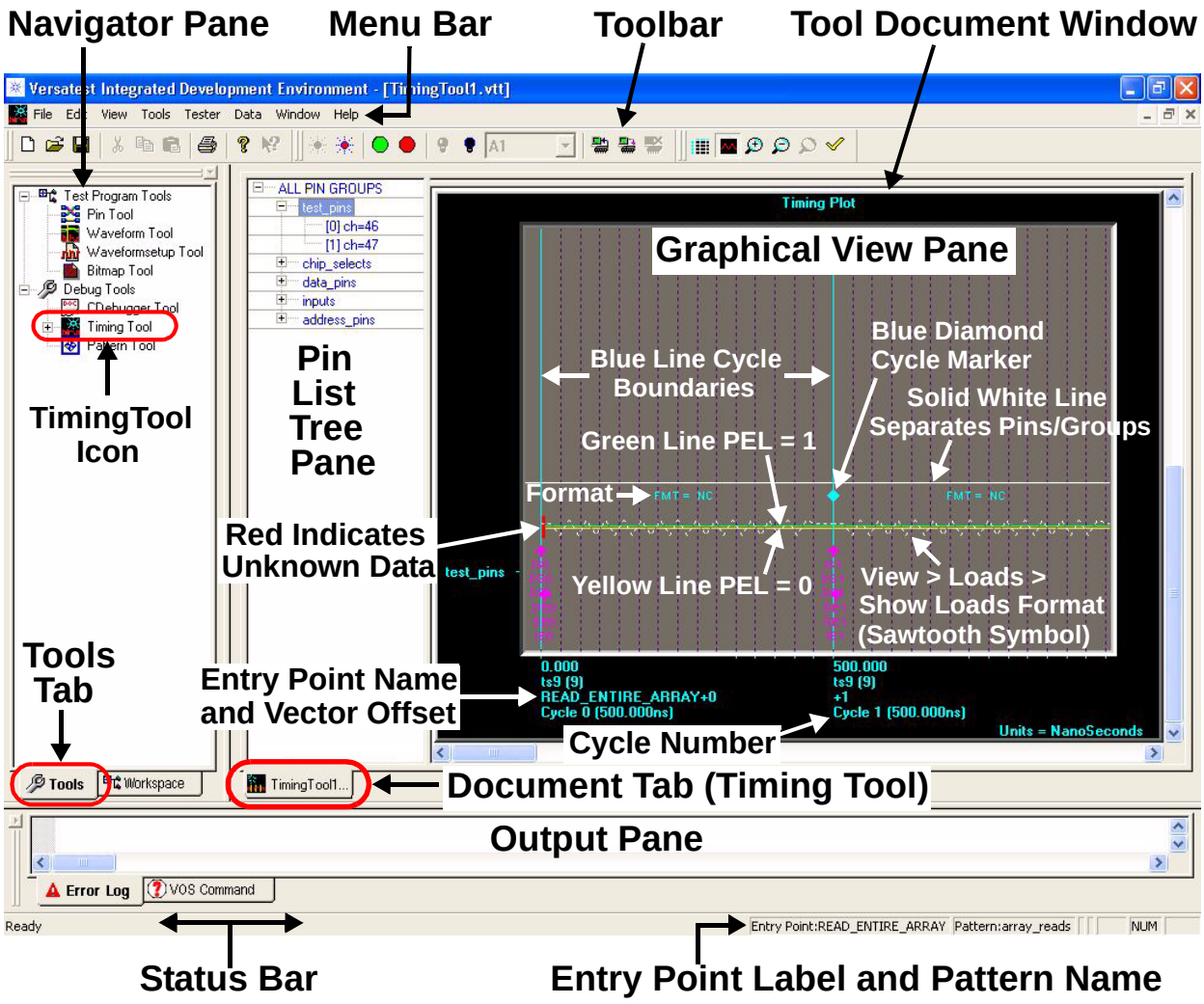


Figure 7-1. Timing Tool Main Window Graphical View Pane

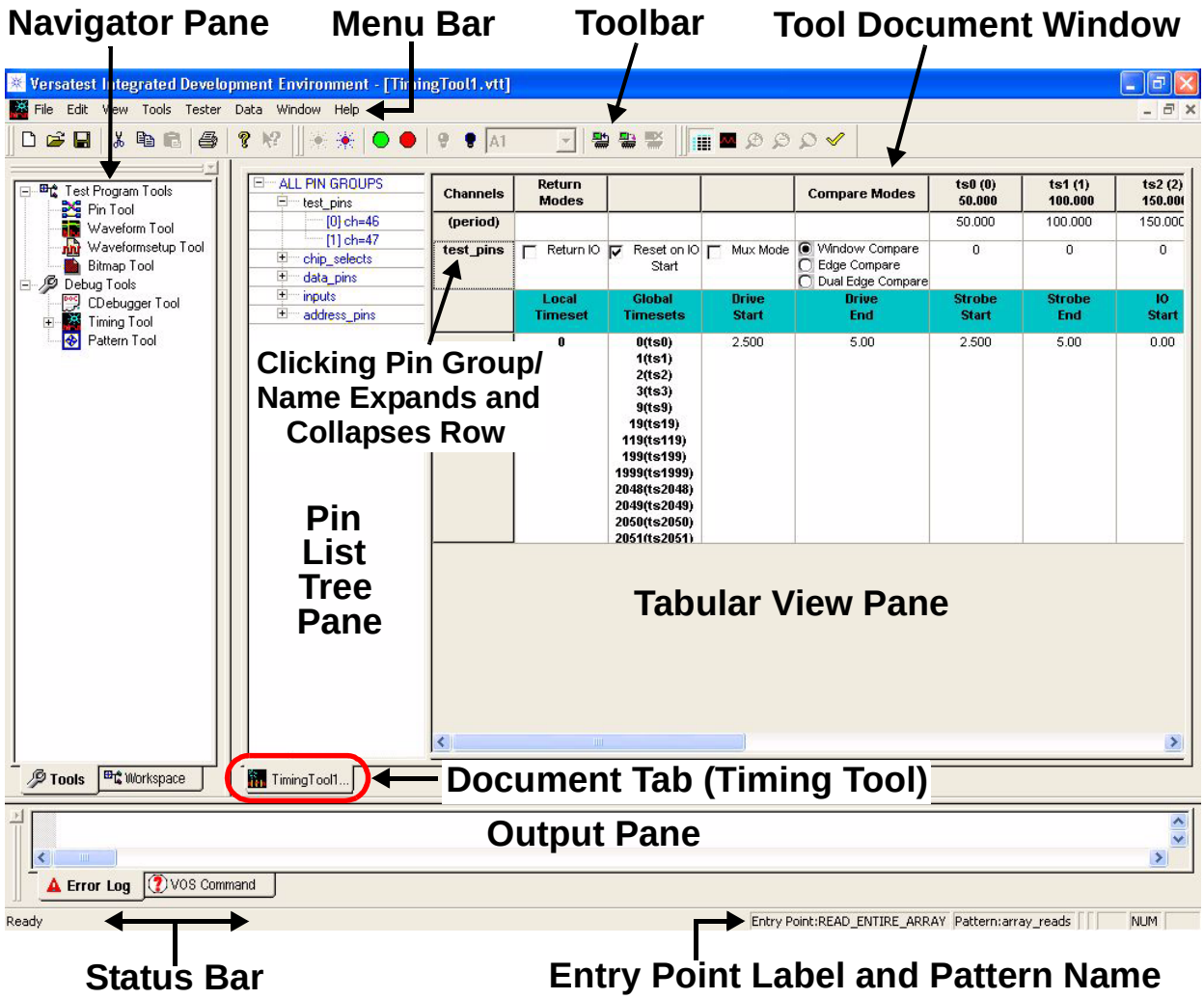


Figure 7-2. Timing Tool Main Window Tabular View Pane

Menu Bar

The menu bar at the top of the Timing Tool main window (Figure 7-1 on page 292) contains the following eight pull-down menus from which you can select commands:

- File menu on page 294
- Edit menu on page 299
- View menu on page 301
- Tools menu on page 311
- Tester menu on page 314

- Data menu on page 317
- Window menu on page 320
- Help menu on page 321

File Menu

Selecting File in the menu bar opens the menu in Figure 7-3.

Figure 7-3. File Menu

The File menu contains the following commands:

- New command on page 295
- Open command on page 296
- Close command on page 298
- Close All command on page 298
- Save command on page 298
- Save As command on page 298
- Open Workspace command on page 298
- Save Workspace command on page 298
- Close Workspace Command on page 298
- Print command on page 298

- Print Preview command on page 299
- Print Setup command on page 299
- Recent Workspaces on page 299
- Recent File command on page 299
- Exit command on page 299

New Command (File Menu)

Displays the New command submenu (Figure 7-4) that allows you to display a new Workspace or create new IDE documents. The New toolbar button displays a New dialog box that lists the same items to select as the submenu.

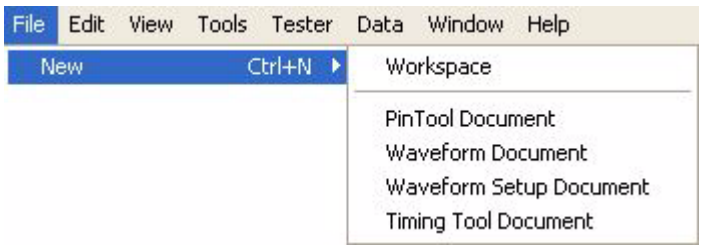


Figure 7-4. File > New Command Submenu

The New command submenu contains the following commands:

- Workspace command on page 295
- PinTool Document command on page 295
- Waveform Document command on page 296
- Waveform Setup Document command on page 296
- Timing Tool Document command on page 296

Workspace Command (New Command Submenu)

Displays as the active Workspace its default with its corresponding Menu bar, Toolbar, Navigator pane, Output pane, and Status bar.

PinTool Document Command (New Command Submenu)

Displays as the active document a blank PinTool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Document Command (New Command Submenu)

Displays as the active document a blank Waveform Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Setup Document Command (New Command Submenu)

Displays as the active document the default Waveform Setup Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Timing Tool Document Command (New Command Submenu)

Displays as the active document a blank Timing Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and graphical display window), Output pane, and Status bar.

Open Command (File Menu)

 Displays the Open command submenu (Figure 7-5) that allows you to open a Workspace or IDE documents from the submenu list. The Open  toolbar button displays a generic Open dialog box from which you can open a selection listed in the submenu.

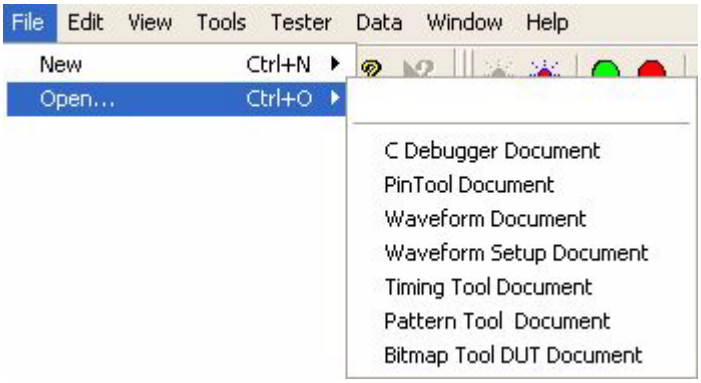


Figure 7-5. Open Command Submenu

The Open command submenu contains the following commands that display an Open dialog box similar to Figure 7-6:

- C Debugger Document command on page 297
- PinTool Document command on page 297
- Waveform Document command on page 297
- Waveform Setup Document command on page 297
- Timing Tool Document command on page 297

- Pattern Tool Document command on page 298
- Bitmap Tool DUT Document command on page 298

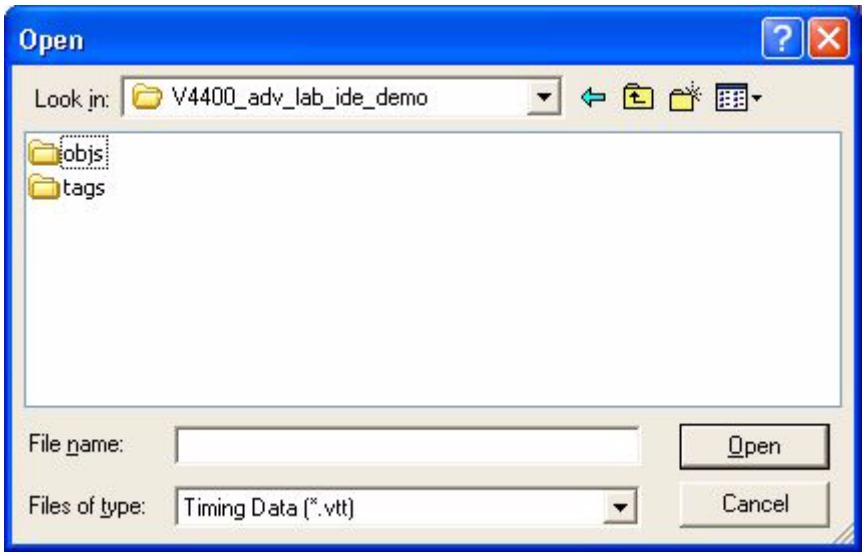


Figure 7-6. File > Open Dialog Box

C Debugger Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 7-6) to select a previously saved C Debugger Tool document file with a *.cof extension.

PinTool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 7-6) to select a previously saved PinTool document file with a *.pin file extension.

Waveform Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 7-6) to select a previously saved Waveform document file with a *.dnc file extension.

Waveform Setup Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 7-6) to select a previously saved Waveform Setup document file with a *.stp file extension.

Timing Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 7-6) to select a previously saved Timing Tool document file with a *.vtt file extension.

Pattern Tool Document Command (Open Command Submenu)

Displays an Open dialog box (Figure 7-6) to select a previously saved Pattern Tool document file with an *.apg2 file extension.

Bitmap Tool DUT Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 7-6) to select a previously saved Bitmap Tool DUT definition document file with a *.dut file extension.

Close Command (File Menu)

Closes the active tool document.

Close All Command (File Menu)

Closes all tool documents and displays the default IDE main window.

Save Command (File Menu)

 Saves the active document file.

Save As Command (File Menu)

Displays the Save As dialog box to save the active tool document file.

Open Workspace Command (File Menu)

Displays an Open Workspace dialog box with a *.wsp extension. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace and opening another. The Workspace consists of the tools, layout, and open documents.

Save Workspace Command (File Menu)

Saves the current workspace with a *.wsp extension. The Workspace consists of the tools, layout, and open documents.

Close Workspace Command (File Menu)

Closes the current workspace. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace.

Print Command (File Menu)

 Prints the Pin List Tree Pane that lists the displaying pin groups/labels of the active Timing Tool document window.

Print Preview Command (File Menu)

Displays a print preview window of the Pin List Tree Pane that lists the displaying pin groups/labels of the active Timing Tool document window.

Print Setup Command (File Menu)

Displays a printer setup dialog box that allows you to select and configure a printer.

Recent Workspaces Command (File Menu)

Displays a Recent Workspaces submenu from which you can select a workspace.

Recent File Command (File Menu)

Not currently supported by the IDE.

Exit Command (File Menu)

Closes the IDE. If the workspace or any other tool document files have changed, you will be asked if you would like to save them.

Edit Menu

Selecting Edit in the menu bar opens the menu in Figure 7-3.

Figure 7-7. Edit Menu

The Edit menu contains the following commands:

- Undo command below on page 300
- Redo command on page 300

- Cut command on page 300
- Copy command below on page 300
- Paste command on page 300
- Find command on page 300
- Replace command on page 301
- Find in Workspace on page 301

Undo Command (Edit Menu)

Allows you to undo any text editing in the Tabular View Pane.

Redo Command (Edit Menu)

Allows you to redo any text editing in the Tabular View Pane.

Cut Command (Edit Menu)

Cuts the currently selected timing/vector information for insertion elsewhere.

Copy Command (Edit Menu)

Copies the currently selected timing/vector information for insertion elsewhere.

Paste Command (Edit Menu)

Inserts the last copied/cut timing data at the current spot in the vector sequence.

Find Command (Edit Menu)

Not supported by the Timing Tool. Displays the Find dialog box (Figure 7-8) used for text searching.

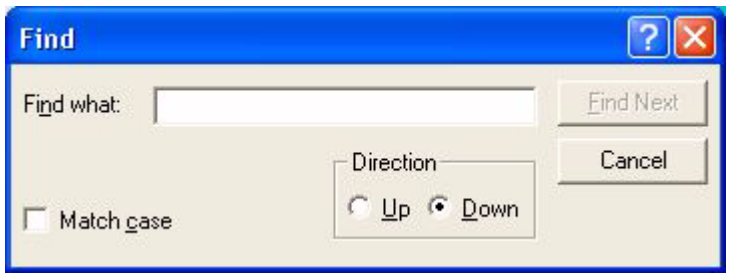


Figure 7-8. Find Command Dialog Box

Replace Command (Edit Menu)

Not supported by the Timing Tool. Displays the Replace dialog box (Figure 7-9) that provides text replacement capability based on the criteria you specify.

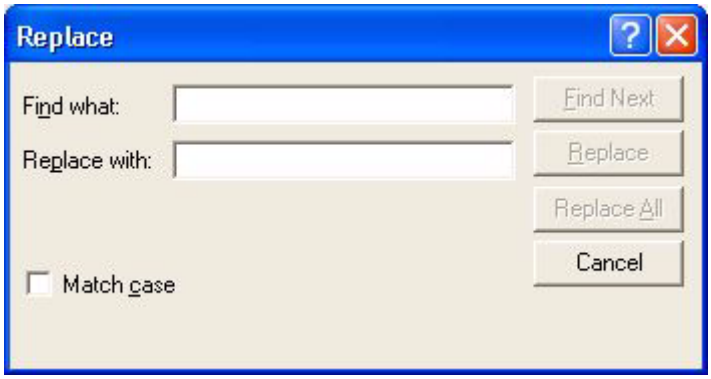


Figure 7-9. Replace Dialog Box

Find in Workspace Command (Edit Menu)

Not currently supported by the IDE.

View Menu

Selecting View in the menu bar opens the menu in Figure 7-10.

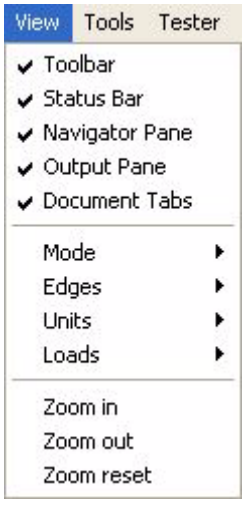


Figure 7-10. View Menu

The View menu contains the following commands:

Toolbar Command (View Menu)

Displays or hides the toolbar shown in Figure 7-11. The toolbar displays at the top of the Timing Tool main window when a ✓ displays in front of its command in the View menu. Clicking on the buttons in the toolbar give you quick access to many of the menu bar commands. Clicking in the Display pane activates the associated toolbar buttons. Positioning the mouse cursor over a toolbar button displays tooltip text with the corresponding command description.

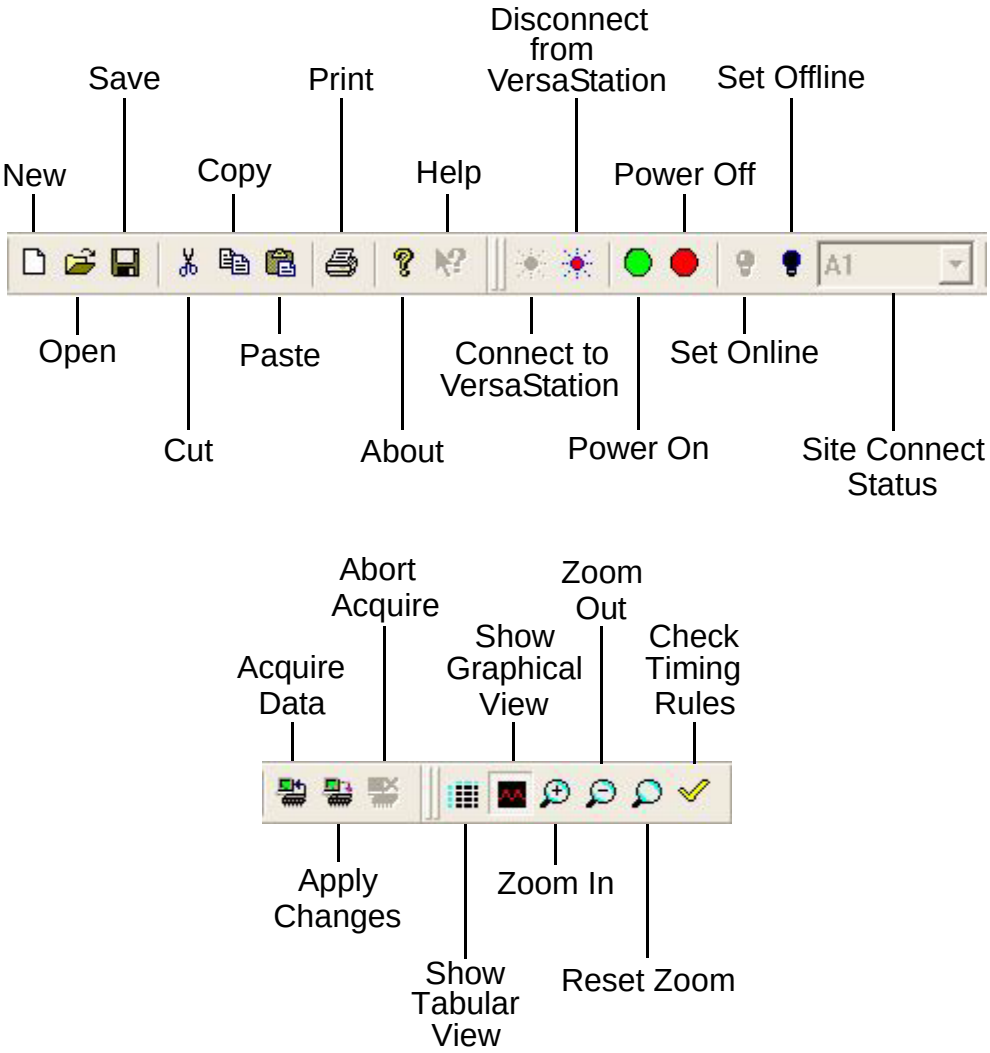


Figure 7-11. Timing Tool Toolbar

File > New on page 295

File > Open on page 296

File > Save on page 298

Edit > Cut on page 300

Edit > Copy on page 300

Help > Help on page 321

Tester > Connect to VersaStation on page 315

Tester > Disconnect from VersaStation on page 315

Tester > Power On on page 317

Tester > Power Off on page 317

Edit > Paste on page 300

File > Print on page 298

Help > About on page 321

Tester > Set Online on page 315

Tester > Set Offline on page 315

A1 IDE Site Connect Status

Tester > Acquire Data on page 316

Tester > Apply Changes on page 317

Tester > Abort Acquire on page 317

View > Mode > Show Tabular View on page 305

View > Mode > Show Graphical View on page page 306

View > Zoom In on page page 310

View > Zoom Out on page 310

View > Reset Zoom on page 311

Data > Check Timing Rules on page 318

Status Bar Command (View Menu)

Displays the Status Bar (similar to Figure 7-1 on page 292) in either the graphical or tabular display when a ✓ displays in front of its command in the View menu. The Status Bar displays the status of the active view window (for example, ready), the entry point of the displaying pattern, and the pattern name.

Navigator Pane Command (View Menu)

Displays the Navigator Pane (similar to Figure 7-1 on page 292) when a ✓ displays in front of its command in the View menu.

The Timing Tool is associated with the `TimingTool` icon on the Tools Tab in the Navigator Pane.

Output Pane Command (View Menu)

Displays the Output Pane (similar to Figure 7-1 on page 292) when a ✓ displays in front of its command in the View menu.

The Timing Tool is associated with the `VOS Command` tab in the Output Pane. The `VOS Command` tab is enabled when the IDE is set online by the selecting the yellow Set Online toolbar button or the corresponding `Tester > Set Online` command. The VOS

Command tab allows you to enter VOS terminal commands and display the results on the tab and in the corresponding test site window in the VK Test Station main window. See the "VOS Terminal Commands" chapter in the *Command Reference Volume 2* for the available commands.

Document Tabs Command (View Menu)

Displays the Document Tabs at the bottom of the Tool Document Window (similar to Figure 7-1 on page 292) when a ✓ displays in front of its command in the View menu.

Mode Command (View Menu)

Displays the Mode submenu (Figure 7-12) that allows you to select either Tabular view in the active view window or Graphical view in the active view window.

Figure 7-12. Mode Submenu

The Mode submenu contains the following two commands:

- `View > Mode > Tabular` below on page 305
- `View > Mode > Graphical` on page 306

Tabular Command (Mode Command Submenu)

 Displays the Tabular View Pane in the active document window (similar to Figure 7-2 on page 293) when a ✓ is displayed in front of its command in the Mode command submenu (Figure 7-12). It displays the selected pins in a tabular format. It shows the global time sets (GTS) currently set up for the selected pins and the corresponding local time sets (LTS) mapped to the GTS.

The tabular view (or grid view) consists of a header row, a row with the global timeset periods, followed by a row with the set of global timesets for each of the selected pin groups/pins being shown. Each pin row can be expanded or collapsed by clicking on the pin group/pin name (in the first column) to show the local timeset and edge settings for that pin.

Each pin row also has some columns dedicated to changing return mode and compare mode settings for that pin group/pin.

When a pin row is expanded it will show a row for each local timeset used for that pin or pin group. Each local timeset row will show the global timeset(s) that use that local timeset, the edge settings for each of the six edges, and a column of APG rules violations. If there is a rules violation for a local timeset edge set, it will show up highlighted in red.

Global timeset values, local timesets, and edge settings can all be modified by clicking in the grid at the appropriate value and changing the setting in that cell. Rules violations that result from changing a value will immediately appear upon setting the value.

Graphical Command (Mode Command Submenu)

 Displays the Graphical View Pane in the active document window (similar to Figure 7-1 on page 292) when a ✓ is displayed in front of its command in the Mode command submenu (Figure 7-12).

The graphical view consists of the pin group or pin labels on the left, the vector or cycle information at the bottom, and details of the timing data in the middle.

The Graphical View Pane shows the following information that includes all of the theoretical vector information related to timing such as the global time sets, formats, cycle times, and six edge settings:

- A waveform showing the graphical representation of what the data will do. The green line indicates PEL =1 and a yellow line indicates a PEL = 0. Red indicates that the data is unknown. Gray displays for ambiguous data.
- Drive or compare format for the current cycle.
- Blue vertical lines showing cycle separation.
- Selectable blue diamond cycle marker that can be dragged or clicked on to change the cycle duration.
- Solid white lines separating pin group or pins.
- The following six edge settings with cycle numbers and edge designators that can be dragged to change their settings:
    - IO Start (IS)
    - IO End (IE)
    - Drive Start (DS)
    - Drive End (DE)
    - Strobe Start (SS)
    - Strobe End (SE)

The vector information at the bottom of the Graphical View Pane shows the following:

- Accumulated time
- Global timeset name and number for the cycle starting
- Entry point name and offset for the cycle starting
- Cycle number

The following settings and parameters can be changed by double-clicking on objects or areas on in the Graphical View Pane:

- Double-clicking on an edge marker displays an Edit Edge Value dialog box that allows you to edit the edge marker value (similar to Figure 7-13).

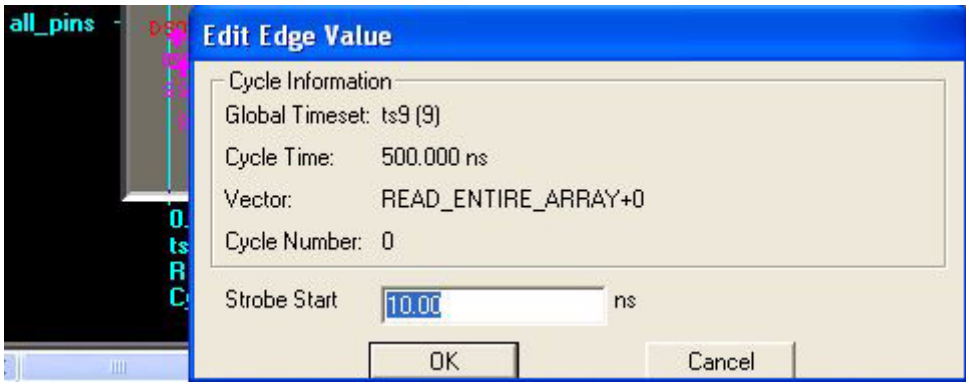


Figure 7-13. Edit Edge Dialog Box

- Double-clicking on a blue diamond cycle marker displays an Edit Global Timeset dialog box that allows you to change the global timeset for that cycle (similar to Figure 7-14).

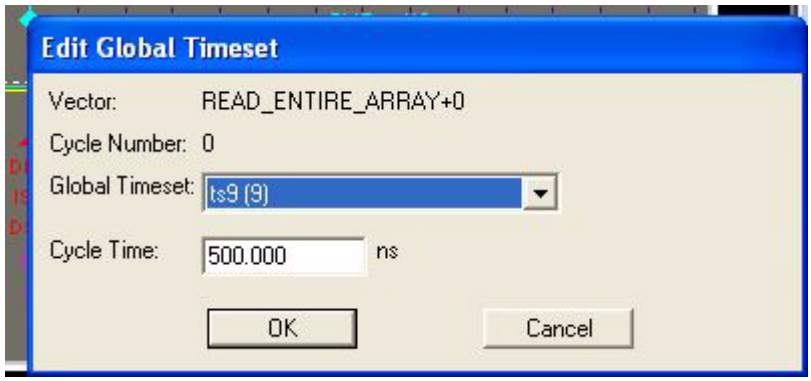


Figure 7-14. Edit Global Timeset Dialog Box

- Double-clicking anywhere else in the pin group or pin area displays an Edit Pin Attributes dialog box that allows you to change the channel mode and the pin mode (similar to Figure 7-15).

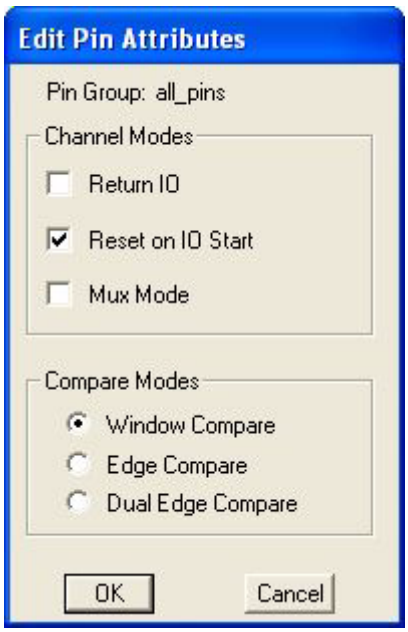


Figure 7-15. Edit Pin Attributes Dialog Box

Edges Command (View Menu)

Displays the Edges submenu (Figure 7-16) that allows you to select displaying of Edges only or Edges with Formatting information in the Timing Tool main window Graphical Display (similar to Figure 7-1 on page 292).

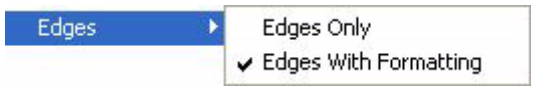


Figure 7-16. Edges Submenu

The Edges submenu contains the following two commands:

Edges Only Command (Edges Command Submenu)

Displays the edges only without formatting information in the graphical view when a ✓ is displayed in front of its command in the Edges command submenu (Figure 7-16).

Edges With Formatting Command (Edges Command Submenu)

Displays the edges with formatting information in the graphical view (similar to Figure 7-1 on page 292) when a ✓ is displayed in front of its command in the Edges command submenu (Figure 7-16). For example, `FMT = NC`.

Units Command (View Menu)

Displays the Units submenu (Figure 7-17) that allows showing all timing values in one of the allowed units. All values being shown either in the tabular display or the graphical display change to reflect the unit choice.

Figure 7-17. Units Submenu

The Units submenu contains the following two commands:

NanoSeconds Command (Units Command Submenu)

Shows all values displaying in either the tabular view or the graphical view in nanoseconds when a ✓ is displayed in front of its command in the Units command submenu (Figure 7-17).

PicoSeconds Command (Units Command Submenu)

Shows all values displaying in either the tabular view or the graphical view in picoseconds when a ✓ is displayed in front of its command in the Units command submenu (Figure 7-17).

Loads Command (View Menu)

Displays the Loads submenu (Figure 7-18) that controls displaying of the active load format in the graphical view (similar to Figure 7-1 on page 292).

Figure 7-18. Loads Submenu

The Loads submenu contains the following two commands:

Show Load Format Command (Units Command Submenu)

Displays the active load format in the graphical view (similar to Figure 7-1 on page 292) when a ✓ is displayed in front of its command in the Loads command submenu (Figure 7-17).

The active load format sawtooth symbol in the graphical view represents the following:

- A dotted line means the load is driven by data.
- A solid line means the load is enabled.
- A broken line means it is ambiguous when showing a pin group when the active status is different for pins in the group.

Hide Load Format Command (Units Command Submenu)

Hides the active load format in the graphical view when a ✓ is displayed in front of its command in the Loads command submenu (Figure 7-17).

Zoom In Command (View Menu)

 Zooms in on the graphical view in the active window. When the display mode is showing in the tabular format, this command is disabled.

Zoom Out Command (View Menu)

 Zooms out on the graphical view in the active window. When the display mode is showing in the tabular format, this command is disabled.

Zoom Reset Command (View Menu)

 Resets to the original zoom factor in the graphical view of the active window. When the display mode is showing in the tabular format, this command is disabled.

Tools Menu

Selecting Tools in the menu bar opens the menu in Figure 7-19.

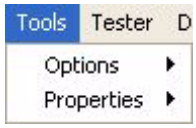


Figure 7-19. Tools Menu

The Tools menu contains the following commands:

- Options command on page 311
- Properties command on page 311

Options Command (Tools Menu)

Displays the Options submenu shown in Figure 7-20.

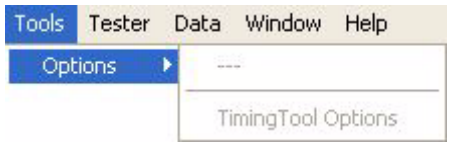


Figure 7-20. Options Submenu

The Options command submenu contains the following command:

- TimingTool Options command on page 311

TimingTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

Properties Command (Tools Menu)

Displays the Properties submenu shown in Figure 7-21.

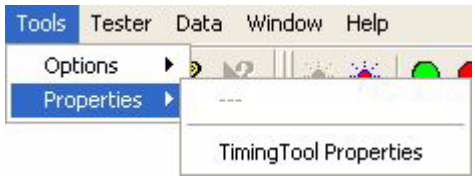


Figure 7-21. Properties Submenu

The Properties command submenu contains the following command:

- TimingTool Properties command on page 312

TimingTool Properties Command (Properties Command Submenu)

Displays the Set Data Options dialog box (similar to Figure 7-22) that has the following two tabs:

- Pin Groups tab (Figure 7-22): Lists all pin groups for the current set of vectors that can be selected or de-selected to display and then select the OK button.
- Global Timesets tab (similar to Figure 7-23): Lists all global time set for the current set of vectors that can be selected or de-selected to display and then select the OK button.

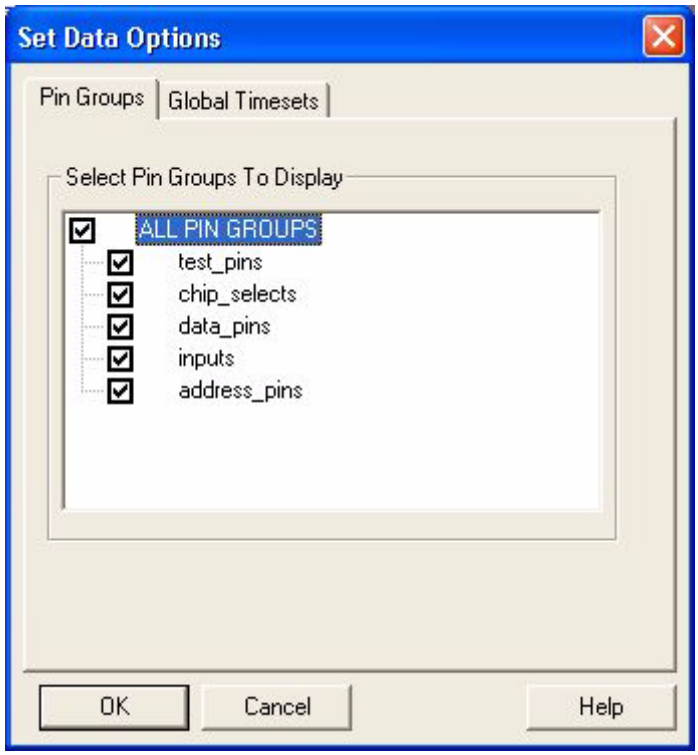


Figure 7-22. Set Options Dialog Box Pin Groups Tab

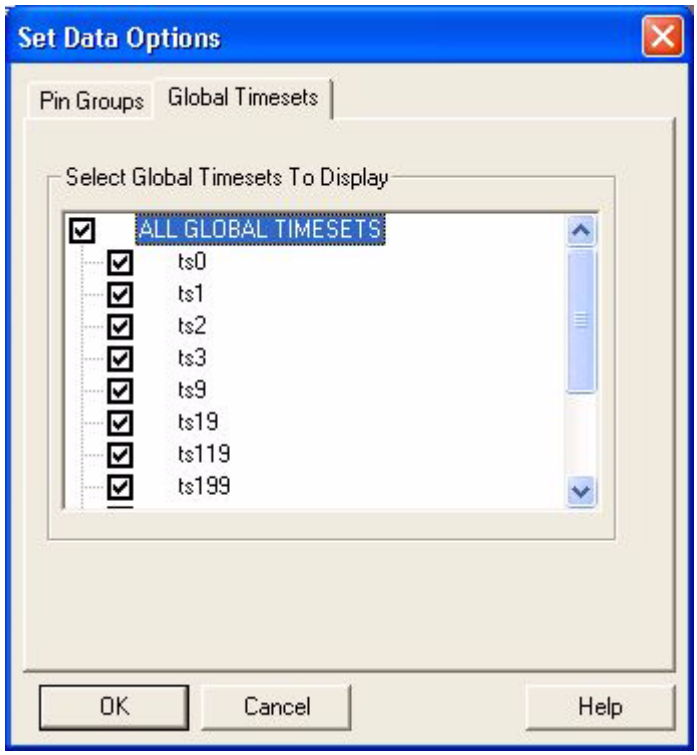


Figure 7-23. Set Options Dialog Box Global Timesets Tab

Tester Menu

Selecting Tester in the menu bar opens the menu in Figure 7-24.

Figure 7-24. Tester Menu

The Tester menu contains the following commands:

-  Connect to VersaStation on page 315
-  Disconnect from VersaStation on page 315
-  Set Online command on page 315
-  Set Offline command on page 315
-  Acquire Data command on page 316
-  Apply Changes command on page 317
-  Abort Acquire command on page 317
-  Tester Power On command on page 317
-  Tester Power Off command on page 317

Connect to VersaStation Command (Tester Menu)

 Connects the IDE to VersaStation (formerly called PCM). The IDE must be connected to VersaStation (PCM) before it can be connected to a specific tester test site.

Disconnect from VersaStation Command (Tester Menu)

 Disconnects the IDE from VersaStation (formerly called PCM).

Set Online Command (Tester Menu)

 Connects the IDE to the tester for the following tools that support online mode. The IDE must be connected to VersaStation (formerly PCM) before it can be connected to a specific test site.

- C Program Debugger (currently has no offline capability)
- Pattern Tool (currently has no offline capability)
- Waveform Tool
- Timing Tool

Set Offline Command (Tester Menu)

 Disconnects the IDE from the tester. The following tools support offline mode:

- Pin Tool (currently has no online capability)
- Waveform Tool (viewing saved files only)
- Timing Tool (viewing saved files only)
- Bitmap Tool (currently has no online capability)

Select the Open toolbar button or the `File > Open` command to display an open dialog box from which a Timing Tool file with a .VTT (Versatest Timing Tool) extension is opened. The .VTT file is created by selecting `File > Save` after timing data is acquired in online mode by selecting `Tester > Acquire Data`.

Acquire Data Command (Tester Menu)

Displays the Acquire Timing Data dialog box (similar to Figure 7-25) that specifies that data to be acquired and displayed. The timing data acquired is from the physical site specified in the toolbar Site Connect Status A1 drop-down list box and the vector data is from the current test program. Selecting the yellow Set Online toolbar button or corresponding `Tester > Set Online` command connects the IDE to the tester site `A1` as shown in the toolbar A1 drop-down list box.

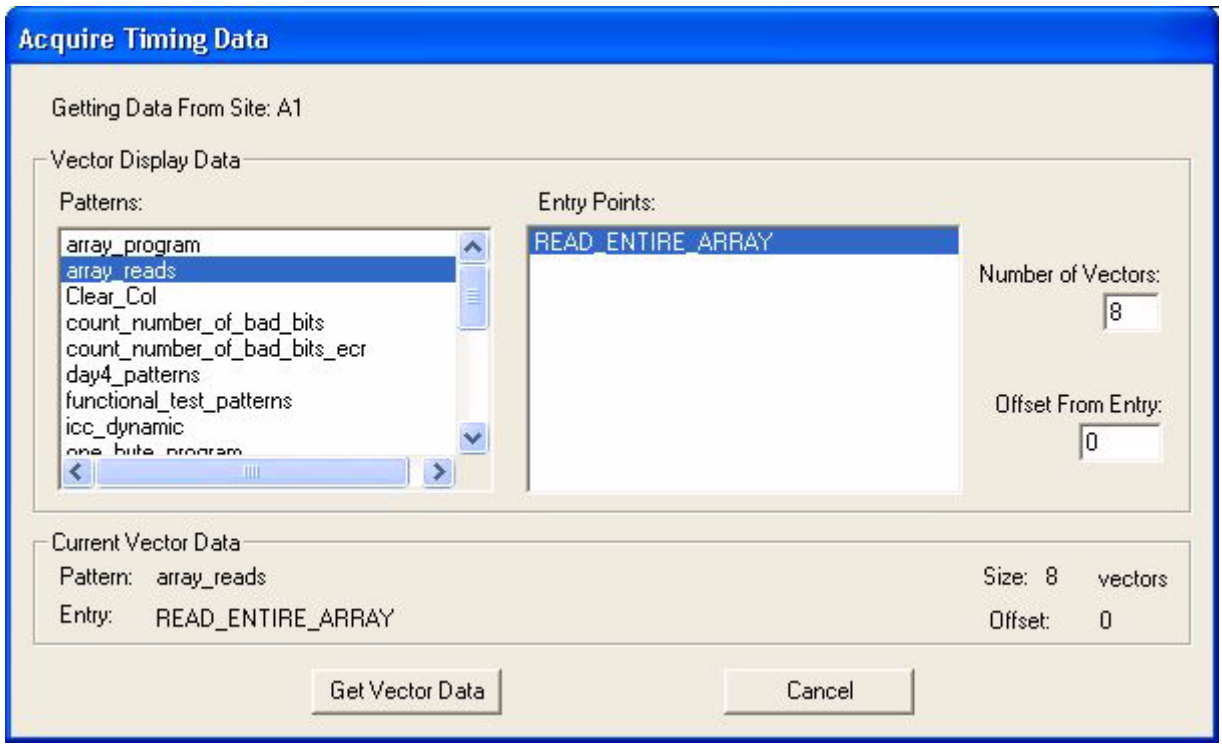


Figure 7-25. Acquire Timing Data Dialog Box

The Acquire Timing Data dialog box contains the following fields:

- `Vector Display Data` panel:
  - `Patterns`: Displays the patterns in the acquired timing data.

  - `Entry Points`: Displays the entry point for the selected pattern.
  - `Number of Vectors`: Specifies the number of vectors in the selected pattern to display. The initial value is the number of vectors in the pattern.
  - `Offset from Entry`: Specifies the offset from the entry point from which the data acquire begins.
- `Current Vector Data` panel:
  - `Pattern`: Displays name of the selected pattern.
  - `Entry`: Displays the name of the selected entry point.
  - `Size`: Displays the number of vectors in the selected pattern.
  - `Offset`: Displays the offset in the selected pattern.
- Get Vector Data button: Acquires the specified data and displays it in the Timing Tool graphical view (similar to Figure 7-1 on page 292).

Apply Changes Command (Tester Menu)

 Downloads edited timing data back to the hardware.

Abort Acquire Command (Tester Menu)

 After selecting the Get Vector Data button in the Acquire Timing Data Dialog Box (similar to Figure 7-25), stops the capture if you would like to stop it before it is complete.

Tester Power On Command (Tester Menu)

 Same as the VK Test Station main window `Utilities > Power On` command and its corresponding  toolbar button. Resets and powers up the test sites (Test Head).

Tester Power Off Command (Tester Menu)

 Same as the VK Test Station main window `Utilities > Power Off` command and its corresponding  toolbar button. Turns off power to the test sites (Test Head).

Data Menu

Selecting Data in the menu bar opens the menu in Figure 7-26.

Figure 7-26. Data Menu

The Data menu contains the following commands:

- Compile command on page 318
- Create Code Fragment command on page 318
- Check Timing Rules command on page 318

Compile Command (Data Menu)

Allows saving of edited timing data in a compact file format (file extension .VTTC) that can be read by a new (yet to be defined) VOS command in order to set all of the timing from within a test program.

Create Code Fragment Command (Data Menu)

Allows creation of a code fragment (a subroutine, actually) containing all of the information needed to set up the hardware timing as described by the timing data. This subroutine can be compiled in with and called from within the test program.

Check Timing Rules Command (Data Menu)

 Displays the Check Timing Rules dialog box (similar to Figure 7-27) for the pins selected in the Pin List Tree pane. The APG Rules Checker is an off-line tool that is used for checking patterns to identify when Pattern Language Programming Rules have been violated. The APG operates properly if, and only if, you adhere to these pattern language rules. The Timing Tool will test the given timing data for rules violation. See appendix A, “Pattern Language Programming Rules,” in the *Command Reference Volume 1* for detailed information about the rules. For the V4400 test system, see appendix B, “APG Rules Checker,” in the *V4400 Command Reference Volume 1* for additional information about the rules checker.

As shown in the `Type of Rules Checking` panel (Figure 7-27), this dialog box provides the following two modes for running the APG Rules Checker:

- Check Edges Only: Checks the rules in the tabular view.

- Check Vectors: Checks the rules in graphical view. Those rules that apply only to cycle-to-cycle timing, or that require knowledge of the channel format, will only be tested in the graphical timing view, not in the tabular view.

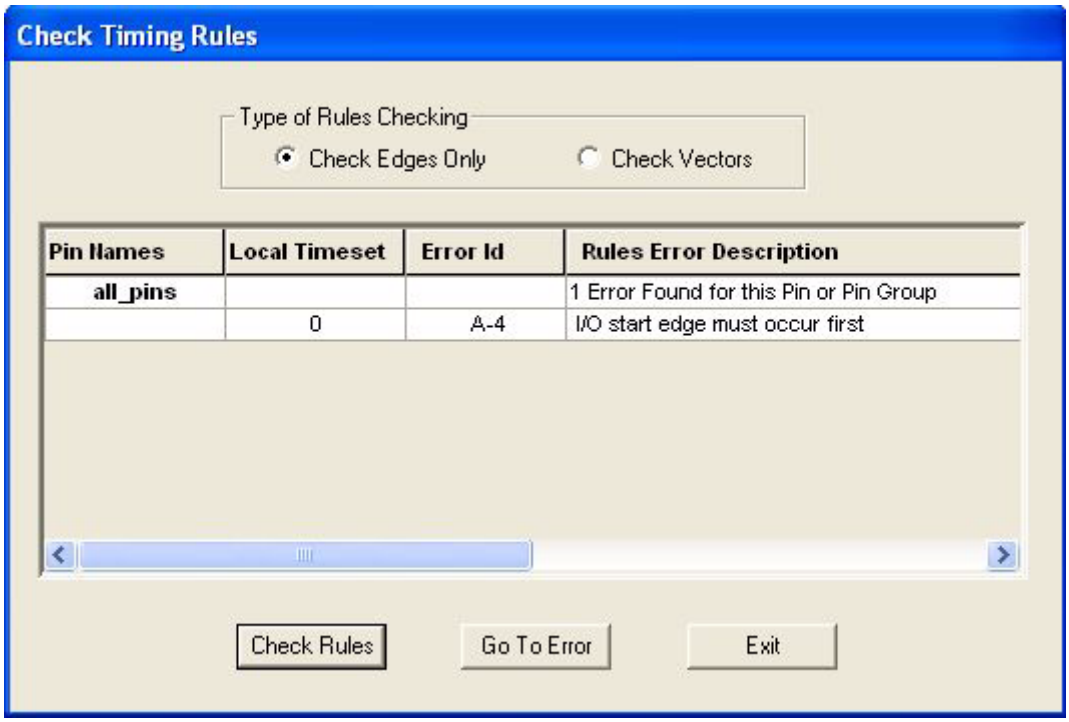


Figure 7-27. Check Timing Rules Dialog Box

Leaving the default Check Edges Only option button selected and selecting the Check Rules  button, checks the rules and displays the results (similar to Figure 7-27). The results contain the following fields:

- `Pin Names`: Displays the pin group or pin name failing.
- `Local Timeset`: Displays the LTS that has the error.
- `Error Id`: Displays the APG rule number violated. This number is used to reference the rule in the Pattern Language Programming Rules.
- `Rules Error Description`: Displays the number of errors for the selected pin or pin group and a brief summary of each violation.

Selecting the `Check Vectors` option button in the Check Timing Rules dialog box (Figure 7-27) returns to displaying the Graphical Display, and selecting the Check Rules [Check Rules] button displays the results in the Graphical Display with the Check Timing Rules dialog box displaying. The failing edge marker labels display in red in the Graphical Display. These labels display in red whenever there is an error, not only when you run the rules checker.

Double-clicking on a particular violation in the dialog box, or by highlighting the violation row and selecting the [Go To Error] button, the graphical or tabular view will show the specific violation.

Window Menu

Selecting Window in the menu bar opens the menu in Figure 7-28.

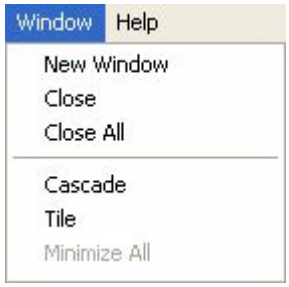


Figure 7-28. Window Menu

The Window menu contains the following commands:

- New Window command on page 320
- Close command on page 320
- Close All command on page 321
- Cascade command on page 321
- Tile command on page 321
- Minimize All command on page 321

New Window Command (Window Menu)

Displays a blank copy of the active timing tool document window.

Close Command (Window Menu)

Closes the active tool document window.

Close All Command (Window Menu)

Closes all tool document windows with their corresponding tabs.

Cascade Command (Window Menu)

Cascades all open tool document windows in an overlapping fashion one on top of another with the title bar of each visible.

Tile Command (Window Menu)

Tiles all open tool document windows in a non-overlapping fashion.

Minimize All Command (Window Menu)

Not currently supported.

Help Menu

Selecting Help in the menu bar opens the menu in Figure 7-29.

Figure 7-29. Help Menu

The Help menu contains the following two commands:

Help Topics Command (Help Menu)

 Not currently supported.

About Versatest Integrated Development Environment Command (Help Menu)

 Displays the About Versatest Integrated Development Environment dialog box that contains software component version and copyright information (similar to Figure 7-30).

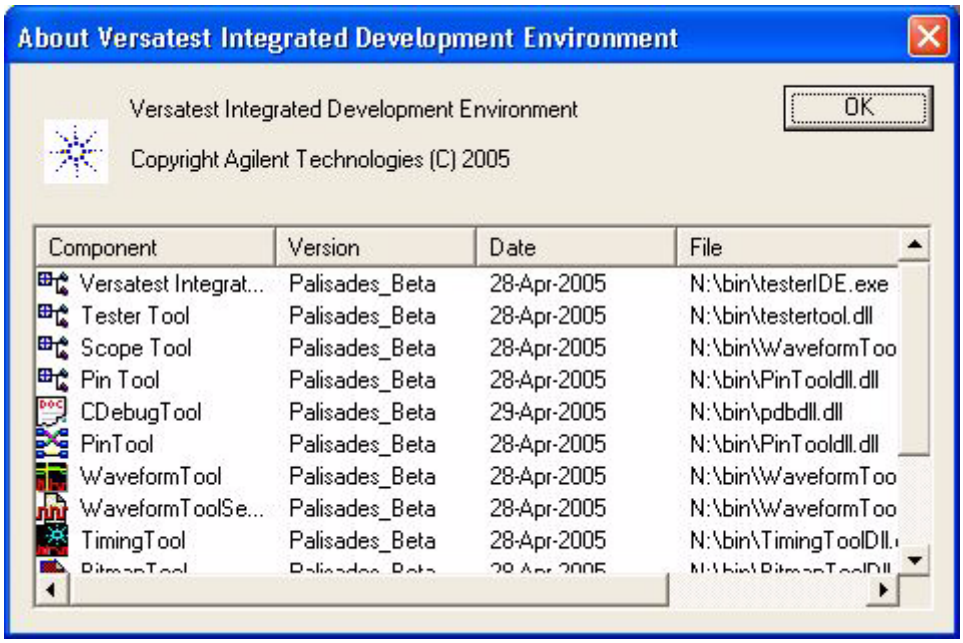


Figure 7-30. About Versatest Integrated Development Environment

Pin List Tree Pane

The Pin List Tree pane (similar to Figure 7-1 on page 292) displays the defined pin groups. Selecting the expand ⊞ button for a pin group opens the tree to display the component pin channels. Similarly, selecting the collapse ⊟ button for a pin group causes the tree for that group to collapse to display just the pin group name.

Clicking to select one or multiple pin channels (Ctrl + click) displays the corresponding timing plots in either the graphical or tabular display. You can also select multiple pins by clicking on a pin to highlight it and then pressing the Shift + ↓ keys or Shift + ↑ keys to select pins in sequence.

Timing Tool Getting Started

The Timing Tool displays GTS, LTS, and timing edge information in a graphical and tabular format.

The graphical display currently shows all of the theoretical vector information related to timing that includes the global time sets, formats, cycle times, and the following six edge settings:

- IO Start
- IO End
- Drive Start
- Drive End
- Strobe Start
- Strobe End

The tabular format displays selected pins in a tabular format. It shows the GTS currently set up for the selected pins and the corresponding LTS mapped to the GTS.

The Timing Tool also provides the capability to test the given timing data for Pattern Language Programming Rules violations and display errors in both the graphical and tabular views.

The Timing Tool has online and offline modes. In online mode, the timing data is acquired from the a specified physical test site and the vector data is from the current test program. In offline mode, the data comes from a previously saved Timing Tool file. The Timing Tool file is created in online mode after the data has been acquired. After the data is acquired in online mode or the Timing Tool file is opened in offline mode, the features are currently the same for both modes, except offline mode can not interact with the hardware.

This section demonstrates how to setup, capture, and display Timing Tool data for analysis. For additional information about the Timing Too, see the "Timing Tool Main Window" section on page 291 that provides descriptions of all the menus, menu commands, and dialog boxes that make up the tool's interface.

Getting Started Contents

This Getting Started contains the following examples:

- "Launching the IDE and Displaying the Timing Tool Document Window" on page 332
- "Using the Timing Tool in Offline and Online Modes" on page 336

NOTE The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

Loading the Test Program

In this section of the Getting Started, we will perform the following tasks in preparation for launching the IDE, Timing Tool, and acquiring and displaying the timing data in the Timing Tool graphical and tabular views.

- Launch the VK Test Station application and display its VK Test Station main window.
- Load a plan file, power on the test sites (test head), and download the test program files specified in the plan file to the test sites.

1 Selecting start > `Programs` > `Versatest Test System Software` > `VK Test Station` displays the VK Test Station main window (similar to Figure 7-31).

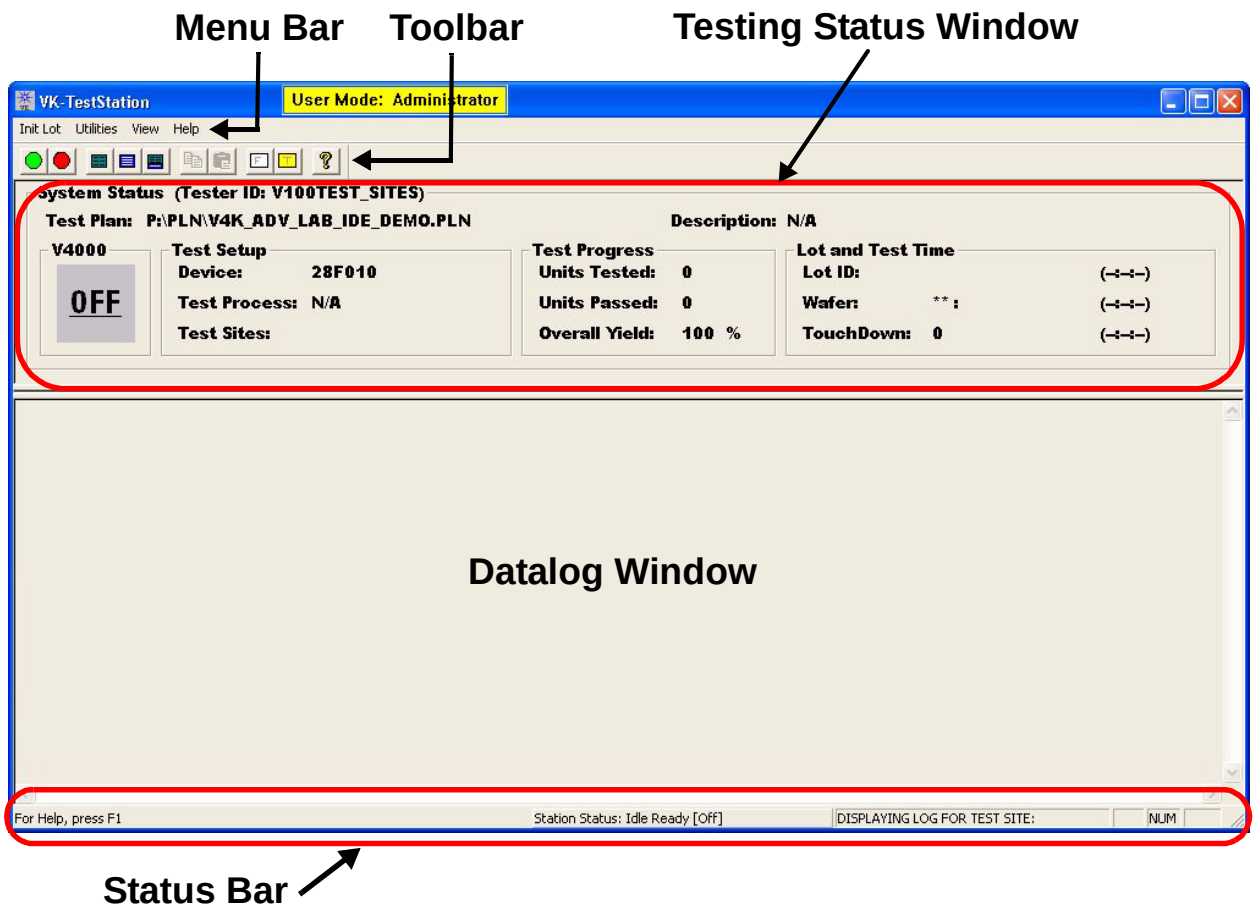


Figure 7-31. VK Test Station Main Window

2 In the menu bar, selecting `Init Lot` > `Enter Lot Information` displays the Initialize Test Station Setup dialog box (Figure 7-32) that is used to set up each lot for testing.

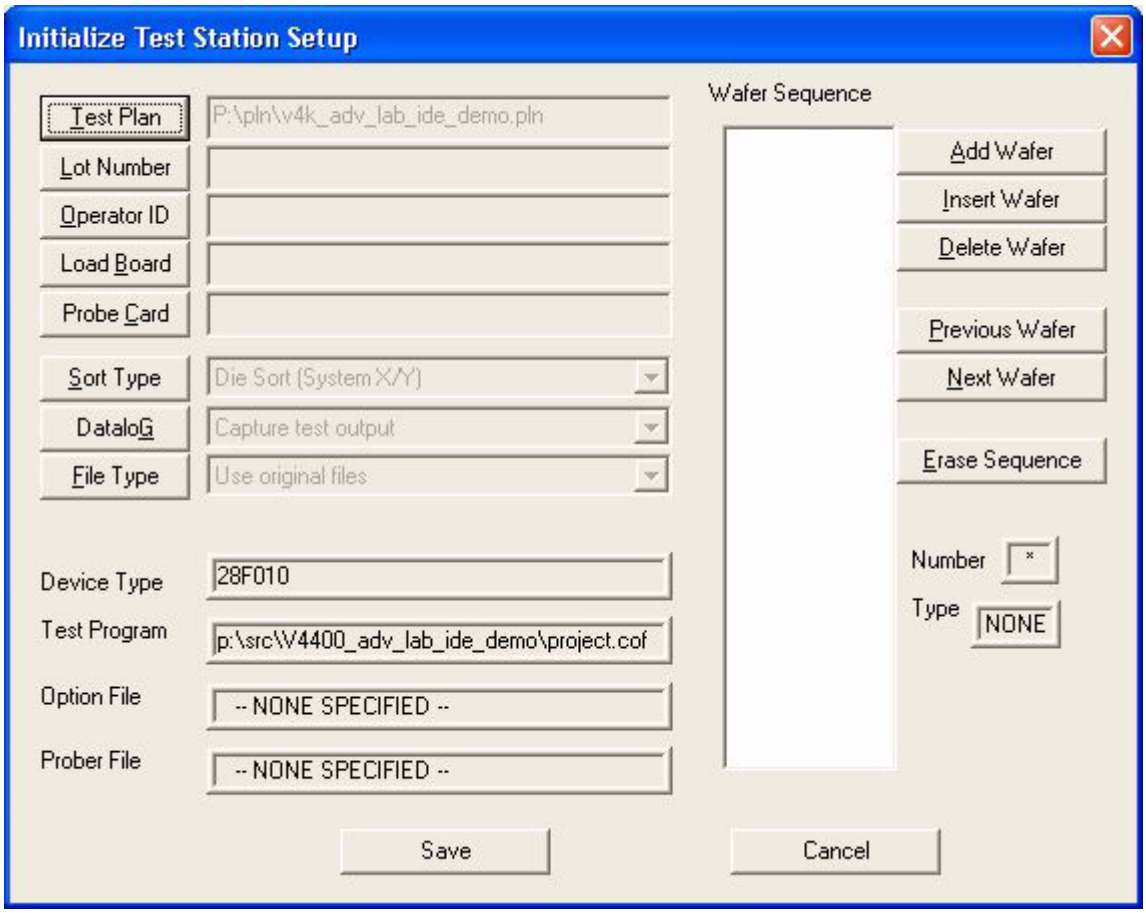


Figure 7-32. Initialize Test Station Setup Dialog Box

3 Selecting the Test Plan button displays the Open dialog box (Figure 7-33) that lists the available plan files. Test plan files define the tester setup that is used. The `v4k_adv_lab_ide_demo.pln` plan file will be used for this example.

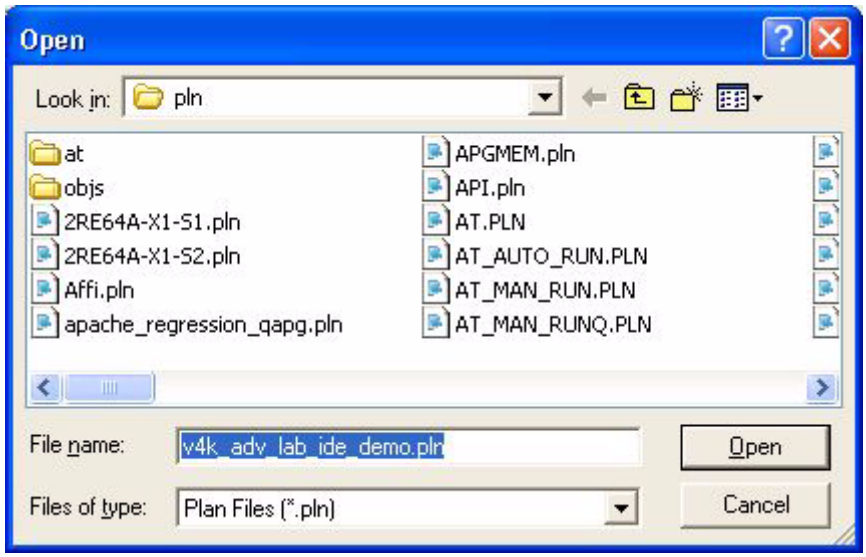


Figure 7-33. Select Test Plan Dialog Box

4 Selecting the `v4k_adv_lab_ide_demo.pln` plan file to highlight it, and selecting Open displays the Initialize Test Station Setup dialog box with the plan file displayed in the Test Plan field (Figure 7-32 on page 326).

5 Selecting the Save button in the dialog box displays a Red Hand Alert dialog box that warns about the loss of summary data (Figure 7-34). The TEST_PLAN_WARNING plan file configuration switch controls whether this dialog box displays. The default is for it to display.

Figure 7-34. Red Hand Alert Are You Sure Dialog Box

6 Selecting OK displays another Red Hand Alert dialog box (Figure 7-35) that warns to Z down the wafer and disconnect all DUTs prior to initialization of the test sites. The TEST_PLAN_WARNING plan file switch also controls whether this dialog box displays.

Figure 7-35. Red Hand Alert Z-Down Dialog Box

7 Selecting OK displays the Test Plan Validation dialog box (Figure 7-36). The `VALIDATE 0x10` plan file test switch controls whether this dialog box displays. It displays the corresponding checksums and adds them to the summary file.

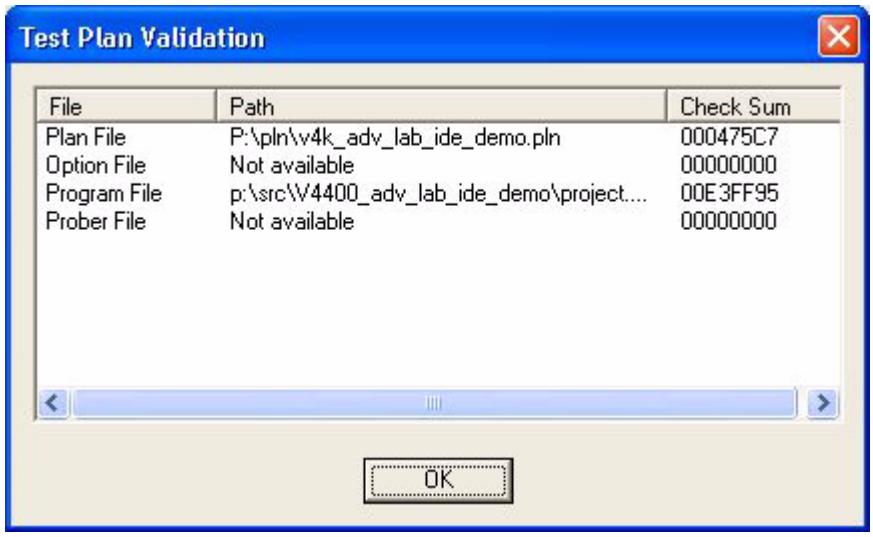


Figure 7-36. Test Plan Validation Dialog Box

8 Selecting OK begins the test head power on and downloads the Versatest Operating System (VOS) and the test program files specified in the plan file. The power on is complete when the terminal prompt `A1>` displays in the Datalog window (Figure 7-37).

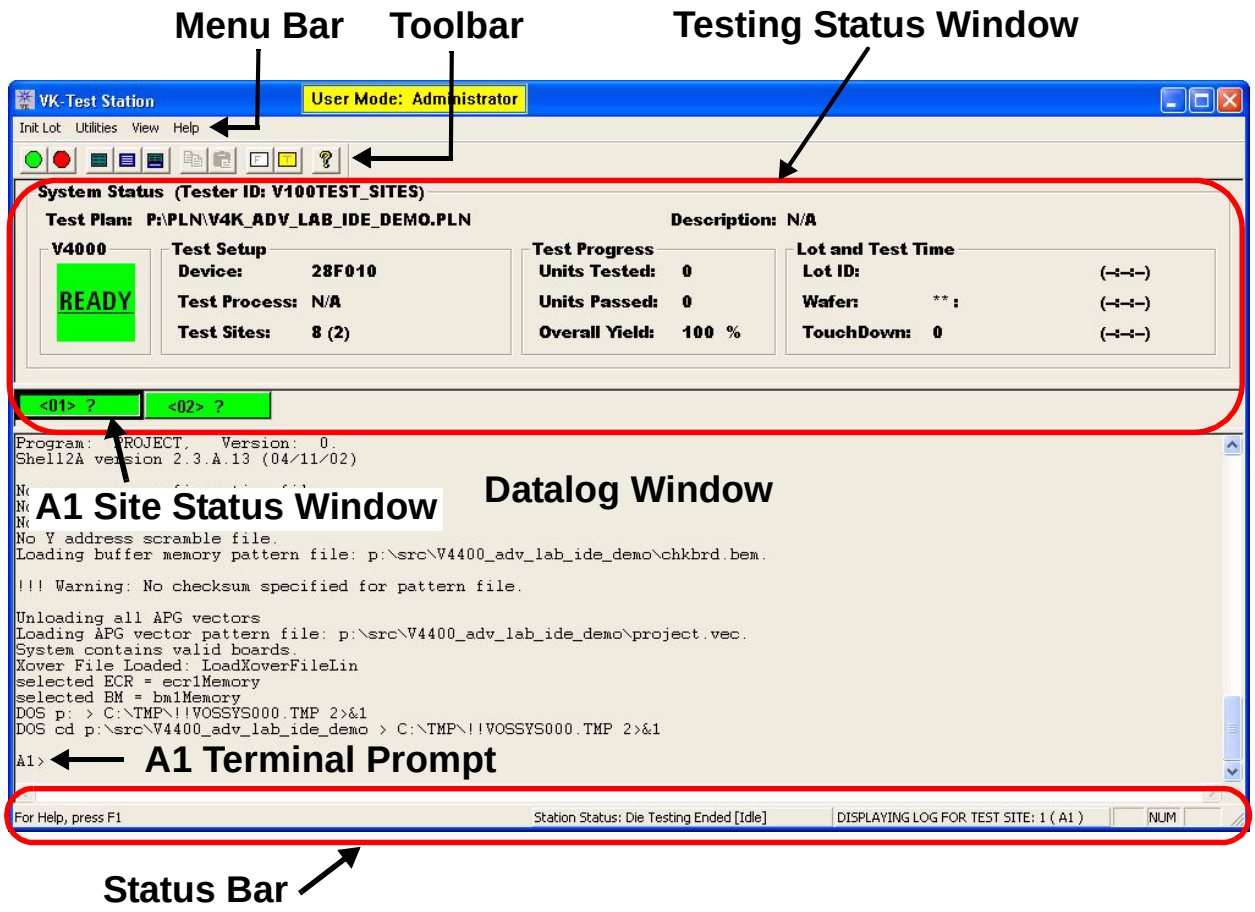


Figure 7-37. VK Test Station Main Window After Power On

Launching the IDE and Displaying the Timing Tool Document Window

This section demonstrates how to launch IDE and display the Timing Tool Document Window in preparation to connect to a test site in online mode and display the timing data in the Timing Tool graphical and tabular views.

1 Selecting start > `Programs` > `Versatest Test System Software` > `Integrated Development Environment` displays its default main window (Figure 7-38).

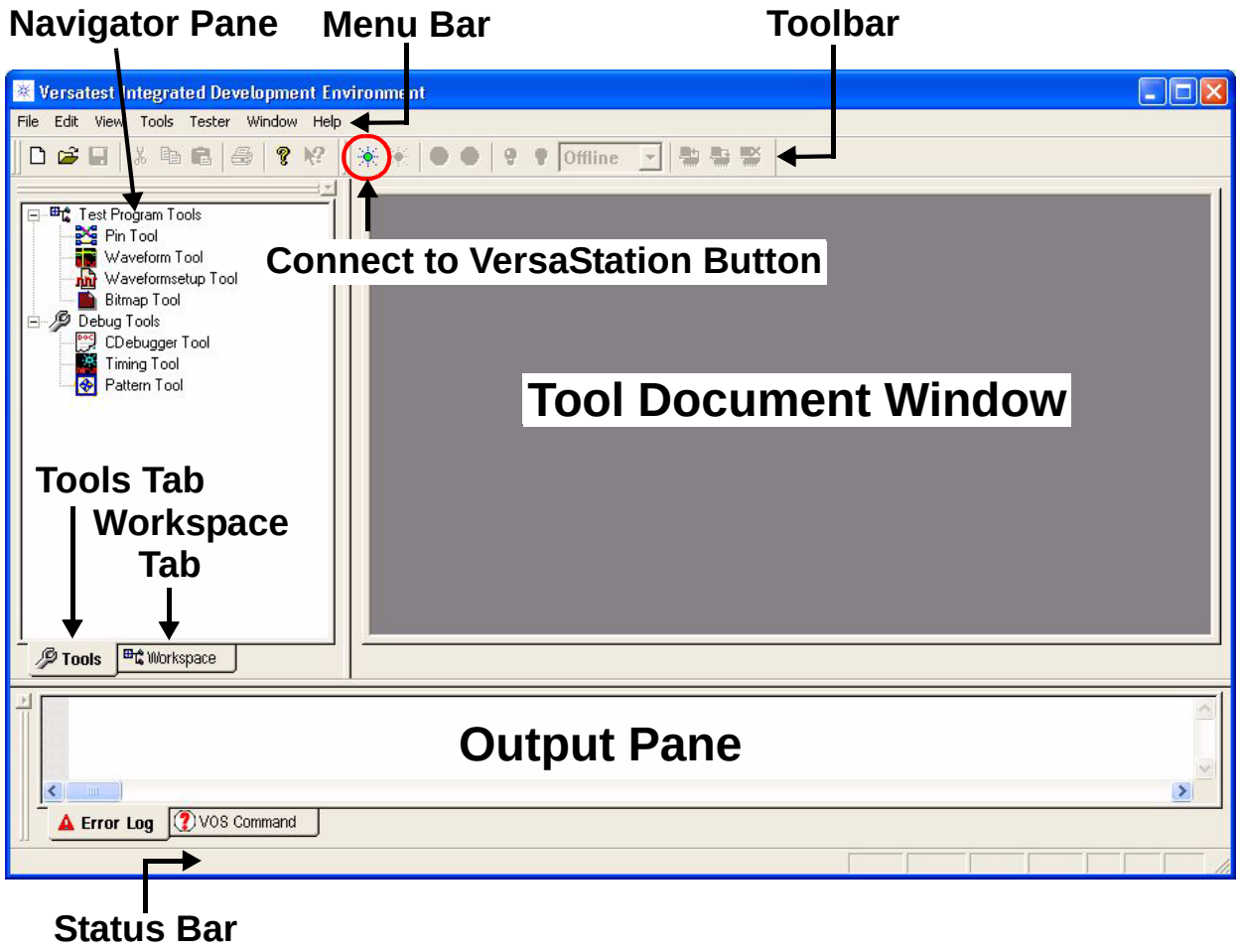


Figure 7-38. Versatest Integrated Development Environment Main Window

2 Selecting the green starlight Connect to VersaStation toolbar button or the `Tester` > `Connect to VersaStation` command connects the IDE to VersaStation (formerly PCM) as indicated in the

Output Pane in Figure 7-39. The IDE must be connected to VersaStation (PCM) before it can be connected to a specific tester test site.

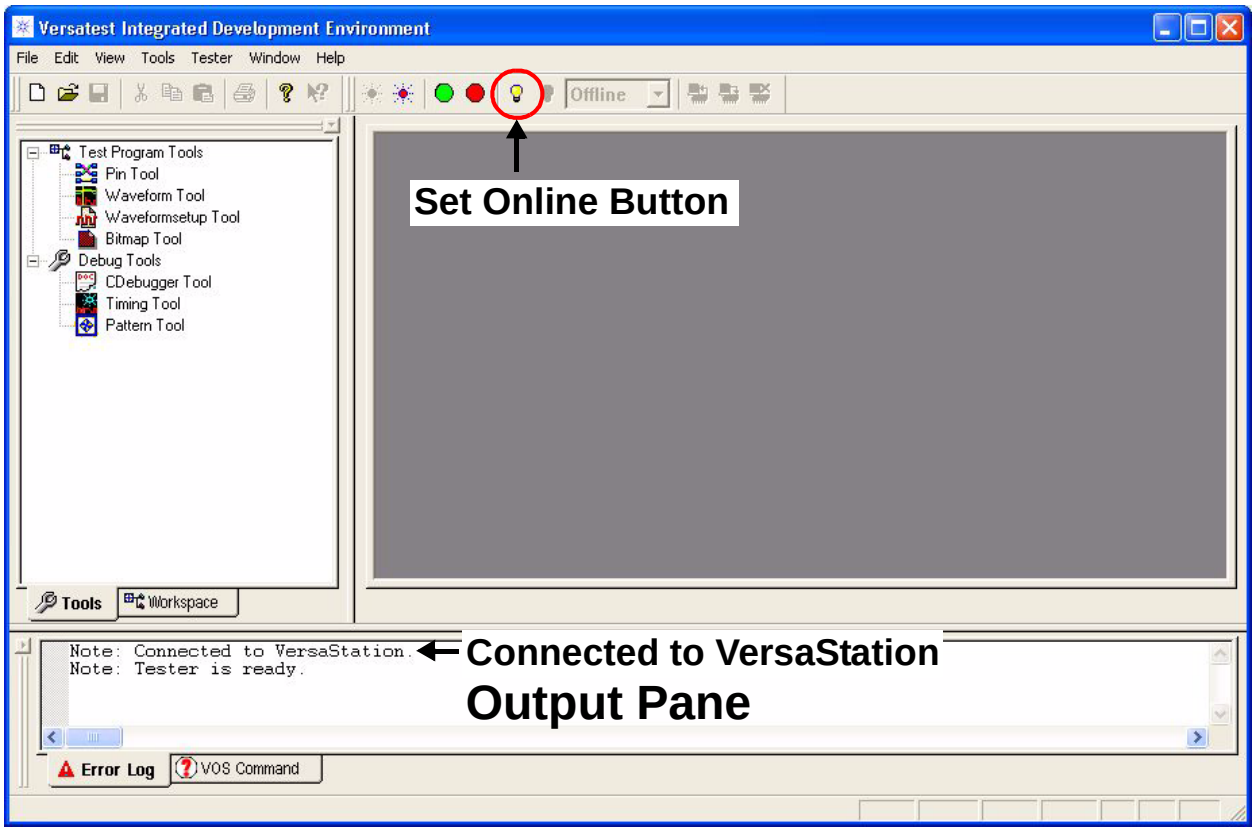


Figure 7-39. IDE Connected to VersaStation

3 Selecting the yellow light bulb Set Online toolbar button or corresponding `Tester > Set Online` command enables the IDE to connect to the tester when the Site Connect Status drop-down list box A1 A1 is enabled as shown in the toolbar in (Figure 7-40).

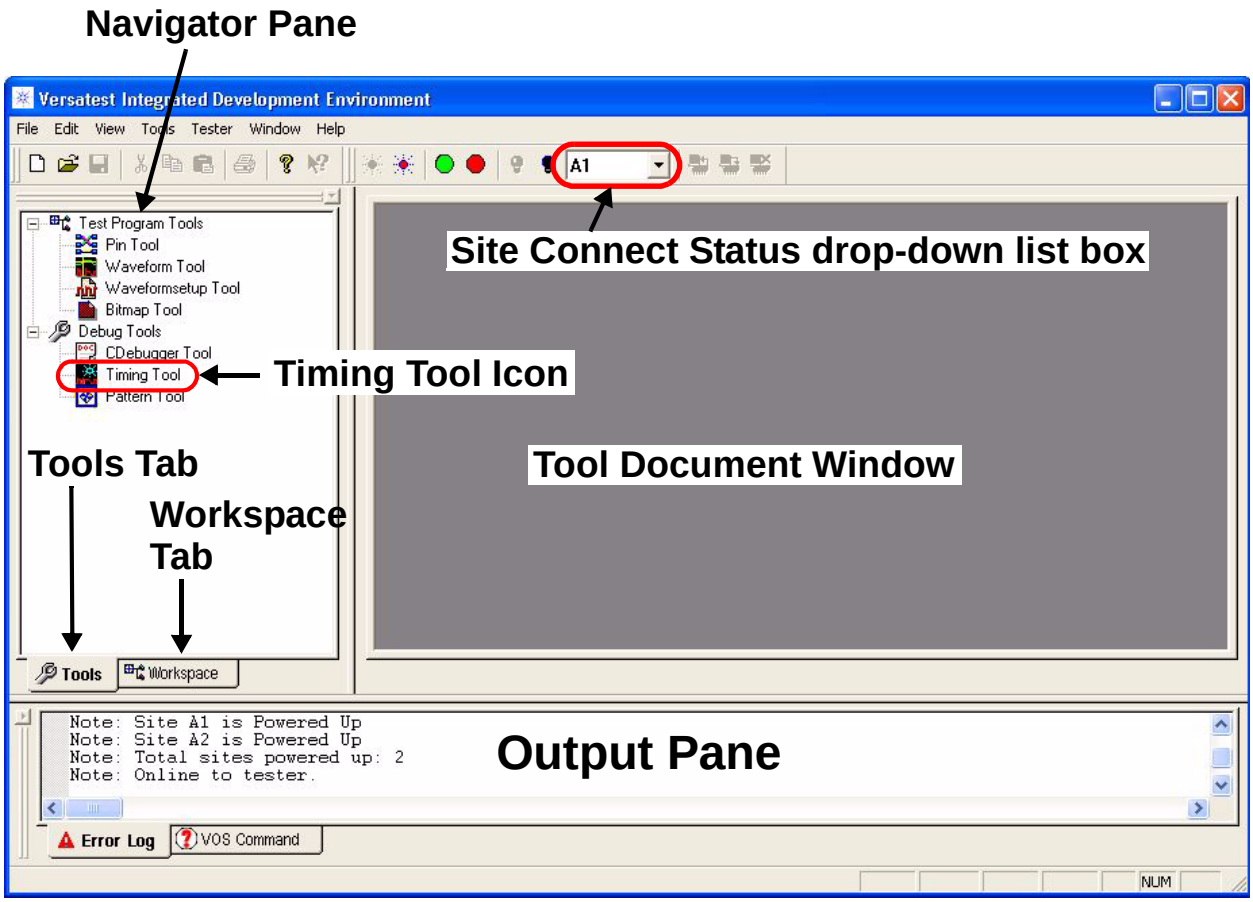


Figure 7-40. IDE Main Window Set Online

4 Choosing the site that the IDE connects to is done by selecting the down-arrow button on the right side of the Site Connect Status drop-down list box to display the available sites and selecting from the list (similar to Figure 7-41). Selecting a tool makes the connection to that site and disables the Site Connect Status drop-down list box.

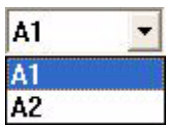


Figure 7-41. Site Connect Status Drop-Down List Box

5 Double-clicking the `TimingTool` icon under `Debug Tools` (Figure 7-40) displays the Timing Tool as the active tool in the Tool Document window (Figure 7-42). Selecting the tool makes the connection to that site and disables the Site Connect Status drop-down

list box. This also adds the Timing Tool Document TimingTool1 tab at the bottom of the Timing Tool Document window, and its menu bar and toolbar.

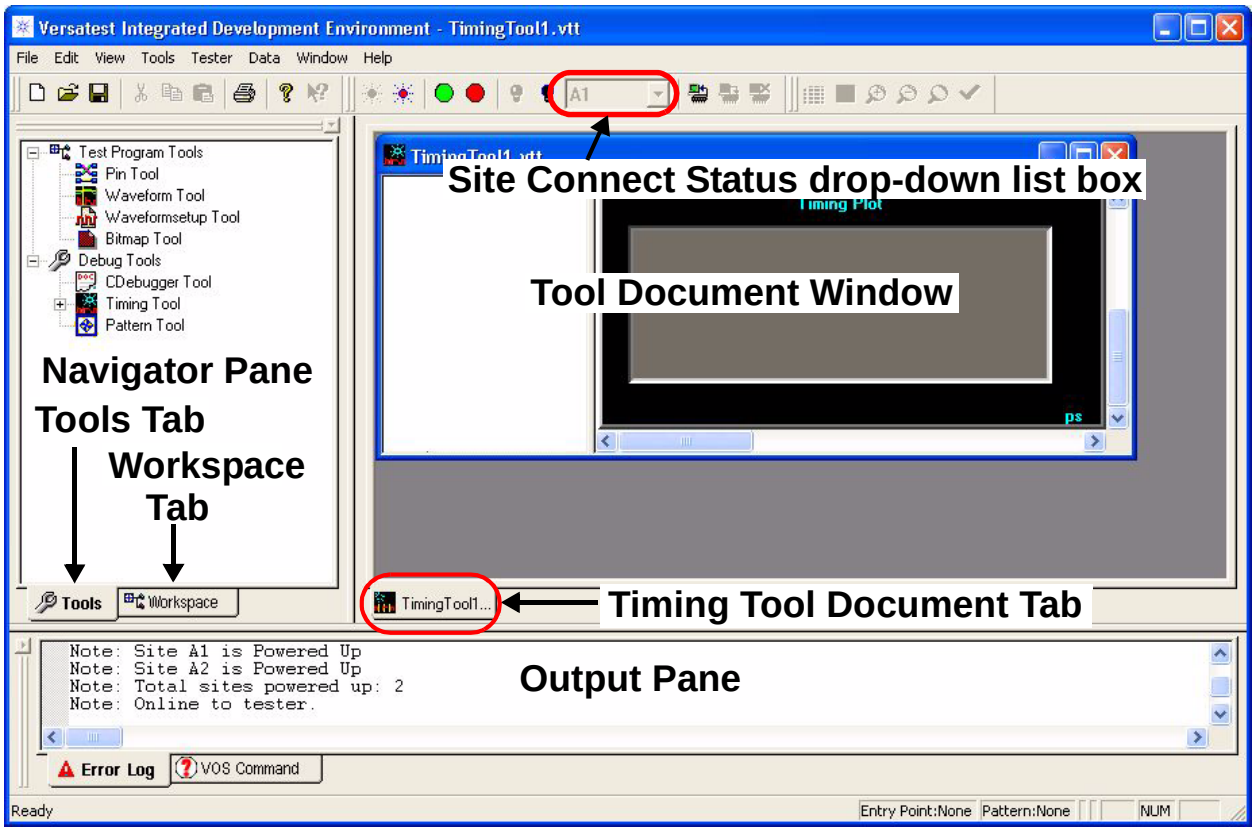


Figure 7-42. Timing Tool Default Graphical View

Using the Timing Tool in Offline and Online Modes

Online mode requires that the VK Test Station software be running with the appropriate plan file loaded. In offline mode, the Timing Tool can run as a stand-alone application.

1 In offline mode, selecting `File > Open > Timing Tool Document` displays an Open Dialog box from which a Timing Tool file with a .VTT (Versatest Timing Tool) extension is opened. The .VTT file is created by selecting `File > Save` after timing data is acquired in online mode by selecting `Tester > Acquire Data`.

In online mode, selecting the Acquire Data toolbar button or its corresponding `Tester > Acquire Data` command displays the Acquire Timing Data dialog box (similar to Figure 7-43) that specifies the data to be acquired and displayed. The timing data acquired is from the physical site specified in the toolbar Site Connect Status A1 drop-down list box and the vector data is from the current test program. As done previously, selecting the yellow Set Online toolbar button or corresponding `Tester > Set Online` command connects the IDE to the tester `A1` as shown in the toolbar A1 drop-down list box.

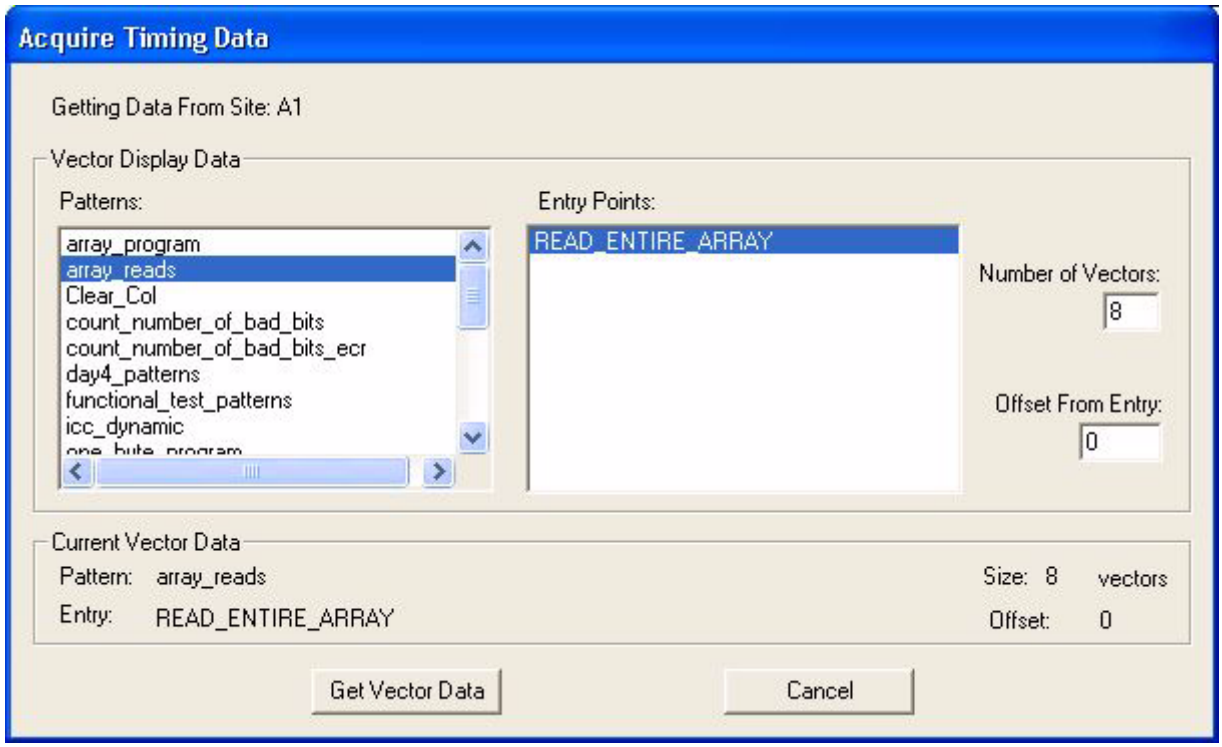


Figure 7-43. Acquire Timing Data Dialog Box

The Acquire Timing Data dialog box contains the following fields:

- `Vector Display Data` panel:
  - `Patterns`: Displays the patterns in the acquired timing data.
  - `Entry Points`: Displays the entry point for the selected pattern.
  - `Number of Vectors`: Specifies the number of vectors in the selected pattern to display. The initial value is the number of vectors in the pattern.
  - `Offset from Entry`: Specifies the offset from the entry point from which the data acquire begins.
- `Current Vector Data` panel:
  - `Pattern`: Displays name of the selected pattern.
  - `Entry`: Displays the name of the selected entry point.
  - `Size`: Displays the number of vectors in the selected pattern.
  - `Offset`: Displays the offset in the selected pattern.
- Get Vector Data button: Acquires the specified data and displays it in the Timing Tool graphical view (similar to Figure 7-44).

2 Selecting the Get Vector Data button in the Acquire Timing Data dialog box (similar to Figure 7-43) acquires the specified data and displays it in the Timing Tool graphical view (similar to Figure 7-44).

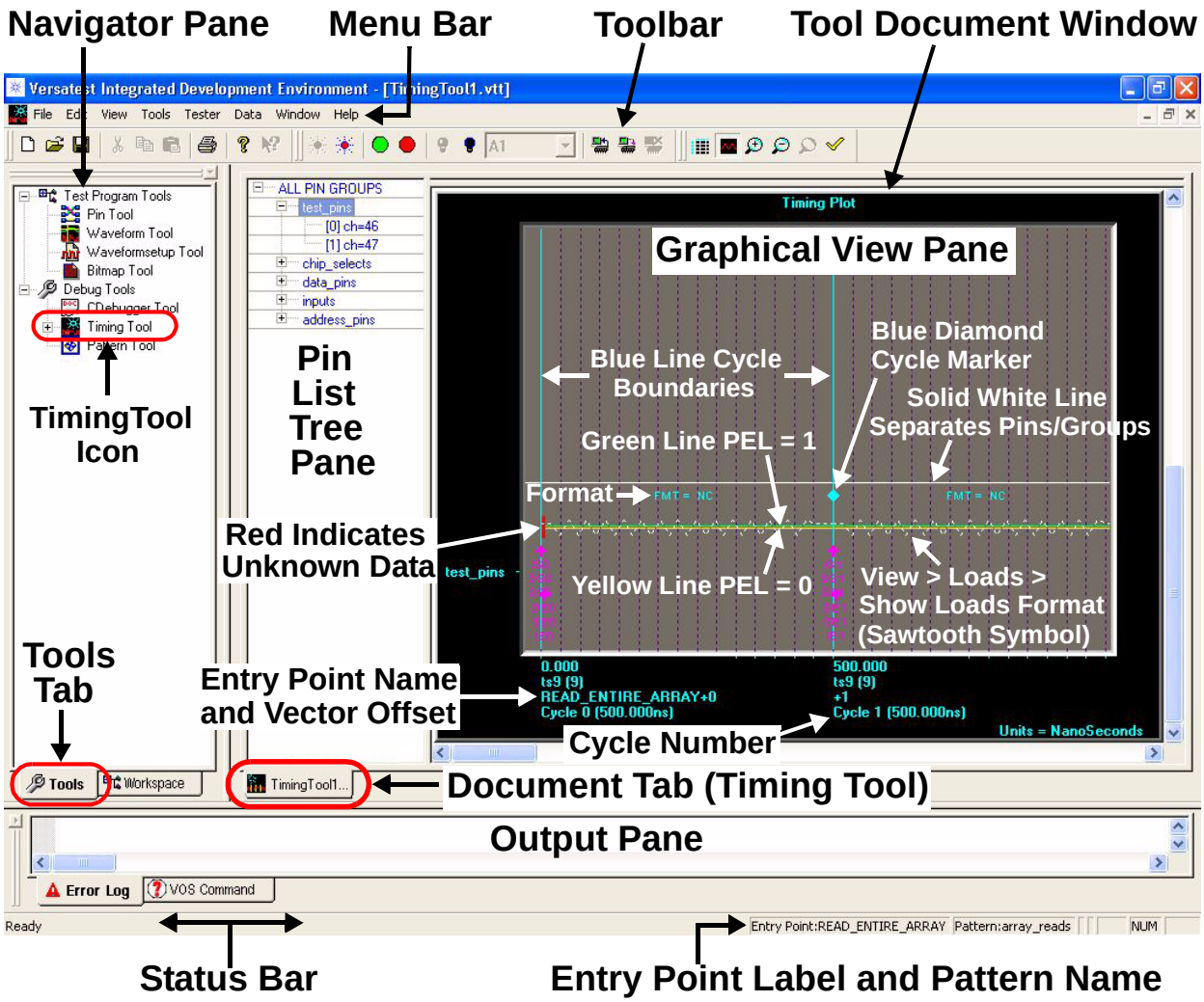


Figure 7-44. Timing Tool Main Window Graphical View Pane

3 Selecting the Show Tabular View toolbar button or its corresponding `View > Mode > Tabular` command displays the tabular view (similar to Figure 7-45).

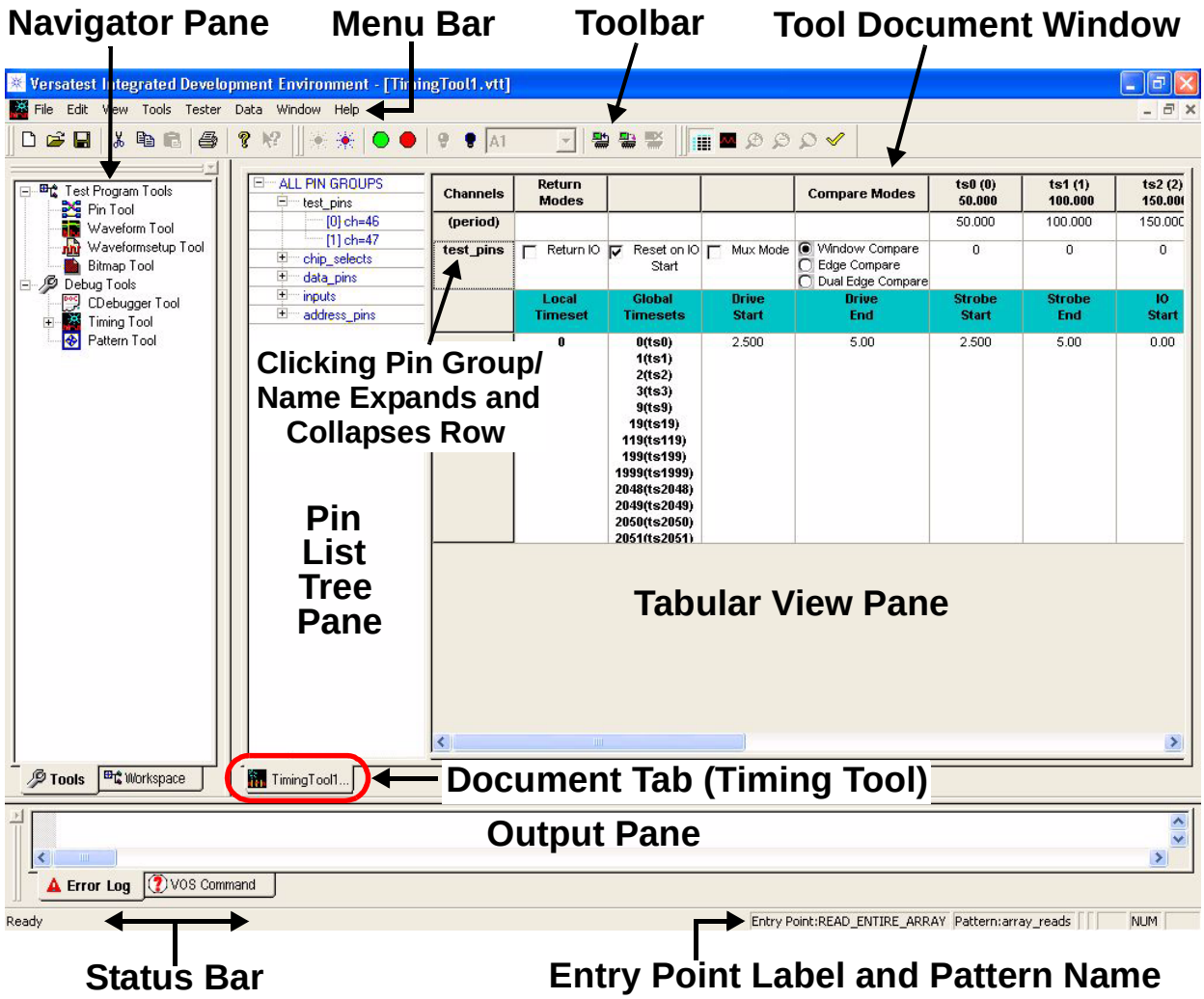


Figure 7-45. Timing Tool Main Window Tabular View Pane

8

Bitmap Tool

Introduction

This chapter provides information about the optional Versatest Series Bitmap Tool. This tool allows you to view and compare multiple bitmap files.

Using the optional Bitmap Tool has licensing requirements. See the "Software Installation" chapter in the *User's Guide* for more information.

Chapter Contents

This chapter contains the following information about the Timing Tool:

NOTE The actual colors displayed in this manual can be viewed from its Acrobat Reader PDF file on the Versatest Series Manuals CD-ROM. If you are viewing the PDF file, you can use Acrobat Reader's `View > Zoom In` and `View > Zoom Out` menu bar commands to adjust the display magnification to help you see graphics such as waveforms.

Bitmap Tool Overview

The Bitmap Tool is an application that allows you to view and compare multiple failed bitmap files. Using the Bitmap Tool, you can pinpoint specific locations where memory bits pass and fail tests.

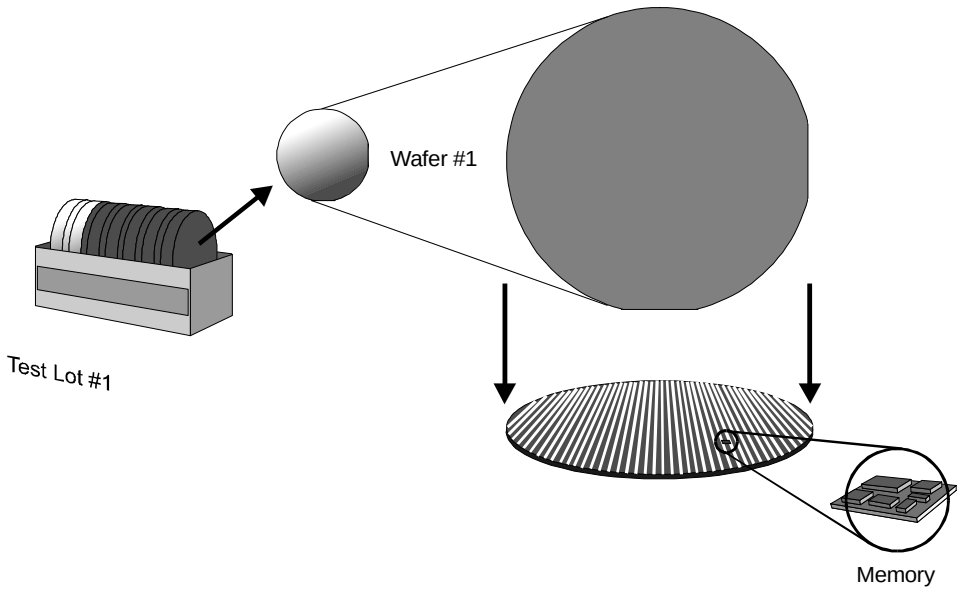


Figure 8-1. Taking a Closer Look at Test Samples

Organizations that manufacture memory devices or use them in product development suffer high costs related to testing them for defects or failures.

As the demand for these products increases, testing and scrap costs also increase. As cost increases, it becomes necessary to find ways to reduce testing costs, reduce scrap, and increase the yield of usable product.

It also becomes necessary to swiftly but logically attack the highest costs of measurable failures first, then move on to less expensive issues until your product reaches a zero-defect level of quality.

To achieve this end, sophisticated test equipment and teams of engineers and technicians test memory arrays and analyze test results in an attempt to find the causes of failures.

The Bitmap Tool moves toward automating some of these processes with a software application that analyzes data from silicon wafer test equipment.

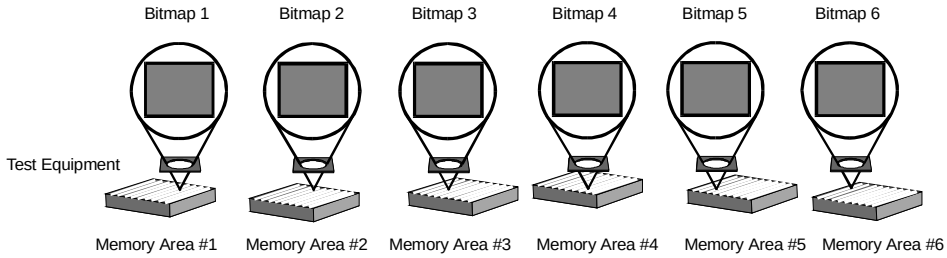


Figure 8-2. Translating Test Results

The Agilent Versatest Series test equipment produce bitmap files that result from test findings. After the test equipment collects failure data from a memory array, that information is stored in a logical or physical bitmap file. The Bitmap Tool translates the file into a visual representation, providing a surprisingly usable method of visually querying for failure locations.

The Bitmap Tool provides a means of analyzing bitmap files in many ways. For example, use the Bitmap Tool to analyze multiple bitmap files from a single memory array to study and compare results from different kinds of tests. You can also apply the Bitmap Tool to analyze multiple bitmap files from multiple memory arrays to compare the results of the same test performed on multiple memory arrays.

The Bitmap Tool allows you to visualize a stack of bitmaps for an easy, straightforward method of comparison and analysis. This dramatically reduces the labor cost of analyzing the test results, and allows you to review more results at higher speeds.

The Bitmap Tool provides a visual representation of multiple bitmap files for comparison and analysis. It is able to analyze and store the condition of each bit from bitmap files generated during testing. The two possible conditions for each bit are pass or fail. The Versatest Series test equipment Error Catch RAM (ECR) bitmap files store bits that pass as 1s and failing bits as 0s (zeros). Versatest bitmap files have a .hbm extension.

The Bitmap Tool looks for four basic characteristics about the bitmap files stored.

- Failing bits found in the same location on different bitmaps
- Failing bits found in different locations on different bitmaps
- Passing bits found in the same location on different bitmaps different bitmaps
- Passing bits found in different locations on different bitmaps

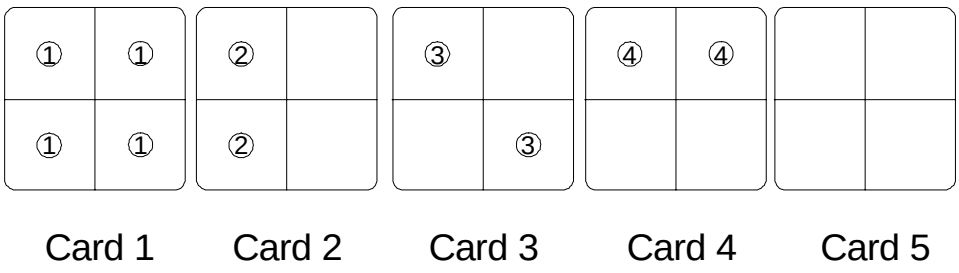


Figure 8-3. Paper Card Example

For example, think of a bitmap as though it were a paper card with holes punched in locations where failed bits are placed (see Figure 8-3). If you stacked several of these cards upon one another, you could note:

- The location of all failed bits on all of the cards.
- The locations of each failed bit where those bits appear in the same location as failed bits on other cards.
- The locations where failed bits appear, but do not match with the same location on other cards.

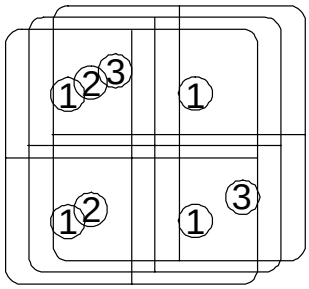


Figure 8-4. Stacking the Deck - Accumulating Bitmaps

If you inverted your test by punching holes in locations where passing bits are located, you could compare results of passing bits on the cards. This would allow you to note:

- The location of all passing bits on all of the cards.
- The locations of each passing bit where those bits appear in the same location as passing bits on other cards.
- The locations where passing bits appear, but do not match with the same location as passing bits on other cards.

Logical Operations

The Bitmap Tool provides the capability to use logical operations to visualize other characteristics of failed and passing bits.

Selecting the Bitmap Tool's OR logical operation allows you to analyze all of the failed bits on selected bitmaps from those loaded. It ignores the locations of all passing bit locations. Figure 8-5 illustrates how all failed bit locations are selected for display on the view pane.

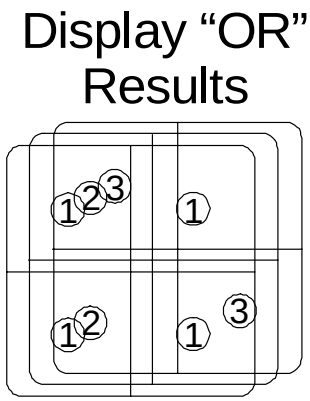


Figure 8-5. "OR" Operations Show All Failed Bits

In the inverted state, it allows you to see the locations of all passing bits on all bitmaps, ignoring the location of all failed bits.

If you want to expose locations where bits fail in the same location on all loaded bitmaps, you can select the AND operator (see the `Action > Logical Operations` command on page 372) to provide this output. Figure 8-6 illustrates how failed bits in common locations (circled) are chosen for display on the view pane.

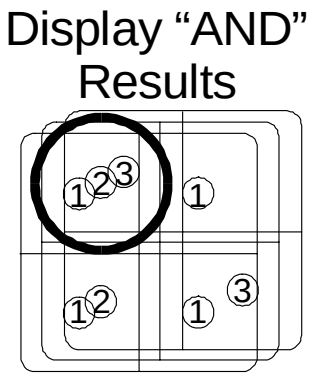


Figure 8-6. "AND" Displays Only Matching Bits

If you want to expose only failed bits when they appear in different locations, and ignore failed bits in common locations, select the XOR operator (see the `Action > Logical Operations` command on page 372). Figure 8-7 illustrates how locations where the condition differs (circled) are chosen for display on the view pane.

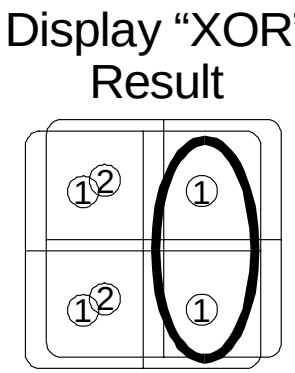


Figure 8-7. “XOR” Displays Only Non-Matching Locations

To use this feature, select the first bitmap, then add that bitmap to a second bitmap using the XOR function. This allows you to obtain the resulting union of the bitmaps. Next, pair the result from the union with another bitmap.

Using this paper card analogy, you would select the first card and hold it up to a second card (Figure 8-7). Locations where both cards have holes would be ignored. Locations where holes appear differently in same places would be collected onto a third paper card called a result. This result creates a logical operation file that you can use just as though it were a card or bitmap.

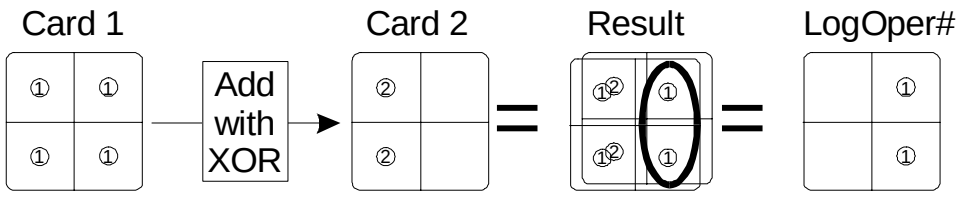


Figure 8-8. Using the “XOR” Function

C Language Commands and Plan File Switches

The following C language commands are used for writing bitmap files that are compatible with the Bitmap Tool. See the *Versatest Series Command Reference Volume 1* for command descriptions.

- `get_bitmap_num_param`
- `get_bitmap_str_param`
- `read_bmecr_bitmap`
- `set_bitmap_num_param`
- `set_bitmap_str_param`
- `write_bmecr_bitmap`

The following plan file and configuration file switches are available for use with the `write_bmecr_bitmap` command. See the *Versatest Series Command Reference Volume 2* for the switch descriptions.

- BITMAP_FILE_REV
- BITMAP_NUM_DUT
- BITMAP_NUM_DUT_MASK
- BITMAP_NUM_IO
- BITMAP_XMAX
- BITMAP_XMIN
- BITMAP_YMAX
- BITMAP_YMIN
- BITMAP_ZMAX
- BITMAP_ZMIN

Bitmap Tool Main Window

The Bitmap Tool main window shown in Figure 8-9 is the application interface.

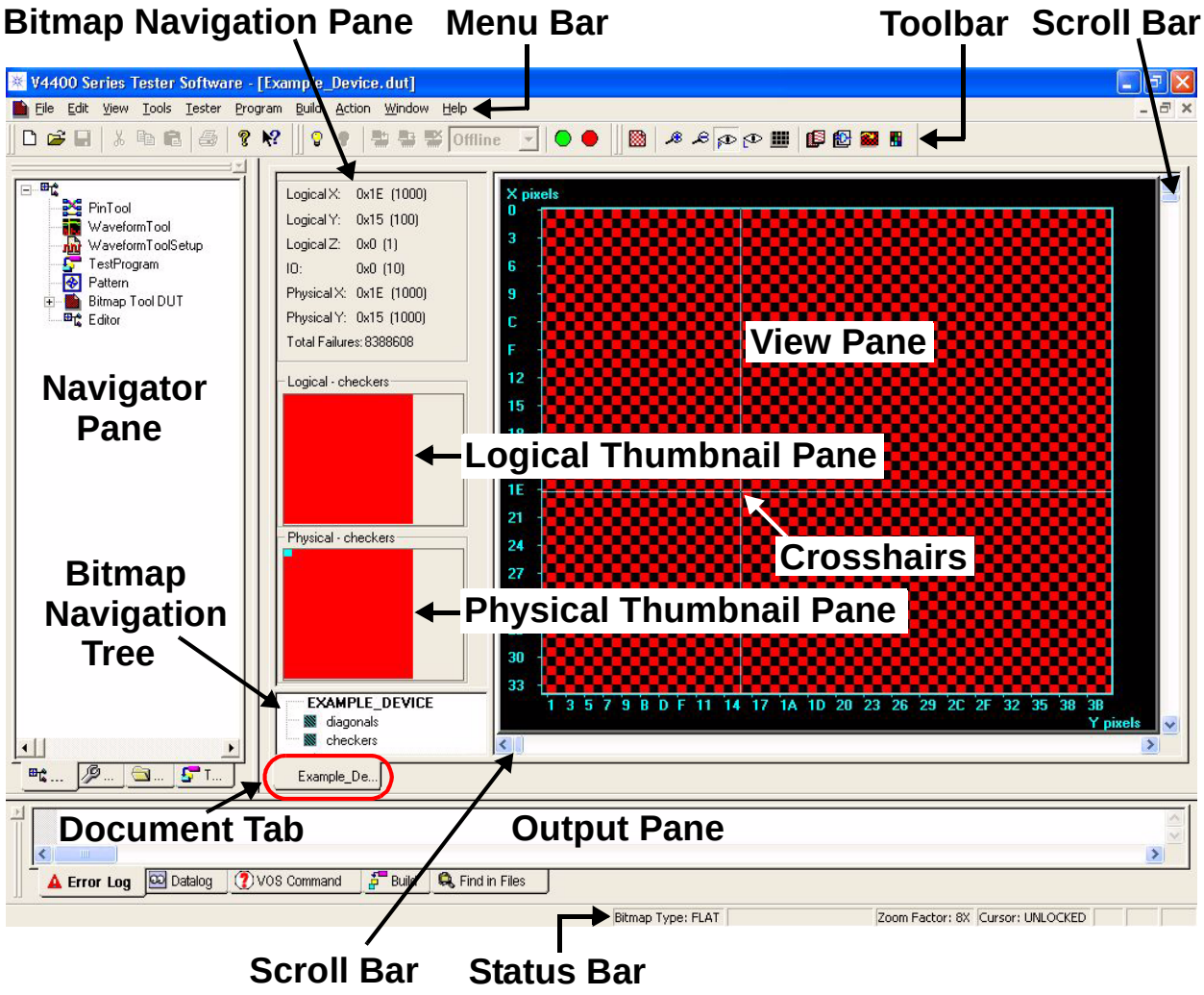


Figure 8-9. Bitmap Tool Main Window

The Bitmap Tool interface consists of the following unique functional areas in the IDE:

- Navigator Pane: See the `View > Navigator Pane` command on page 363
- Bitmap Navigation pane on page 381

- Menu bar on page 350
- Toolbar: See the `View > Toolbar` command on page 360
- View Pane on page 380
- Thumbnail pane on page 381
- Bitmap Navigation Tree on page 381
- Output Pane: See the `View > Output Pane` command on page 363
- Status Bar: See the `View > Status Bar` command on page 362

Menu Bar

The menu bar at the top of the Bitmap Tool main window (Figure 8-9 on page 349) contains the following 10 pull-down menus from which you can select commands:

- File menu on page 350
- Edit menu on page 357
- View menu on page 359
- Tools menu on page 365
- Tester menu on page 367
- Program menu on page 369
- Build menu on page 370
- Action menu on page 371
- Window menu on page 378
- Help menu on page 379

File Menu

Selecting File in the menu bar opens the menu in Figure 8-10.

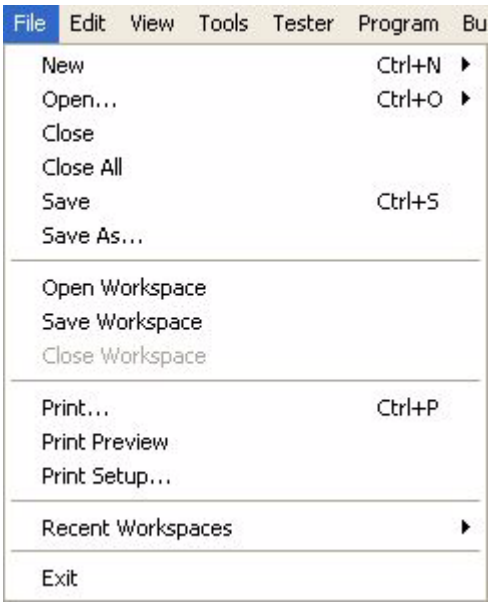


Figure 8-10. File Menu

The File menu contains the following commands:

- New command on page 352
- Open command on page 354
- Close command on page 356
- Close All command on page 356
- Save command on page 356
- Save As command on page 356
- Open Workspace on page 356
- Save Workspace (Save All) command on page 356
- Close Workspace on page 357
- Print command on page 357
- Print Preview command on page 357
- Print Setup command on page 357
- Recent Workspaces on page 357
- Exit command on page 357

New Command (File Menu)

Displays the New command submenu (Figure 8-11) that allows you to display a new Workspace or create new IDE documents. The New toolbar button displays a New dialog box that lists the same items to select as the submenu.

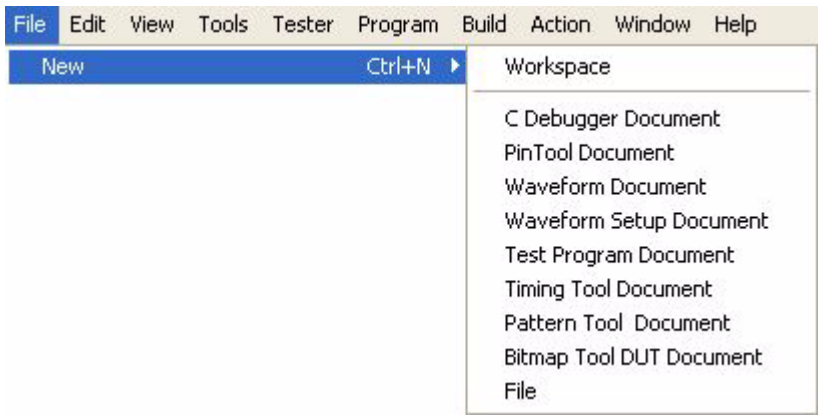


Figure 8-11. File > New Command Submenu

The New command submenu contains the following commands:

- Workspace command on page 352
- C Debugger Document command on page 353
- Pin Tool Document command on page 353
- Waveform Document command on page 353
- Waveform Setup Document command on page 353
- Test Program Document command on page 353
- Timing Tool Document command on page 353
- Pattern Tool Document command (Pattern Tool) on page 353
- Bitmap Tool DUT Document command on page 353
- File command on page 353

Workspace Command (New Command Submenu)

Displays as the active Workspace its default with its corresponding Menu bar, Toolbar, Navigator pane, Output pane, and Status bar.

C Debugger Document Command (New Command Submenu)

Displays as the active document a blank C Debugger document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Pin Tool Document Command (New Command Submenu)

Displays as the active document a blank PinTool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Document Command (New Command Submenu)

Displays as the active document a blank Waveform Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Waveform Setup Document Command (New Command Submenu)

Displays as the active document a blank Waveform Setup Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Test Program Document Command (New Command Submenu)

Note currently supported by the IDE.

Timing Tool Document Command (New Command Submenu)

Displays as the active document a blank Timing Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and graphical display window), Output pane, and Status bar.

Pattern Tool Document Command (New Command Submenu)

Displays as the active document a blank Pattern Tool document with its corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

Bitmap Tool DUT Document Command (New Command Submenu)

Displays an Open dialog box from which you open a DUT Description file (.dut) to display a blank Bitmap Tool document with the loaded DUT file and corresponding Menu bar, Toolbar, Navigator pane, Document tab (and window), Output pane, and Status bar.

File Command (New Command Submenu)

Not currently supported by the IDE.

Open Command (File Menu)

Displays the Open command submenu (Figure 8-12) that allows you to open a Workspace or IDE documents from the submenu list. The Open toolbar button displays a generic Open dialog box from which you can open a selection listed in the submenu.

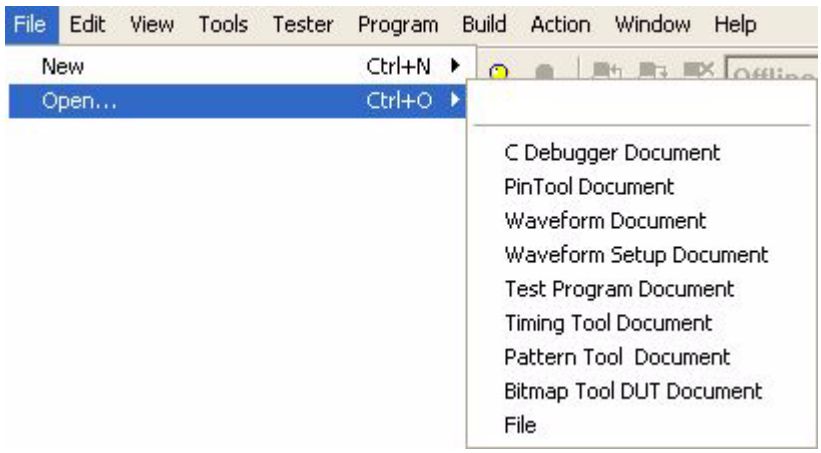


Figure 8-12. Open Command Submenu

The Open command submenu contains the following commands that display an Open dialog box similar to Figure 8-13:

- C Debugger Document command on page 355
- Pin Tool Document command on page 355
- Waveform Document command on page 355
- Waveform Setup Document command on page 355
- Test Program Document command on page 355
- Timing Tool Document command on page 355
- Pattern Tool Document command on page 356
- Bitmap Tool DUT Document command on page 356
- File command on page 356

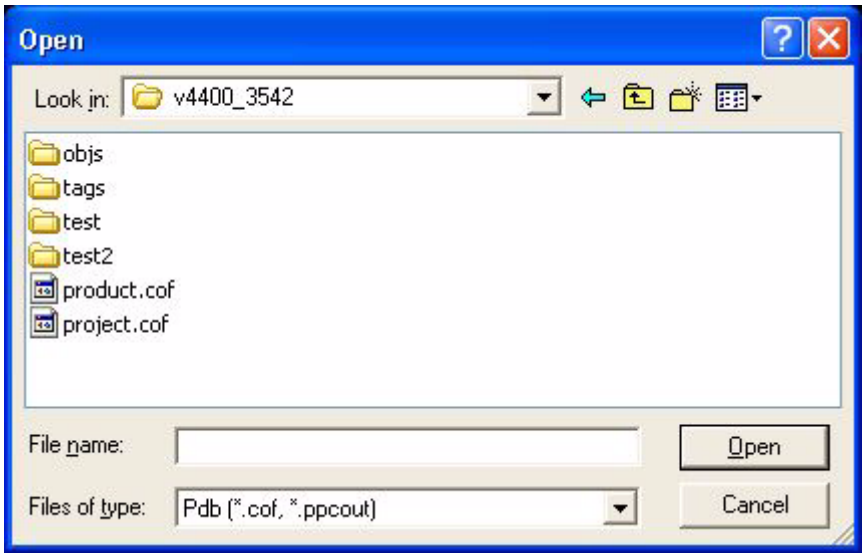


Figure 8-13. File > Open Dialog Box

C Debugger Document Command (Open Command Submenu)

Displays an Open dialog box (Figure 8-13) to select a previously saved C Debugger Tool document file with a *.cof extension.

Pin Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 8-13) to select a previously saved PinTool document file with a *.pin file extension.

Waveform Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 8-13) to select a previously saved Waveform document file with a *.dnc file extension.

Waveform Setup Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 8-13) to select a previously saved Waveform Setup document file with a *.stp file extension.

Test Program Document Command (Open Command Submenu)

Note currently supported by the IDE.

Timing Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 8-13) to select a previously saved Timing Tool document file with a *.vtt file extension.

Pattern Tool Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 8-13) to select a previously saved Pattern Tool document file with an *.apg2 file extension.

Bitmap Tool DUT Document Command (Open Command Submenu)

Displays an Open dialog box (similar to Figure 8-13) to select a previously saved Bitmap Tool DUT definition document file with a *.dut file extension.

File Command (Open Command Submenu)

Not currently supported by the IDE.

Close Command (File Menu)

Closes the active tool document.

Close All Command (File Menu)

Closes all tool documents and displays the default IDE main window.

Save Command (File Menu)

 Saves the active document file.

Save As Command (File Menu)

Displays the Save As dialog box to save the active tool document file.

Open Workspace Command (File Menu)

Displays an Open Workspace dialog box with a *.wsp extension. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace and opening another. The Workspace consists of the tools, layout, and open documents.

Save Workspace Command (File Menu)

Saves the current workspace with a *.wsp extension. The Workspace consists of the tools, layout, and open documents. This command enables you to save the tools, layout, and open documents' current state, and later resume with the same Workspace by using the `File > Open Workspace` command.

Close Workspace Command (File Menu)

Closes the current workspace. If changes have been made to the current workspace, you will be asked if you would like to save the changes before closing the current workspace.

Print Command (File Menu)

 Prints the current contents of the Bitmap Navigation Tree (see Figure 8-9 on page 349).

Print Preview Command (File Menu)

Displays a Print Preview window of the Bitmap Navigation Tree contents before printing. Pressing the Esc key returns to the Bitmap Tool main window.

Print Setup Command (File Menu)

Displays a printer setup dialog box that allows you to select and configure a printer.

Recent Workspaces Command (File Menu)

Displays a Recent Workspaces submenu from which you can select a workspace.

Exit Command (File Menu)

Closes the IDE. If the workspace or any other tool document files have changed, you will be asked if you would like to save them.

Edit Menu

Selecting Edit in the menu bar opens the menu in Figure 8-14.

Figure 8-14. Edit Menu

The Edit menu contains the following commands:

- Undo command on page 358
- Redo command on page 358
- Cut command on page 358
- Copy command on page 358
- Paste command on page 358
- Find command on page 359
- Replace command on page 359
- Find in Files command on page 359

Undo Command (Edit Menu)

Not supported by the Bitmap Tool.

Redo Command (Edit Menu)

Not supported by the Bitmap Tool.

Cut Command (Edit Menu)

Not supported by the Bitmap Tool.

Copy Command (Edit Menu)

Not supported by the Bitmap Tool.

Paste Command (Edit Menu)

Not supported by the Bitmap Tool.

Find Command (Edit Menu)

Not supported by the Bitmap Tool.

Replace Command (Edit Menu)

Not supported by the Bitmap Tool.

Find in Files Command (Edit Menu)

Displays the Find in Files dialog box that provides search capability based on the criteria you specify.

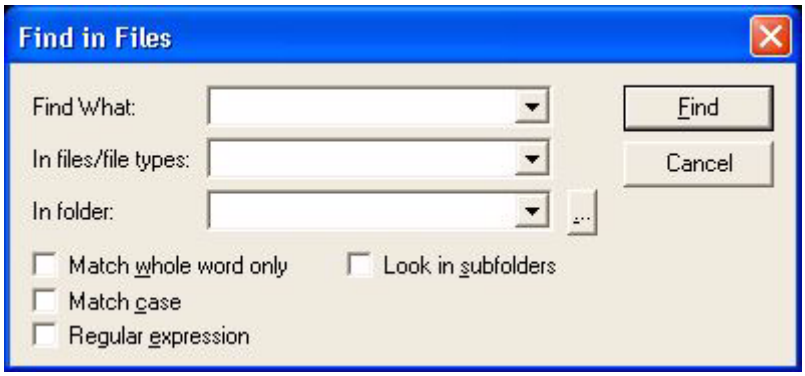


Figure 8-15. Find in Files Dialog Box

View Menu

Selecting View in the menu bar opens the menu in Figure 8-16.

Figure 8-16. View Menu

The View menu contains the following commands:

- Toolbar command on page 360
- Status Bar command on page 362
- Navigator Pane command on page 363
- Output Pane command on page 363
- Document Tabs command on page 363
- Logical View command on page 363
- Physical View command on page 363
- Display Grid command on page 363
- Grid Setup command on page 364
- Units command on page 364
- Zoom In command on page 364
- Zoom Out command on page 364

Toolbar Command (View Menu)

Displays or hides the toolbar shown in Figure 8-17. The toolbar displays at the top of the Bitmap Tool main window when a ✓ displays in front of its command in the View menu. Clicking on the buttons in the toolbar give you quick access to many of the menu bar commands. Positioning the mouse cursor over a toolbar button displays tooltip text with the corresponding command description.

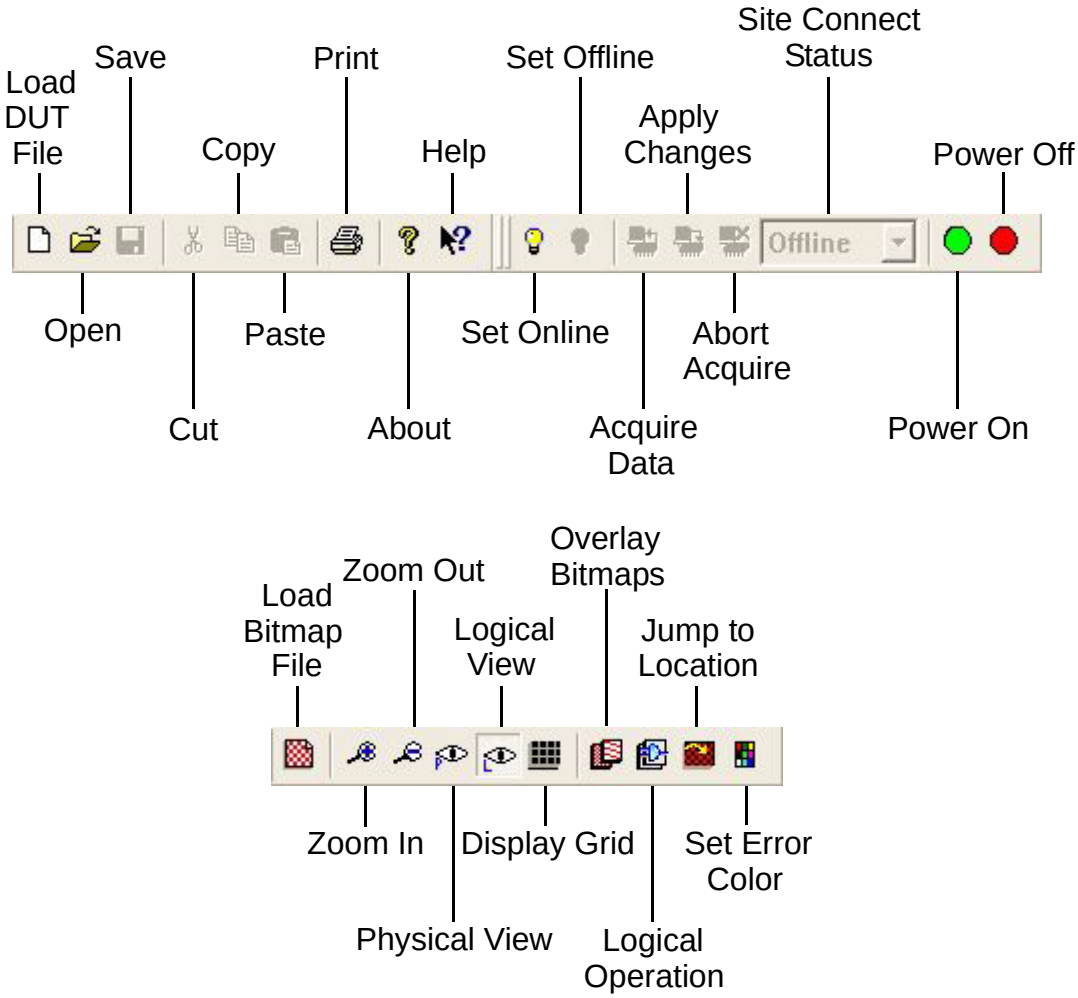


Figure 8-17. Bitmap Tool Toolbar

The toolbar contains the following command buttons:

 File > New (Load DUT File) on page 352

 File > Open on page 354

 File > Save on page 356

 Edit > Cut on page 358

 Edit > Copy on page 358

 Edit > Paste on page 358

 File > Print on page 357

 Help > About V4400 Software on page 380

 Help > Help Topics on page 380

 Tester > Set Online on page 368

 Tester > Set Offline on page 368

 Tester > Acquire Data on page 369 (not supported by Bitmap Tool)

 Tester > Apply Changes on page 369 (not supported by Bitmap Tool)

 Tester > Abort Acquire on page 369 (not supported by Bitmap Tool)

IDE Site Connect Status. Bitmap Tool currently supports only Offline mode.

 Tester > Power On on page 369

 Tester > Power Off on page 369

 Action > Load Bitmap File on page 371

 View > Zoom In on page 364

 View > Zoom Out on page 364

 View > Physical View on page 363

 View > Logical View on page 363

 View > Display Grid on page 363

 Action > Overlay Bitmaps on page 374

 Action > Logical Operation on page 372

 Action > Jump to Location on page 375

 Action > Set Error Color on page 376

Status Bar Command (View Menu)

Displays the Status Bar (similar to Figure 8-9 on page 349) when a ✓ displays in front of its command in the View menu. The Status Bar displays the following:

- Bitmap Type: FLAT for a single bitmap, or OVERLAY, XOR, MULTI-LEVEL, and so forth for the logical operations displaying.

- View Showing: LOGICAL or PHYSICAL.
- Zoom Factor
- Cursor: UNLOCKED or LOCKED

Navigator Pane Command (View Menu)

Displays the IDE Navigator Pane (similar to Figure 8-9 on page 349) when a ✓ displays in front of its command in the View menu.

Output Pane Command (View Menu)

Displays the Output Pane (similar to Figure 8-9 on page 349) when a ✓ displays in front of its command in the View menu.

The Bitmap Tool is associated with the `VOS Command` tab in the Output Pane. The `VOS Command` tab is enabled when the IDE is set online by the selecting the yellow Set Online toolbar button or the corresponding `Tester > Set Online` command. The VOS Command tab allows you to enter VOS terminal commands and display the results on the tab and in the corresponding test site window in the VK Test Station main window. See the "VOS Terminal Commands" chapter in the *Command Reference Volume 2* for the available commands.

Document Tabs Command (View Menu)

Displays the Document Tabs at the bottom of the Tool Document Window (similar to Figure 8-9 on page 349) when a ✓ displays in front of its command in the View menu.

Logical View Command (View Menu)

Displays the View pane in the logical format when a • (bullet) displays in front of its command in the View menu.

Physical View Command (View Menu)

Displays the View pane in the physical format when a • (bullet) displays in front of its command in the View menu.

Display Grid Command (View Menu)

Allows you to enable or disable the display of the grid in the View pane as specified by the Setup Grid Properties dialog box (Figure 8-18).

Grid Setup Command (View Menu)

Displays the Setup Grid Properties dialog box (Figure 8-18). When the grid displays by selecting the `View > Display Grid` command, the Setup Grid Properties dialog box allows you to customize the grid. For example, typing `64` in the `Horizontal (Y) Grid Spacing` text box and `32` in the `Vertical (X) Grid Spacing` text box and selecting OK would display a gray grid with those properties.

Figure 8-18. Setup Grid Properties Dialog Box

Units Command (View Menu)

Displays a Units submenu (Figure 8-19) that allows you to select whether to display the View pane and Navigation pane in decimal or hexadecimal.

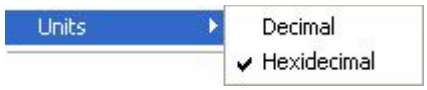


Figure 8-19. Units Submenu

Zoom In Command (View Menu)

 Increases the magnification of the view of the bitmap displaying in the View pane.

Zoom Out Command (View Menu)

 Decreases the magnification of the view of the bitmap displaying in the View pane.

Tools Menu

Selecting Tools in the menu bar opens the menu in Figure 8-20. The commands in the Tools menu are only for Agilent-internal use for the Bitmap Tool.

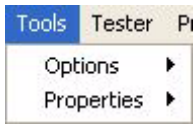


Figure 8-20. Tools Menu

The Tools menu contains the following commands:

- Options command on page 365
- Properties command on page 365

Options Command (Tools Menu)

Displays the Options submenu shown in Figure 8-21.

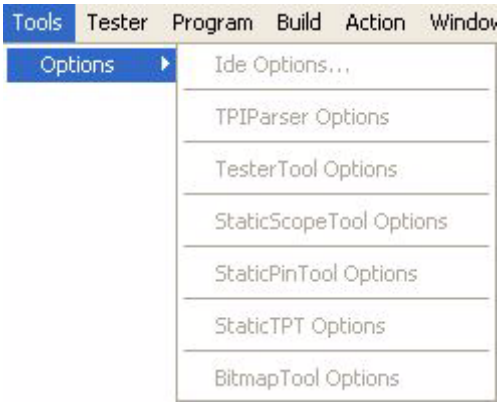


Figure 8-21. Options Submenu

The Options command submenu contains the following commands:

- Ide Options command on page 366
- TPIParser Options command on page 366
- TesterTool Options command on page 366
- StaticScopeTool Options command on page 366
- StaticPinTool Options command on page 366
- StaticTPT Options command on page 366

- BitmapTool Options command on page 366

Ide Options Command (Options Command Submenu)

Not currently supported by the IDE.

TPIParser Options Command (Options Command Submenu)

Not currently supported by the IDE.

TesterTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticPinTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

StaticTPT Options Command (Options Command Submenu)

Not currently supported by the IDE.

BitmapTool Options Command (Options Command Submenu)

Not currently supported by the IDE.

Properties Command (Tools Menu)

Displays the Properties submenu shown in Figure 8-22.

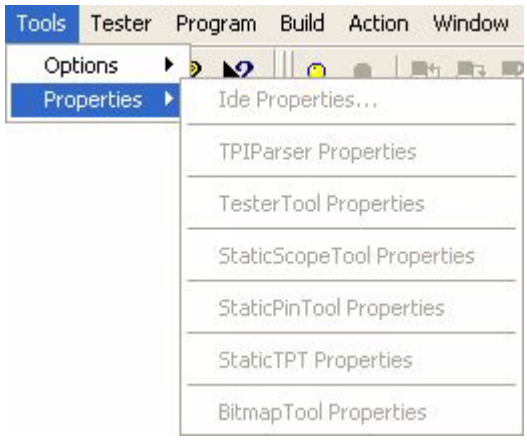


Figure 8-22. Properties Submenu

The Properties command submenu contains the following commands:

Ide Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TPIParser Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

TesterTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticScopeTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticPinTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

StaticTPT Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

BitmapTool Properties Command (Properties Command Submenu)

Not currently supported by the IDE.

Tester Menu

Selecting Tester in the menu bar opens the menu in Figure 8-23.

Figure 8-23. Tester Menu

The Tester menu contains the following commands:

- Set Online command on page 368
- Set Offline command on page 368
- Acquire Data command on page 369
- Apply Changes command on page 369
- Abort Acquire command on page 369
- Power On command on page 369
- Power Off command on page 369

Set Online Command (Tester Menu)

Connects the IDE to the tester for the following tools that support online mode (currently the Bitmap Tool supports only offline mode):

- C Program Debugger (currently has no offline capability)
- Pattern Tool (currently has no offline capability)
- Waveform Tool
- Timing Tool

Set Offline Command (Tester Menu)

Disconnects the IDE from the tester. Currently the Bitmap Tool supports only offline mode. The following tools support offline mode:

- Pin Tool (currently has no online capability)
- Waveform Tool (viewing saved files only)
- Timing Tool (viewing saved files only)
- Bitmap Tool (currently has no online capability)

Acquire Data Command (Tester Menu)

Not currently supported by the Pattern Tool. The Timing Tool supports this command.

Apply Changes Command (Tester Menu)

Not currently supported by the Pattern Tool. The Timing Tool supports this command.

Abort Acquire Command (Tester Menu)

Not currently supported by the Pattern Tool. The Timing Tool supports this command.

Tester Power On Command (Tester Menu)

Same as the VK Test Station main window `Utilities > Power On` command and its corresponding toolbar button. Resets and powers up the test sites (Test Head).

Tester Power Off Command (Tester Menu)

Same as the VK Test Station main window `Utilities > Power Off` command and its corresponding toolbar button. Turns off power to the test sites (Test Head).

Program Menu

Selecting Program in the menu bar opens the menu in Figure 8-24. The Program menu is not currently supported by the IDE.

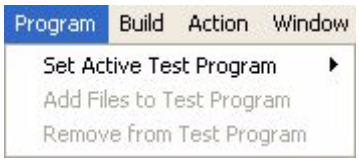


Figure 8-24. Program Menu

The Program menu contains the following commands:

- Set Active Test Program command on page 370
- Add Files to Test Program command on page 370
- Remove from Test Program command on page 370

Set Active Test Program Command (Program Menu)

Not currently supported by the IDE.

Add Files to Test Program Command (Program Menu)

Not currently supported by the IDE.

Remove from Test Program Command (Program Menu)

Not currently supported by the IDE.

Build Menu

Selecting Build in the menu bar opens the menu in Figure 8-25. The Build menu is not currently supported by the IDE.

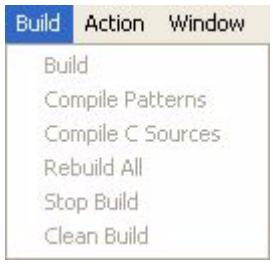


Figure 8-25. Build Menu

The Build menu contains the following commands:

- Build command on page 370
- Compile Patterns command on page 370
- Compile C Sources command on page 371
- Rebuild All command on page 371
- Stop Build command on page 371
- Clean Build command on page 371

Build Command (Build Menu)

Not currently supported by the IDE.

Compile Patterns Command (Build Menu)

Not currently supported by the IDE.

Compile C Sources Command (Build Menu)

Not currently supported by the IDE.

Rebuild All Command (Build Menu)

Not currently supported by the IDE.

Stop Build Command (Build Menu)

Not currently supported by the IDE.

Clean Build Command (Build Menu)

Not currently supported by the IDE.

Action Menu

Selecting Action in the menu bar opens the menu in Figure 8-26.

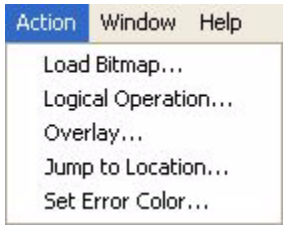


Figure 8-26. Action Menu

The Action menu contains the following commands:

- Load Bitmap command on page 371
- Logical Operation command on page 372
- Overlay command on page 374
- Jump to Location command on page 375
- Set Error Color command on page 376

Load Bitmap Command (Action Menu)

Displays a Load Bitmap File Open dialog box to select bitmap files (similar to Figure 8-27).

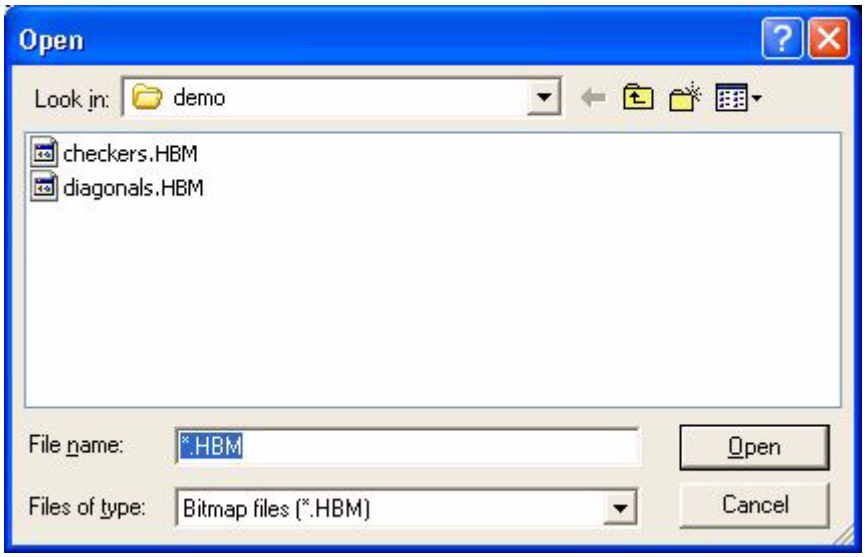


Figure 8-27. Load Bitmap File Open Dialog Box

Logical Operation Command (Action Menu)

 Displays the Logical Operation dialog box (similar to Figure 8-28). The list box displays the currently loaded bitmaps or operations that are listed in the Bitmap Navigation Tree. Selecting bitmaps or operations to highlight them and then one of the `Select Logical Operation` option buttons defines the logical operation. Typing a name in the `Enter Bitmap Name` text box and then selecting OK closes the dialog box and displays the Bitmap Navigation Tree with the created logical operation (Figure 8-29) and also displays it in the View pane.

The available operations are illustrated in Figure 8-30 on page 374.

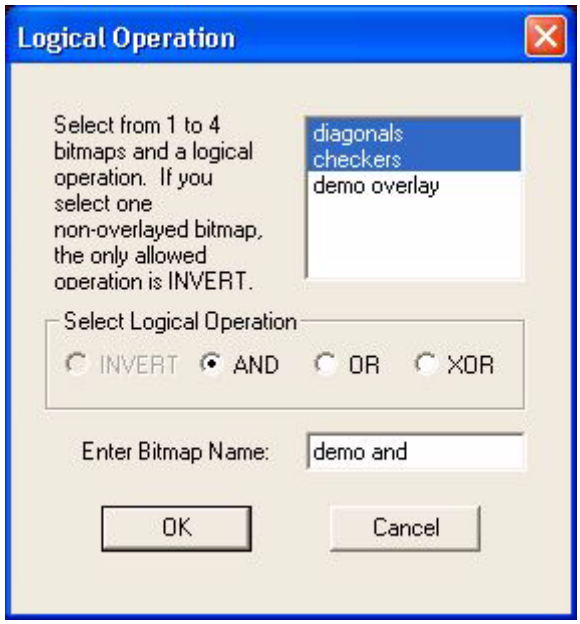


Figure 8-28. Logical Operation Dialog Box

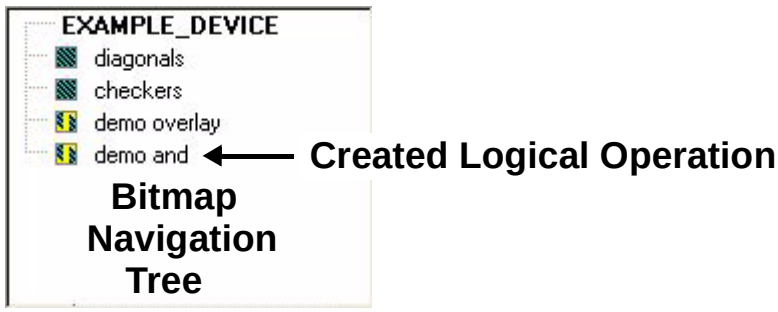


Figure 8-29. Bitmap Navigation Tree Displaying Logical Operation

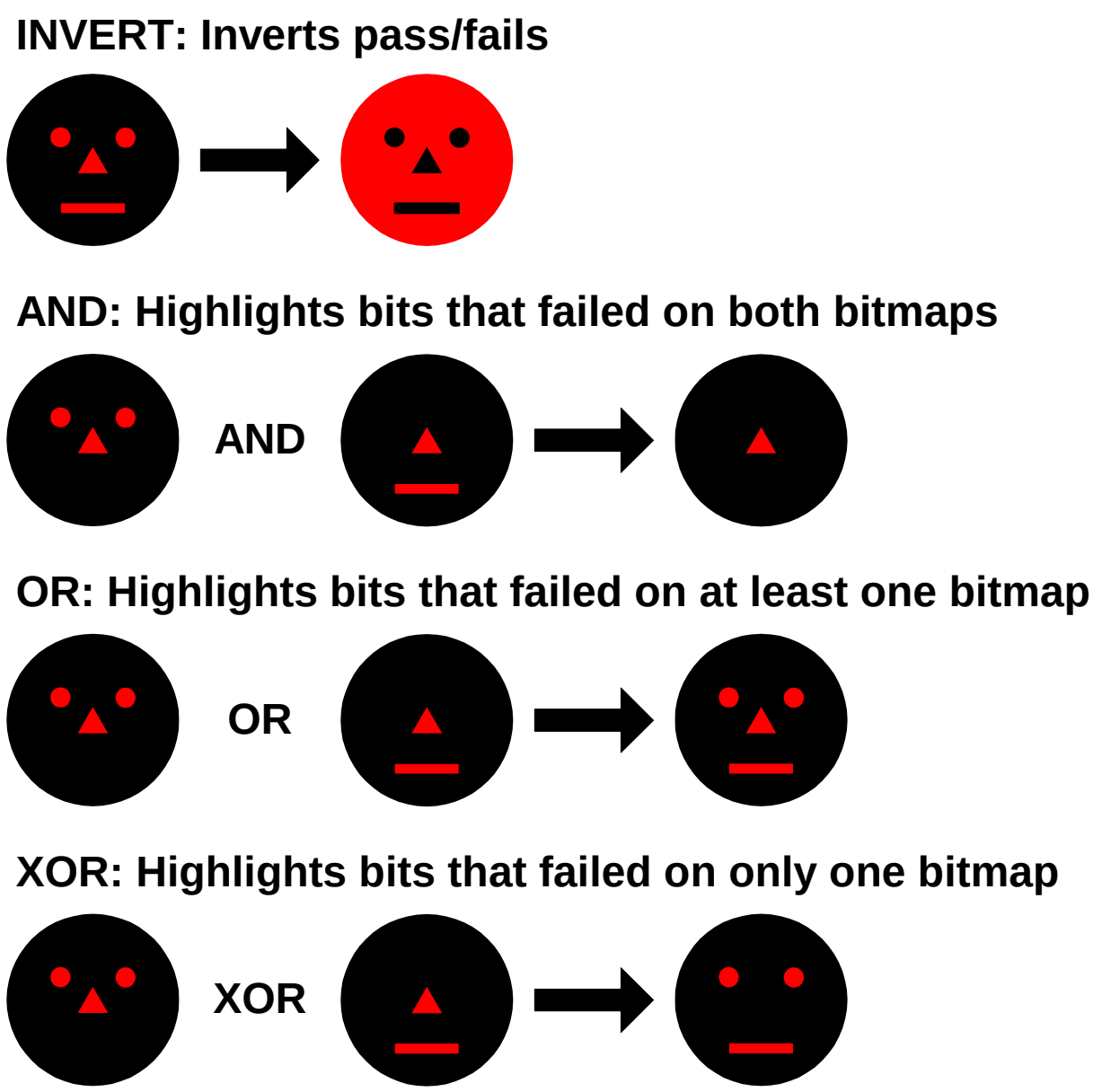


Figure 8-30. Logical Operations

Overlay Command (Action Menu)

Displays the Overlay Bitmaps dialog box (similar to Figure 8-31). The `Loaded Bitmaps` list box displays the currently loaded bitmaps. Selecting bitmaps and then the Add button adds the selected bitmap to display in the `Bitmaps to Overlay` list box. Typing the name in the `Enter Overlay Name` text box gives it a name. Selecting OK closes the dialog box and displays the Bitmap Navigation Tree with the

created `Overlay` operation (Figure 8-32) and also displays it in the View pane. For Overlay operations using the default colors, bits where only one bitmap failed are dark red and bits where both bitmaps failed are bright red.

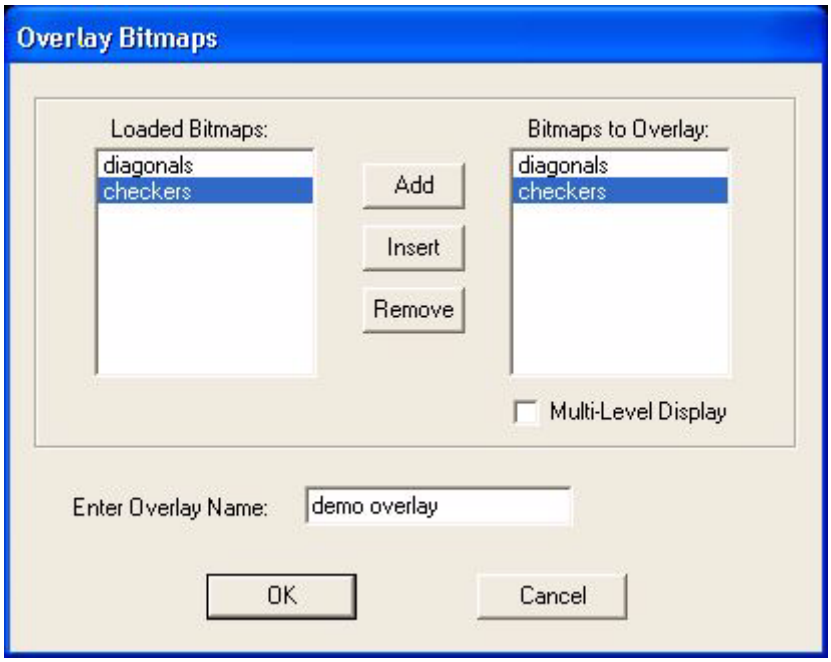


Figure 8-31. Overlay Bitmaps Dialog Box

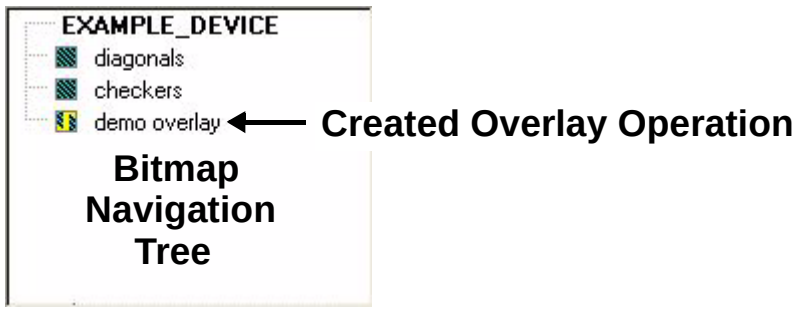


Figure 8-32. Bitmap Navigation Tree Displaying Overlay Operation

Jump to Location Command (Action Menu)

Displays the Jump to Location dialog box (similar to Figure 8-33). Entering the coordinates in the dialog box and selecting OK causes the cross hairs to locate at the address that you specify.

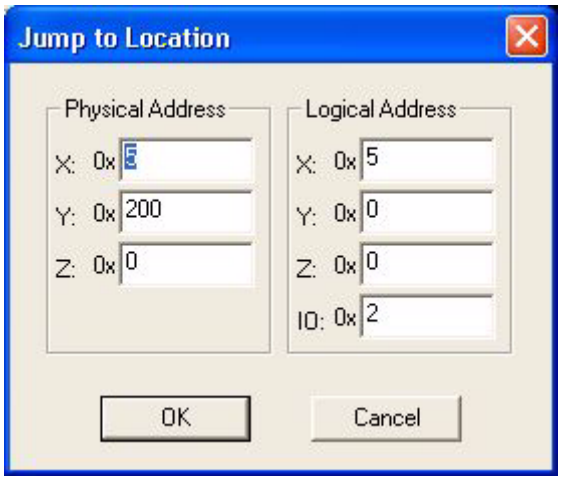


Figure 8-33. Jump to Location Dialog Box

Set Error Color Command (Action Menu)

 Displays the Select System Colors tab on the Set Bitmap Colors dialog box (Figure 8-34). This tab allows you to set the pass and fail colors for the bitmaps. The defaults are black for pass and red for fail. The colors can be changed by selecting the corresponding drop-down list box to display a Color dialog box palette from which additional colors can be selected or created.

The Select Multi-Level Colors tab (Figure 8-35) allows you to select colors to distinguish a single bit's status for multi level displays.

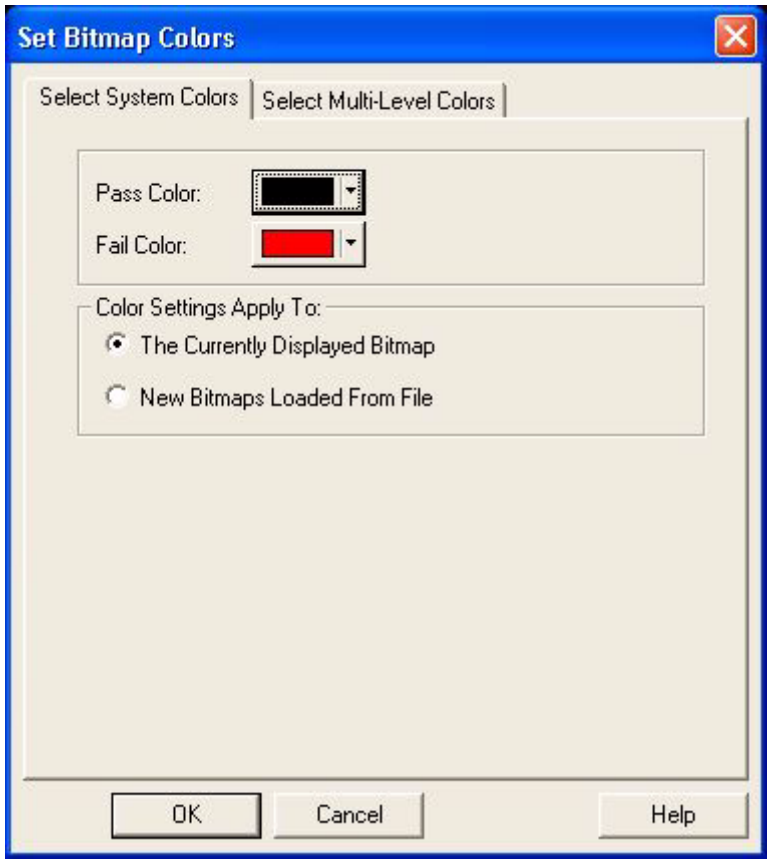


Figure 8-34. Select System Colors Tab on Set Bitmap Colors Dialog Box

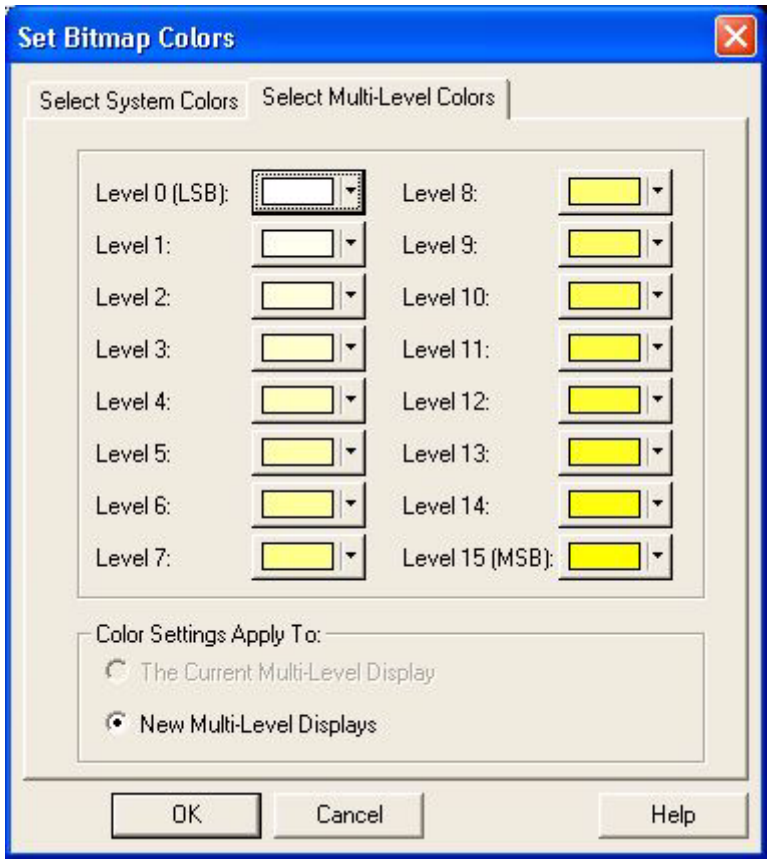


Figure 8-35. Select Multi-Level Colors Tab on Set Bitmap Colors Dialog Box

Window Menu

Selecting Window in the menu bar opens the menu in Figure 8-36.

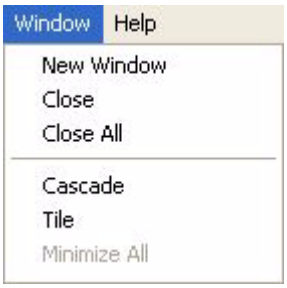


Figure 8-36. Window Menu

The Window menu contains the following commands:

- New Window command on page 379
- Close command on page 379
- Close All command on page 379
- Cascade command on page 379
- Tile command on page 379
- Minimize All command on page 379

New Window Command (Window Menu)

Displays another Bitmap Tool document tab window that has no DUT file loaded.

Close Command (Window Menu)

Closes the active document window.

Close All Command (Window Menu)

Closes all tool document windows with their corresponding tabs.

Cascade Command (Window Menu)

Cascades all open tool document windows in an overlapping fashion one on top of another with the title bar of each visible.

Tile Command (Window Menu)

Tiles all open tool document windows in a non-overlapping fashion.

Minimize All Command (Window Menu)

Not currently supported by the IDE.

Help Menu

Selecting Help in the menu bar opens the menu in Figure 8-37.

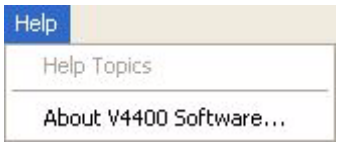


Figure 8-37. Help Menu

The Help menu contains the following two commands:

Help Topics Command (Help Menu)

Not currently supported.

About V4400 Software Command (Help Menu)

Displays the About V4400 Series Tester Software dialog box that contains software component version and copyright information (similar to Figure 8-38).

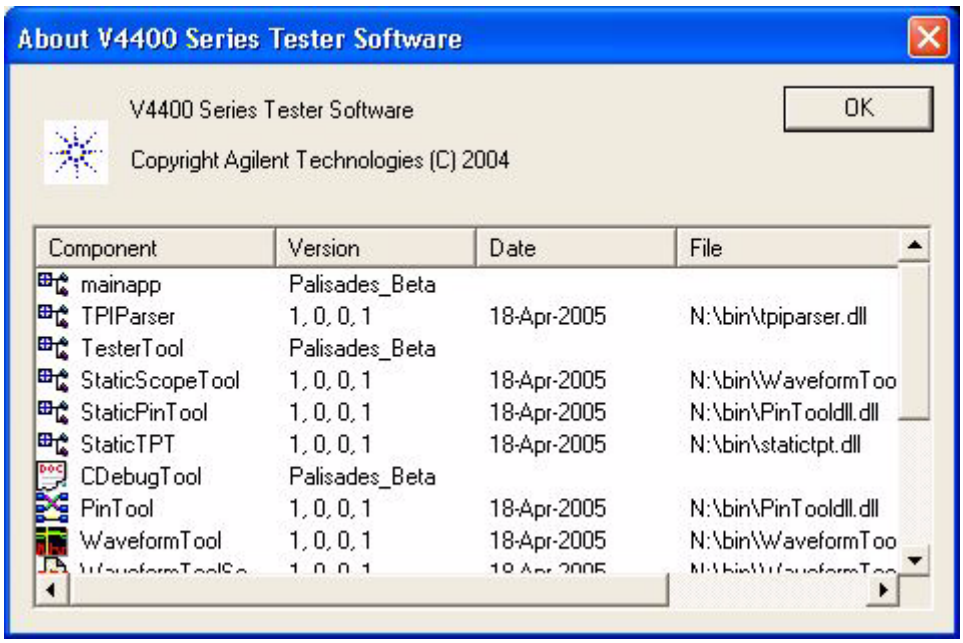


Figure 8-38. About V4400 Software Dialog Box

View Pane

The View Pane (Figure 8-9 on page 349) displays the bitmaps, overlays, and logical operations selected in the Bitmap List. This allows you to view and compare bitmap failure locations within single or multiple bitmaps. The View Pane provides scroll bars on the right-hand side and bottom edge when the magnification of the bitmap within is set to cause the area of the bitmap to be larger than the pane size.

Bitmap Navigation Pane

The Control Pane (Figure 8-9 on page 349) offers information about the coordinates associated with the mouse pointer location. This lists the Logical and Physical address location for selected locations on the bitmap.

The `Logical Z` shows the number of layers of the logical bitmap. (Currently only one layer is supported.) This means that each bit in the logical bitmap has three address coordinates: X, Y and Z.

There is also a `Total Failures` section that displays the total number of failed bits for the displayed bitmaps or logical operations in the View pane.

Thumbnail Pane

The Thumbnail Pane (Figure 8-9 on page 349) shows a thumbnail of the logical and physical layouts of the device. The highlighted area in the thumbnail indicates the current coverage area you are seeing in the View Pane.

Bitmap Navigation Tree

The Bitmap List (Figure 8-9 on page 349) contains a list of the DUT file and all bitmaps loaded in the program, and overlay and logical operations that have been created. The list allows you to show, hide, and remove bitmaps, overlays, and logical operations shown on the View pane.

Bitmap Tool Getting Started

This section demonstrates how to load, view, compare, and analyze Agilent Versatest Series bitmap files. The example files consist of a DUT definition file and two simulated bitmap files for a 16 Mb device with 16 I/Os. For additional information about the Bitmap Tool, see the "Bitmap Tool Main Window" section on page 349 that provides descriptions of all the menus, menu commands, and dialog boxes that make up the tool's interface.

Getting Started Contents

This Getting Started contains the following examples:

Creating a DUT Definition File

To view files in the Bitmap Tool, you must first create and load a DUT definition file. This file supplies the Bitmap Tool with the information it requires about the memory array's rows, columns, I/Os, and scrambling information. The file is loaded from the File > Open > DUT Description Document > Open dialog box. You will be shown later in this chapter how to load the file in the "Loading a DUT Definition File and Displaying the Bitmap Tool Main Window" section on page 408.

The DUT definition file used for this example is shown in Figure 8-39 through Figure 8-50. For additional information and examples, see the "DUT Definition File" section starting on page 424.

NOTE Currently the Bitmap Tool DUT definition file requires a carriage return before the "DestinationX" row scrambling header. After loading a DUT definition file without the carriage return, results in an application error and the program terminates without warning.

A DUT definition file must be saved as an ASCII text file with a .dut extension. The file consists of the following sections. Each section is described following the DUT definition file, starting on page 396.

- Header Section
- Pinout Section
- Scrambling Section

```
BEGIN DUT
          DATE=05/04/03
          USER=CSTD
          COMPANY=Agilent Technologies
          DEVICE=16IO
          PROTOCOL=parallel
          TECHNOLOGY=FLASH
          COLUMNS=4096       // Number of physical bit columns.
          ROWS=4096          // Number of physical rows.
          i/oS=16            // Number of i/os.
          PINS=48            // Number of pins device has that is specified in “PINOUT” section.
END DUT

BEGIN MISC
          anything=5 // Field is required but not currently used.

END MISC

BEGIN     PINOUT
          P1=x7,a15
          P2=x6,a14
          P3=x5,a13
          P4=x4,a12
          P5=x3,a11
          P6=x2,a10
          P7=x1,a9
          P8=x0,a8
          P9=x11,a19
          P10=unused
          P11=WE
          P12=unused
          P13=unused
          P14=unused
          P15=unused
          P16=x10,a18
          P17=x9,a17
          P18=y7,a7
          P19=y6,a6
          P20=y5,a5
          P21=y4,a4
          P22=y3,a3
          P23=y2,a2
          P24=y1,a1
          P25=y0,a0
          P26=CE
          P27=VSS
          P28=OE
          P29=IO0
          P30=IO8
          P31=IO1
          P32=IO9
          P33=IO2
          P34=IO10
          P35=IO3
          P36=IO11
          P37=VDD
          P38=IO4
          P39=IO12
          P40=IO5
          P41=IO13
          P42=IO6
          P43=IO14
          P44=IO7
          P45=IO15
          P46=VSS
          P47=unused
          P48=x8,a16

END PINOUT
```

Figure 8-39. DUT Definition File (1 of 12)

```
BEGIN     SCRAMBLING Logical
          BEGIN REGION
               MINX=0          // Min physical X
               MAXX=4095       // Max physical X
               MINY=0          // Min physical Y
               MAXY=4095       // Max physical Y

DestinationY   io0  io1  io2  io3  io4  io5  io6  io7  io8  io9  io10 io11 io12 io13 io14 io15
0              0    256  512  768  1024 1280 1536 1792 2048 2304 2560 2816 3072 3328 3584 3840
1              1    257  513  769  1025 1281 1537 1793 2049 2305 2561 2817 3073 3329 3585 3841
2              2    258  514  770  1026 1282 1538 1794 2050 2306 2562 2818 3074 3330 3586 3842
3              3    259  515  771  1027 1283 1539 1795 2051 2307 2563 2819 3075 3331 3587 3843
4              4    260  516  772  1028 1284 1540 1796 2052 2308 2564 2820 3076 3332 3588 3844
5              5    261  517  773  1029 1285 1541 1797 2053 2309 2565 2821 3077 3333 3589 3845
6              6    262  518  774  1030 1286 1542 1798 2054 2310 2566 2822 3078 3334 3590 3846
7              7    263  519  775  1031 1287 1543 1799 2055 2311 2567 2823 3079 3335 3591 3847
8              8    264  520  776  1032 1288 1544 1800 2056 2312 2568 2824 3080 3336 3592 3848
9              9    265  521  777  1033 1289 1545 1801 2057 2313 2569 2825 3081 3337 3593 3849
10             10   266  522  778  1034 1290 1546 1802 2058 2314 2570 2826 3082 3338 3594 3850
11             11   267  523  779  1035 1291 1547 1803 2059 2315 2571 2827 3083 3339 3595 3851
12             12   268  524  780  1036 1292 1548 1804 2060 2316 2572 2828 3084 3340 3596 3852
13             13   269  525  781  1037 1293 1549 1805 2061 2317 2573 2829 3085 3341 3597 3853
14             14   270  526  782  1038 1294 1550 1806 2062 2318 2574 2830 3086 3342 3598 3854
15             15   271  527  783  1039 1295 1551 1807 2063 2319 2575 2831 3087 3343 3599 3855
16             16   272  528  784  1040 1296 1552 1808 2064 2320 2576 2832 3088 3344 3600 3856
17             17   273  529  785  1041 1297 1553 1809 2065 2321 2577 2833 3089 3345 3601 3857
18             18   274  530  786  1042 1298 1554 1810 2066 2322 2578 2834 3090 3346 3602 3858
19             19   275  531  787  1043 1299 1555 1811 2067 2323 2579 2835 3091 3347 3603 3859
20             20   276  532  788  1044 1300 1556 1812 2068 2324 2580 2836 3092 3348 3604 3860
21             21   277  533  789  1045 1301 1557 1813 2069 2325 2581 2837 3093 3349 3605 3861
22             22   278  534  790  1046 1302 1558 1814 2070 2326 2582 2838 3094 3350 3606 3862
23             23   279  535  791  1047 1303 1559 1815 2071 2327 2583 2839 3095 3351 3607 3863
24             24   280  536  792  1048 1304 1560 1816 2072 2328 2584 2840 3096 3352 3608 3864
25             25   281  537  793  1049 1305 1561 1817 2073 2329 2585 2841 3097 3353 3609 3865
26             26   282  538  794  1050 1306 1562 1818 2074 2330 2586 2842 3098 3354 3610 3866
27             27   283  539  795  1051 1307 1563 1819 2075 2331 2587 2843 3099 3355 3611 3867
28             28   284  540  796  1052 1308 1564 1820 2076 2332 2588 2844 3100 3356 3612 3868
29             29   285  541  797  1053 1309 1565 1821 2077 2333 2589 2845 3101 3357 3613 3869
30             30   286  542  798  1054 1310 1566 1822 2078 2334 2590 2846 3102 3358 3614 3870
31             31   287  543  799  1055 1311 1567 1823 2079 2335 2591 2847 3103 3359 3615 3871
32             32   288  544  800  1056 1312 1568 1824 2080 2336 2592 2848 3104 3360 3616 3872
33             33   289  545  801  1057 1313 1569 1825 2081 2337 2593 2849 3105 3361 3617 3873
34             34   290  546  802  1058 1314 1570 1826 2082 2338 2594 2850 3106 3362 3618 3874
35             35   291  547  803  1059 1315 1571 1827 2083 2339 2595 2851 3107 3363 3619 3875
36             36   292  548  804  1060 1316 1572 1828 2084 2340 2596 2852 3108 3364 3620 3876
37             37   293  549  805  1061 1317 1573 1829 2085 2341 2597 2853 3109 3365 3621 3877
38             38   294  550  806  1062 1318 1574 1830 2086 2342 2598 2854 3110 3366 3622 3878
39             39   295  551  807  1063 1319 1575 1831 2087 2343 2599 2855 3111 3367 3623 3879
40             40   296  552  808  1064 1320 1576 1832 2088 2344 2600 2856 3112 3368 3624 3880
41             41   297  553  809  1065 1321 1577 1833 2089 2345 2601 2857 3113 3369 3625 3881
42             42   298  554  810  1066 1322 1578 1834 2090 2346 2602 2858 3114 3370 3626 3882
43             43   299  555  811  1067 1323 1579 1835 2091 2347 2603 2859 3115 3371 3627 3883
44             44   300  556  812  1068 1324 1580 1836 2092 2348 2604 2860 3116 3372 3628 3884
45             45   301  557  813  1069 1325 1581 1837 2093 2349 2605 2861 3117 3373 3629 3885
46             46   302  558  814  1070 1326 1582 1838 2094 2350 2606 2862 3118 3374 3630 3886
47             47   303  559  815  1071 1327 1583 1839 2095 2351 2607 2863 3119 3375 3631 3887
48             48   304  560  816  1072 1328 1584 1840 2096 2352 2608 2864 3120 3376 3632 3888
49             49   305  561  817  1073 1329 1585 1841 2097 2353 2609 2865 3121 3377 3633 3889
50             50   306  562  818  1074 1330 1586 1842 2098 2354 2610 2866 3122 3378 3634 3890
51             51   307  563  819  1075 1331 1587 1843 2099 2355 2611 2867 3123 3379 3635 3891
52             52   308  564  820  1076 1332 1588 1844 2100 2356 2612 2868 3124 3380 3636 3892
53             53   309  565  821  1077 1333 1589 1845 2101 2357 2613 2869 3125 3381 3637 3893
54             54   310  566  822  1078 1334 1590 1846 2102 2358 2614 2870 3126 3382 3638 3894
55             55   311  567  823  1079 1335 1591 1847 2103 2359 2615 2871 3127 3383 3639 3895
56             56   312  568  824  1080 1336 1592 1848 2104 2360 2616 2872 3128 3384 3640 3896
57             57   313  569  825  1081 1337 1593 1849 2105 2361 2617 2873 3129 3385 3641 3897
58             58   314  570  826  1082 1338 1594 1850 2106 2362 2618 2874 3130 3386 3642 3898
59             59   315  571  827  1083 1339 1595 1851 2107 2363 2619 2875 3131 3387 3643 3899
60             60   316  572  828  1084 1340 1596 1852 2108 2364 2620 2876 3132 3388 3644 3900
61             61   317  573  829  1085 1341 1597 1853 2109 2365 2621 2877 3133 3389 3645 3901
62             62   318  574  830  1086 1342 1598 1854 2110 2366 2622 2878 3134 3390 3646 3902
```

Figure 8-40. DUT Definition File (2 of 12)

```
63              63   319  575  831  1087 1343 1599 1855 2111 2367 2623 2879 3135 3391 3647 3903
64              64   320  576  832  1088 1344 1600 1856 2112 2368 2624 2880 3136 3392 3648 3904
65              65   321  577  833  1089 1345 1601 1857 2113 2369 2625 2881 3137 3393 3649 3905
66              66   322  578  834  1090 1346 1602 1858 2114 2370 2626 2882 3138 3394 3650 3906
67              67   323  579  835  1091 1347 1603 1859 2115 2371 2627 2883 3139 3395 3651 3907
68              68   324  580  836  1092 1348 1604 1860 2116 2372 2628 2884 3140 3396 3652 3908
69              69   325  581  837  1093 1349 1605 1861 2117 2373 2629 2885 3141 3397 3653 3909
70              70   326  582  838  1094 1350 1606 1862 2118 2374 2630 2886 3142 3398 3654 3910
71              71   327  583  839  1095 1351 1607 1863 2119 2375 2631 2887 3143 3399 3655 3911
72              72   328  584  840  1096 1352 1608 1864 2120 2376 2632 2888 3144 3400 3656 3912
73              73   329  585  841  1097 1353 1609 1865 2121 2377 2633 2889 3145 3401 3657 3913
74              74   330  586  842  1098 1354 1610 1866 2122 2378 2634 2890 3146 3402 3658 3914
75              75   331  587  843  1099 1355 1611 1867 2123 2379 2635 2891 3147 3403 3659 3915
76              76   332  588  844  1100 1356 1612 1868 2124 2380 2636 2892 3148 3404 3660 3916
77              77   333  589  845  1101 1357 1613 1869 2125 2381 2637 2893 3149 3405 3661 3917
78              78   334  590  846  1102 1358 1614 1870 2126 2382 2638 2894 3150 3406 3662 3918
79              79   335  591  847  1103 1359 1615 1871 2127 2383 2639 2895 3151 3407 3663 3919
80              80   336  592  848  1104 1360 1616 1872 2128 2384 2640 2896 3152 3408 3664 3920
81              81   337  593  849  1105 1361 1617 1873 2129 2385 2641 2897 3153 3409 3665 3921
82              82   338  594  850  1106 1362 1618 1874 2130 2386 2642 2898 3154 3410 3666 3922
83              83   339  595  851  1107 1363 1619 1875 2131 2387 2643 2899 3155 3411 3667 3923
84              84   340  596  852  1108 1364 1620 1876 2132 2388 2644 2900 3156 3412 3668 3924
85              85   341  597  853  1109 1365 1621 1877 2133 2389 2645 2901 3157 3413 3669 3925
86              86   342  598  854  1110 1366 1622 1878 2134 2390 2646 2902 3158 3414 3670 3926
87              87   343  599  855  1111 1367 1623 1879 2135 2391 2647 2903 3159 3415 3671 3927
88              88   344  600  856  1112 1368 1624 1880 2136 2392 2648 2904 3160 3416 3672 3928
89              89   345  601  857  1113 1369 1625 1881 2137 2393 2649 2905 3161 3417 3673 3929
90              90   346  602  858  1114 1370 1626 1882 2138 2394 2650 2906 3162 3418 3674 3930
91              91   347  603  859  1115 1371 1627 1883 2139 2395 2651 2907 3163 3419 3675 3931
92              92   348  604  860  1116 1372 1628 1884 2140 2396 2652 2908 3164 3420 3676 3932
93              93   349  605  861  1117 1373 1629 1885 2141 2397 2653 2909 3165 3421 3677 3933
94              94   350  606  862  1118 1374 1630 1886 2142 2398 2654 2910 3166 3422 3678 3934
95              95   351  607  863  1119 1375 1631 1887 2143 2399 2655 2911 3167 3423 3679 3935
96              96   352  608  864  1120 1376 1632 1888 2144 2400 2656 2912 3168 3424 3680 3936
97              97   353  609  865  1121 1377 1633 1889 2145 2401 2657 2913 3169 3425 3681 3937
98              98   354  610  866  1122 1378 1634 1890 2146 2402 2658 2914 3170 3426 3682 3938
99              99   355  611  867  1123 1379 1635 1891 2147 2403 2659 2915 3171 3427 3683 3939
100             100  356  612  868  1124 1380 1636 1892 2148 2404 2660 2916 3172 3428 3684 3940
101             101  357  613  869  1125 1381 1637 1893 2149 2405 2661 2917 3173 3429 3685 3941
102             102  358  614  870  1126 1382 1638 1894 2150 2406 2662 2918 3174 3430 3686 3942
103             103  359  615  871  1127 1383 1639 1895 2151 2407 2663 2919 3175 3431 3687 3943
104             104  360  616  872  1128 1384 1640 1896 2152 2408 2664 2920 3176 3432 3688 3944
105             105  361  617  873  1129 1385 1641 1897 2153 2409 2665 2921 3177 3433 3689 3945
106             106  362  618  874  1130 1386 1642 1898 2154 2410 2666 2922 3178 3434 3690 3946
107             107  363  619  875  1131 1387 1643 1899 2155 2411 2667 2923 3179 3435 3691 3947
108             108  364  620  876  1132 1388 1644 1900 2156 2412 2668 2924 3180 3436 3692 3948
109             109  365  621  877  1133 1389 1645 1901 2157 2413 2669 2925 3181 3437 3693 3949
110             110  366  622  878  1134 1390 1646 1902 2158 2414 2670 2926 3182 3438 3694 3950
111             111  367  623  879  1135 1391 1647 1903 2159 2415 2671 2927 3183 3439 3695 3951
112             112  368  624  880  1136 1392 1648 1904 2160 2416 2672 2928 3184 3440 3696 3952
113             113  369  625  881  1137 1393 1649 1905 2161 2417 2673 2929 3185 3441 3697 3953
114             114  370  626  882  1138 1394 1650 1906 2162 2418 2674 2930 3186 3442 3698 3954
115             115  371  627  883  1139 1395 1651 1907 2163 2419 2675 2931 3187 3443 3699 3955
116             116  372  628  884  1140 1396 1652 1908 2164 2420 2676 2932 3188 3444 3700 3956
117             117  373  629  885  1141 1397 1653 1909 2165 2421 2677 2933 3189 3445 3701 3957
118             118  374  630  886  1142 1398 1654 1910 2166 2422 2678 2934 3190 3446 3702 3958
119             119  375  631  887  1143 1399 1655 1911 2167 2423 2679 2935 3191 3447 3703 3959
120             120  376  632  888  1144 1400 1656 1912 2168 2424 2680 2936 3192 3448 3704 3960
121             121  377  633  889  1145 1401 1657 1913 2169 2425 2681 2937 3193 3449 3705 3961
122             122  378  634  890  1146 1402 1658 1914 2170 2426 2682 2938 3194 3450 3706 3962
123             123  379  635  891  1147 1403 1659 1915 2171 2427 2683 2939 3195 3451 3707 3963
124             124  380  636  892  1148 1404 1660 1916 2172 2428 2684 2940 3196 3452 3708 3964
125             125  381  637  893  1149 1405 1661 1917 2173 2429 2685 2941 3197 3453 3709 3965
126             126  382  638  894  1150 1406 1662 1918 2174 2430 2686 2942 3198 3454 3710 3966
127             127  383  639  895  1151 1407 1663 1919 2175 2431 2687 2943 3199 3455 3711 3967
128             128  384  640  896  1152 1408 1664 1920 2176 2432 2688 2944 3200 3456 3712 3968
129             129  385  641  897  1153 1409 1665 1921 2177 2433 2689 2945 3201 3457 3713 3969
130             130  386  642  898  1154 1410 1666 1922 2178 2434 2690 2946 3202 3458 3714 3970
131             131  387  643  899  1155 1411 1667 1923 2179 2435 2691 2947 3203 3459 3715 3971
132             132  388  644  900  1156 1412 1668 1924 2180 2436 2692 2948 3204 3460 3716 3972
133             133  389  645  901  1157 1413 1669 1925 2181 2437 2693 2949 3205 3461 3717 3973
```

Figure 8-41. DUT Definition File (3 of 12)

```
134             134  390  646  902  1158 1414 1670 1926 2182 2438 2694 2950 3206 3462 3718 3974
135             135  391  647  903  1159 1415 1671 1927 2183 2439 2695 2951 3207 3463 3719 3975
136             136  392  648  904  1160 1416 1672 1928 2184 2440 2696 2952 3208 3464 3720 3976
137             137  393  649  905  1161 1417 1673 1929 2185 2441 2697 2953 3209 3465 3721 3977
138             138  394  650  906  1162 1418 1674 1930 2186 2442 2698 2954 3210 3466 3722 3978
139             139  395  651  907  1163 1419 1675 1931 2187 2443 2699 2955 3211 3467 3723 3979
140             140  396  652  908  1164 1420 1676 1932 2188 2444 2700 2956 3212 3468 3724 3980
141             141  397  653  909  1165 1421 1677 1933 2189 2445 2701 2957 3213 3469 3725 3981
142             142  398  654  910  1166 1422 1678 1934 2190 2446 2702 2958 3214 3470 3726 3982
143             143  399  655  911  1167 1423 1679 1935 2191 2447 2703 2959 3215 3471 3727 3983
144             144  400  656  912  1168 1424 1680 1936 2192 2448 2704 2960 3216 3472 3728 3984
145             145  401  657  913  1169 1425 1681 1937 2193 2449 2705 2961 3217 3473 3729 3985
146             146  402  658  914  1170 1426 1682 1938 2194 2450 2706 2962 3218 3474 3730 3986
147             147  403  659  915  1171 1427 1683 1939 2195 2451 2707 2963 3219 3475 3731 3987
148             148  404  660  916  1172 1428 1684 1940 2196 2452 2708 2964 3220 3476 3732 3988
149             149  405  661  917  1173 1429 1685 1941 2197 2453 2709 2965 3221 3477 3733 3989
150             150  406  662  918  1174 1430 1686 1942 2198 2454 2710 2966 3222 3478 3734 3990
151             151  407  663  919  1175 1431 1687 1943 2199 2455 2711 2967 3223 3479 3735 3991
152             152  408  664  920  1176 1432 1688 1944 2200 2456 2712 2968 3224 3480 3736 3992
153             153  409  665  921  1177 1433 1689 1945 2201 2457 2713 2969 3225 3481 3737 3993
154             154  410  666  922  1178 1434 1690 1946 2202 2458 2714 2970 3226 3482 3738 3994
155             155  411  667  923  1179 1435 1691 1947 2203 2459 2715 2971 3227 3483 3739 3995
156             156  412  668  924  1180 1436 1692 1948 2204 2460 2716 2972 3228 3484 3740 3996
157             157  413  669  925  1181 1437 1693 1949 2205 2461 2717 2973 3229 3485 3741 3997
158             158  414  670  926  1182 1438 1694 1950 2206 2462 2718 2974 3230 3486 3742 3998
159             159  415  671  927  1183 1439 1695 1951 2207 2463 2719 2975 3231 3487 3743 3999
160             160  416  672  928  1184 1440 1696 1952 2208 2464 2720 2976 3232 3488 3744 4000
161             161  417  673  929  1185 1441 1697 1953 2209 2465 2721 2977 3233 3489 3745 4001
162             162  418  674  930  1186 1442 1698 1954 2210 2466 2722 2978 3234 3490 3746 4002
163             163  419  675  931  1187 1443 1699 1955 2211 2467 2723 2979 3235 3491 3747 4003
164             164  420  676  932  1188 1444 1700 1956 2212 2468 2724 2980 3236 3492 3748 4004
165             165  421  677  933  1189 1445 1701 1957 2213 2469 2725 2981 3237 3493 3749 4005
166             166  422  678  934  1190 1446 1702 1958 2214 2470 2726 2982 3238 3494 3750 4006
167             167  423  679  935  1191 1447 1703 1959 2215 2471 2727 2983 3239 3495 3751 4007
168             168  424  680  936  1192 1448 1704 1960 2216 2472 2728 2984 3240 3496 3752 4008
169             169  425  681  937  1193 1449 1705 1961 2217 2473 2729 2985 3241 3497 3753 4009
170             170  426  682  938  1194 1450 1706 1962 2218 2474 2730 2986 3242 3498 3754 4010
171             171  427  683  939  1195 1451 1707 1963 2219 2475 2731 2987 3243 3499 3755 4011
172             172  428  684  940  1196 1452 1708 1964 2220 2476 2732 2988 3244 3500 3756 4012
173             173  429  685  941  1197 1453 1709 1965 2221 2477 2733 2989 3245 3501 3757 4013
174             174  430  686  942  1198 1454 1710 1966 2222 2478 2734 2990 3246 3502 3758 4014
175             175  431  687  943  1199 1455 1711 1967 2223 2479 2735 2991 3247 3503 3759 4015
176             176  432  688  944  1200 1456 1712 1968 2224 2480 2736 2992 3248 3504 3760 4016
177             177  433  689  945  1201 1457 1713 1969 2225 2481 2737 2993 3249 3505 3761 4017
178             178  434  690  946  1202 1458 1714 1970 2226 2482 2738 2994 3250 3506 3762 4018
179             179  435  691  947  1203 1459 1715 1971 2227 2483 2739 2995 3251 3507 3763 4019
180             180  436  692  948  1204 1460 1716 1972 2228 2484 2740 2996 3252 3508 3764 4020
181             181  437  693  949  1205 1461 1717 1973 2229 2485 2741 2997 3253 3509 3765 4021
182             182  438  694  950  1206 1462 1718 1974 2230 2486 2742 2998 3254 3510 3766 4022
183             183  439  695  951  1207 1463 1719 1975 2231 2487 2743 2999 3255 3511 3767 4023
184             184  440  696  952  1208 1464 1720 1976 2232 2488 2744 3000 3256 3512 3768 4024
185             185  441  697  953  1209 1465 1721 1977 2233 2489 2745 3001 3257 3513 3769 4025
186             186  442  698  954  1210 1466 1722 1978 2234 2490 2746 3002 3258 3514 3770 4026
187             187  443  699  955  1211 1467 1723 1979 2235 2491 2747 3003 3259 3515 3771 4027
188             188  444  700  956  1212 1468 1724 1980 2236 2492 2748 3004 3260 3516 3772 4028
189             189  445  701  957  1213 1469 1725 1981 2237 2493 2749 3005 3261 3517 3773 4029
190             190  446  702  958  1214 1470 1726 1982 2238 2494 2750 3006 3262 3518 3774 4030
191             191  447  703  959  1215 1471 1727 1983 2239 2495 2751 3007 3263 3519 3775 4031
192             192  448  704  960  1216 1472 1728 1984 2240 2496 2752 3008 3264 3520 3776 4032
193             193  449  705  961  1217 1473 1729 1985 2241 2497 2753 3009 3265 3521 3777 4033
194             194  450  706  962  1218 1474 1730 1986 2242 2498 2754 3010 3266 3522 3778 4034
195             195  451  707  963  1219 1475 1731 1987 2243 2499 2755 3011 3267 3523 3779 4035
196             196  452  708  964  1220 1476 1732 1988 2244 2500 2756 3012 3268 3524 3780 4036
197             197  453  709  965  1221 1477 1733 1989 2245 2501 2757 3013 3269 3525 3781 4037
198             198  454  710  966  1222 1478 1734 1990 2246 2502 2758 3014 3270 3526 3782 4038
199             199  455  711  967  1223 1479 1735 1991 2247 2503 2759 3015 3271 3527 3783 4039
200             200  456  712  968  1224 1480 1736 1992 2248 2504 2760 3016 3272 3528 3784 4040
201             201  457  713  969  1225 1481 1737 1993 2249 2505 2761 3017 3273 3529 3785 4041
202             202  458  714  970  1226 1482 1738 1994 2250 2506 2762 3018 3274 3530 3786 4042
203             203  459  715  971  1227 1483 1739 1995 2251 2507 2763 3019 3275 3531 3787 4043
204             204  460  716  972  1228 1484 1740 1996 2252 2508 2764 3020 3276 3532 3788 4044
```

Figure 8-42. DUT Definition File (4 of 12)

205	205	461	717	973	1229	1485	1741	1997	2253	2509	2765	3021	3277	3533	3789	4045
206	206	462	718	974	1230	1486	1742	1998	2254	2510	2766	3022	3278	3534	3790	4046
207	207	463	719	975	1231	1487	1743	1999	2255	2511	2767	3023	3279	3535	3791	4047
208	208	464	720	976	1232	1488	1744	2000	2256	2512	2768	3024	3280	3536	3792	4048
209	209	465	721	977	1233	1489	1745	2001	2257	2513	2769	3025	3281	3537	3793	4049
210	210	466	722	978	1234	1490	1746	2002	2258	2514	2770	3026	3282	3538	3794	4050
211	211	467	723	979	1235	1491	1747	2003	2259	2515	2771	3027	3283	3539	3795	4051
212	212	468	724	980	1236	1492	1748	2004	2260	2516	2772	3028	3284	3540	3796	4052
213	213	469	725	981	1237	1493	1749	2005	2261	2517	2773	3029	3285	3541	3797	4053
214	214	470	726	982	1238	1494	1750	2006	2262	2518	2774	3030	3286	3542	3798	4054
215	215	471	727	983	1239	1495	1751	2007	2263	2519	2775	3031	3287	3543	3799	4055
216	216	472	728	984	1240	1496	1752	2008	2264	2520	2776	3032	3288	3544	3800	4056
217	217	473	729	985	1241	1497	1753	2009	2265	2521	2777	3033	3289	3545	3801	4057
218	218	474	730	986	1242	1498	1754	2010	2266	2522	2778	3034	3290	3546	3802	4058
219	219	475	731	987	1243	1499	1755	2011	2267	2523	2779	3035	3291	3547	3803	4059
220	220	476	732	988	1244	1500	1756	2012	2268	2524	2780	3036	3292	3548	3804	4060
221	221	477	733	989	1245	1501	1757	2013	2269	2525	2781	3037	3293	3549	3805	4061
222	222	478	734	990	1246	1502	1758	2014	2270	2526	2782	3038	3294	3550	3806	4062
223	223	479	735	991	1247	1503	1759	2015	2271	2527	2783	3039	3295	3551	3807	4063
224	224	480	736	992	1248	1504	1760	2016	2272	2528	2784	3040	3296	3552	3808	4064
225	225	481	737	993	1249	1505	1761	2017	2273	2529	2785	3041	3297	3553	3809	4065
226	226	482	738	994	1250	1506	1762	2018	2274	2530	2786	3042	3298	3554	3810	4066
227	227	483	739	995	1251	1507	1763	2019	2275	2531	2787	3043	3299	3555	3811	4067
228	228	484	740	996	1252	1508	1764	2020	2276	2532	2788	3044	3300	3556	3812	4068
229	229	485	741	997	1253	1509	1765	2021	2277	2533	2789	3045	3301	3557	3813	4069
230	230	486	742	998	1254	1510	1766	2022	2278	2534	2790	3046	3302	3558	3814	4070
231	231	487	743	999	1255	1511	1767	2023	2279	2535	2791	3047	3303	3559	3815	4071
232	232	488	744	1000	1256	1512	1768	2024	2280	2536	2792	3048	3304	3560	3816	4072
233	233	489	745	1001	1257	1513	1769	2025	2281	2537	2793	3049	3305	3561	3817	4073
234	234	490	746	1002	1258	1514	1770	2026	2282	2538	2794	3050	3306	3562	3818	4074
235	235	491	747	1003	1259	1515	1771	2027	2283	2539	2795	3051	3307	3563	3819	4075
236	236	492	748	1004	1260	1516	1772	2028	2284	2540	2796	3052	3308	3564	3820	4076
237	237	493	749	1005	1261	1517	1773	2029	2285	2541	2797	3053	3309	3565	3821	4077
238	238	494	750	1006	1262	1518	1774	2030	2286	2542	2798	3054	3310	3566	3822	4078
239	239	495	751	1007	1263	1519	1775	2031	2287	2543	2799	3055	3311	3567	3823	4079
240	240	496	752	1008	1264	1520	1776	2032	2288	2544	2800	3056	3312	3568	3824	4080
241	241	497	753	1009	1265	1521	1777	2033	2289	2545	2801	3057	3313	3569	3825	4081
242	242	498	754	1010	1266	1522	1778	2034	2290	2546	2802	3058	3314	3570	3826	4082
243	243	499	755	1011	1267	1523	1779	2035	2291	2547	2803	3059	3315	3571	3827	4083
244	244	500	756	1012	1268	1524	1780	2036	2292	2548	2804	3060	3316	3572	3828	4084
245	245	501	757	1013	1269	1525	1781	2037	2293	2549	2805	3061	3317	3573	3829	4085
246	246	502	758	1014	1270	1526	1782	2038	2294	2550	2806	3062	3318	3574	3830	4086
247	247	503	759	1015	1271	1527	1783	2039	2295	2551	2807	3063	3319	3575	3831	4087
248	248	504	760	1016	1272	1528	1784	2040	2296	2552	2808	3064	3320	3576	3832	4088
249	249	505	761	1017	1273	1529	1785	2041	2297	2553	2809	3065	3321	3577	3833	4089
250	250	506	762	1018	1274	1530	1786	2042	2298	2554	2810	3066	3322	3578	3834	4090
251	251	507	763	1019	1275	1531	1787	2043	2299	2555	2811	3067	3323	3579	3835	4091
252	252	508	764	1020	1276	1532	1788	2044	2300	2556	2812	3068	3324	3580	3836	4092
253	253	509	765	1021	1277	1533	1789	2045	2301	2557	2813	3069	3325	3581	3837	4093
254	254	510	766	1022	1278	1534	1790	2046	2302	2558	2814	3070	3326	3582	3838	4094
255	255	511	767	1023	1279	1535	1791	2047	2303	2559	2815	3071	3327	3583	3839	4095

DestinationX	0	1	2	3	4	5	6	7
0	0	1	2	3	4	5	6	7
8	8	9	10	11	12	13	14	15
16	16	17	18	19	20	21	22	23
24	24	25	26	27	28	29	30	31
32	32	33	34	35	36	37	38	39
40	40	41	42	43	44	45	46	47
48	48	49	50	51	52	53	54	55
56	56	57	58	59	60	61	62	63
64	64	65	66	67	68	69	70	71
72	72	73	74	75	76	77	78	79
80	80	81	82	83	84	85	86	87
88	88	89	90	91	92	93	94	95
96	96	97	98	99	100	101	102	103
104	104	105	106	107	108	109	110	111
112	112	113	114	115	116	117	118	119
120	120	121	122	123	124	125	126	127
128	128	129	130	131	132	133	134	135
136	136	137	138	139	140	141	142	143

Figure 8-43. DUT Definition File (5 of 12)

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144             144  145  146  147  148  149  150  151
152             152  153  154  155  156  157  158  159
160             160  161  162  163  164  165  166  167
168             168  169  170  171  172  173  174  175
176             176  177  178  179  180  181  182  183
184             184  185  186  187  188  189  190  191
192             192  193  194  195  196  197  198  199
200             200  201  202  203  204  205  206  207
208             208  209  210  211  212  213  214  215
216             216  217  218  219  220  221  222  223
224             224  225  226  227  228  229  230  231
232             232  233  234  235  236  237  238  239
240             240  241  242  243  244  245  246  247
248             248  249  250  251  252  253  254  255
256             256  257  258  259  260  261  262  263
264             264  265  266  267  268  269  270  271
272             272  273  274  275  276  277  278  279
280             280  281  282  283  284  285  286  287
288             288  289  290  291  292  293  294  295
296             296  297  298  299  300  301  302  303
304             304  305  306  307  308  309  310  311
312             312  313  314  315  316  317  318  319
320             320  321  322  323  324  325  326  327
328             328  329  330  331  332  333  334  335
336             336  337  338  339  340  341  342  343
344             344  345  346  347  348  349  350  351
352             352  353  354  355  356  357  358  359
360             360  361  362  363  364  365  366  367
368             368  369  370  371  372  373  374  375
376             376  377  378  379  380  381  382  383
384             384  385  386  387  388  389  390  391
392             392  393  394  395  396  397  398  399
400             400  401  402  403  404  405  406  407
408             408  409  410  411  412  413  414  415
416             416  417  418  419  420  421  422  423
424             424  425  426  427  428  429  430  431
432             432  433  434  435  436  437  438  439
440             440  441  442  443  444  445  446  447
448             448  449  450  451  452  453  454  455
456             456  457  458  459  460  461  462  463
464             464  465  466  467  468  469  470  471
472             472  473  474  475  476  477  478  479
480             480  481  482  483  484  485  486  487
488             488  489  490  491  492  493  494  495
496             496  497  498  499  500  501  502  503
504             504  505  506  507  508  509  510  511
512             512  513  514  515  516  517  518  519
520             520  521  522  523  524  525  526  527
528             528  529  530  531  532  533  534  535
536             536  537  538  539  540  541  542  543
544             544  545  546  547  548  549  550  551
552             552  553  554  555  556  557  558  559
560             560  561  562  563  564  565  566  567
568             568  569  570  571  572  573  574  575
576             576  577  578  579  580  581  582  583
584             584  585  586  587  588  589  590  591
592             592  593  594  595  596  597  598  599
600             600  601  602  603  604  605  606  607
608             608  609  610  611  612  613  614  615
616             616  617  618  619  620  621  622  623
624             624  625  626  627  628  629  630  631
632             632  633  634  635  636  637  638  639
640             640  641  642  643  644  645  646  647
648             648  649  650  651  652  653  654  655
656             656  657  658  659  660  661  662  663
664             664  665  666  667  668  669  670  671
672             672  673  674  675  676  677  678  679
680             680  681  682  683  684  685  686  687
688             688  689  690  691  692  693  694  695
696             696  697  698  699  700  701  702  703
704             704  705  706  707  708  709  710  711
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Figure 8-44. DUT Definition File (6 of 12)

```
712             712  713  714  715  716  717  718  719
720             720  721  722  723  724  725  726  727
728             728  729  730  731  732  733  734  735
736             736  737  738  739  740  741  742  743
744             744  745  746  747  748  749  750  751
752             752  753  754  755  756  757  758  759
760             760  761  762  763  764  765  766  767
768             768  769  770  771  772  773  774  775
776             776  777  778  779  780  781  782  783
784             784  785  786  787  788  789  790  791
792             792  793  794  795  796  797  798  799
800             800  801  802  803  804  805  806  807
808             808  809  810  811  812  813  814  815
816             816  817  818  819  820  821  822  823
824             824  825  826  827  828  829  830  831
832             832  833  834  835  836  837  838  839
840             840  841  842  843  844  845  846  847
848             848  849  850  851  852  853  854  855
856             856  857  858  859  860  861  862  863
864             864  865  866  867  868  869  870  871
872             872  873  874  875  876  877  878  879
880             880  881  882  883  884  885  886  887
888             888  889  890  891  892  893  894  895
896             896  897  898  899  900  901  902  903
904             904  905  906  907  908  909  910  911
912             912  913  914  915  916  917  918  919
920             920  921  922  923  924  925  926  927
928             928  929  930  931  932  933  934  935
936             936  937  938  939  940  941  942  943
944             944  945  946  947  948  949  950  951
952             952  953  954  955  956  957  958  959
960             960  961  962  963  964  965  966  967
968             968  969  970  971  972  973  974  975
976             976  977  978  979  980  981  982  983
984             984  985  986  987  988  989  990  991
992             992  993  994  995  996  997  998  999
1000            1000 1001 1002 1003 1004 1005 1006 1007
1008            1008 1009 1010 1011 1012 1013 1014 1015
1016            1016 1017 1018 1019 1020 1021 1022 1023
1024            1024 1025 1026 1027 1028 1029 1030 1031
1032            1032 1033 1034 1035 1036 1037 1038 1039
1040            1040 1041 1042 1043 1044 1045 1046 1047
1048            1048 1049 1050 1051 1052 1053 1054 1055
1056            1056 1057 1058 1059 1060 1061 1062 1063
1064            1064 1065 1066 1067 1068 1069 1070 1071
1072            1072 1073 1074 1075 1076 1077 1078 1079
1080            1080 1081 1082 1083 1084 1085 1086 1087
1088            1088 1089 1090 1091 1092 1093 1094 1095
1096            1096 1097 1098 1099 1100 1101 1102 1103
1104            1104 1105 1106 1107 1108 1109 1110 1111
1112            1112 1113 1114 1115 1116 1117 1118 1119
1120            1120 1121 1122 1123 1124 1125 1126 1127
1128            1128 1129 1130 1131 1132 1133 1134 1135
1136            1136 1137 1138 1139 1140 1141 1142 1143
1144            1144 1145 1146 1147 1148 1149 1150 1151
1152            1152 1153 1154 1155 1156 1157 1158 1159
1160            1160 1161 1162 1163 1164 1165 1166 1167
1168            1168 1169 1170 1171 1172 1173 1174 1175
1176            1176 1177 1178 1179 1180 1181 1182 1183
1184            1184 1185 1186 1187 1188 1189 1190 1191
1192            1192 1193 1194 1195 1196 1197 1198 1199
1200            1200 1201 1202 1203 1204 1205 1206 1207
1208            1208 1209 1210 1211 1212 1213 1214 1215
1216            1216 1217 1218 1219 1220 1221 1222 1223
1224            1224 1225 1226 1227 1228 1229 1230 1231
1232            1232 1233 1234 1235 1236 1237 1238 1239
1240            1240 1241 1242 1243 1244 1245 1246 1247
1248            1248 1249 1250 1251 1252 1253 1254 1255
1256            1256 1257 1258 1259 1260 1261 1262 1263
1264            1264 1265 1266 1267 1268 1269 1270 1271
1272            1272 1273 1274 1275 1276 1277 1278 1279
```

Figure 8-45. DUT Definition File (7 of 12)

```
1280          1280 1281 1282 1283 1284 1285 1286 1287
1288          1288 1289 1290 1291 1292 1293 1294 1295
1296          1296 1297 1298 1299 1300 1301 1302 1303
1304          1304 1305 1306 1307 1308 1309 1310 1311
1312          1312 1313 1314 1315 1316 1317 1318 1319
1320          1320 1321 1322 1323 1324 1325 1326 1327
1328          1328 1329 1330 1331 1332 1333 1334 1335
1336          1336 1337 1338 1339 1340 1341 1342 1343
1344          1344 1345 1346 1347 1348 1349 1350 1351
1352          1352 1353 1354 1355 1356 1357 1358 1359
1360          1360 1361 1362 1363 1364 1365 1366 1367
1368          1368 1369 1370 1371 1372 1373 1374 1375
1376          1376 1377 1378 1379 1380 1381 1382 1383
1384          1384 1385 1386 1387 1388 1389 1390 1391
1392          1392 1393 1394 1395 1396 1397 1398 1399
1400          1400 1401 1402 1403 1404 1405 1406 1407
1408          1408 1409 1410 1411 1412 1413 1414 1415
1416          1416 1417 1418 1419 1420 1421 1422 1423
1424          1424 1425 1426 1427 1428 1429 1430 1431
1432          1432 1433 1434 1435 1436 1437 1438 1439
1440          1440 1441 1442 1443 1444 1445 1446 1447
1448          1448 1449 1450 1451 1452 1453 1454 1455
1456          1456 1457 1458 1459 1460 1461 1462 1463
1464          1464 1465 1466 1467 1468 1469 1470 1471
1472          1472 1473 1474 1475 1476 1477 1478 1479
1480          1480 1481 1482 1483 1484 1485 1486 1487
1488          1488 1489 1490 1491 1492 1493 1494 1495
1496          1496 1497 1498 1499 1500 1501 1502 1503
1504          1504 1505 1506 1507 1508 1509 1510 1511
1512          1512 1513 1514 1515 1516 1517 1518 1519
1520          1520 1521 1522 1523 1524 1525 1526 1527
1528          1528 1529 1530 1531 1532 1533 1534 1535
1536          1536 1537 1538 1539 1540 1541 1542 1543
1544          1544 1545 1546 1547 1548 1549 1550 1551
1552          1552 1553 1554 1555 1556 1557 1558 1559
1560          1560 1561 1562 1563 1564 1565 1566 1567
1568          1568 1569 1570 1571 1572 1573 1574 1575
1576          1576 1577 1578 1579 1580 1581 1582 1583
1584          1584 1585 1586 1587 1588 1589 1590 1591
1592          1592 1593 1594 1595 1596 1597 1598 1599
1600          1600 1601 1602 1603 1604 1605 1606 1607
1608          1608 1609 1610 1611 1612 1613 1614 1615
1616          1616 1617 1618 1619 1620 1621 1622 1623
1624          1624 1625 1626 1627 1628 1629 1630 1631
1632          1632 1633 1634 1635 1636 1637 1638 1639
1640          1640 1641 1642 1643 1644 1645 1646 1647
1648          1648 1649 1650 1651 1652 1653 1654 1655
1656          1656 1657 1658 1659 1660 1661 1662 1663
1664          1664 1665 1666 1667 1668 1669 1670 1671
1672          1672 1673 1674 1675 1676 1677 1678 1679
1680          1680 1681 1682 1683 1684 1685 1686 1687
1688          1688 1689 1690 1691 1692 1693 1694 1695
1696          1696 1697 1698 1699 1700 1701 1702 1703
1704          1704 1705 1706 1707 1708 1709 1710 1711
1712          1712 1713 1714 1715 1716 1717 1718 1719
1720          1720 1721 1722 1723 1724 1725 1726 1727
1728          1728 1729 1730 1731 1732 1733 1734 1735
1736          1736 1737 1738 1739 1740 1741 1742 1743
1744          1744 1745 1746 1747 1748 1749 1750 1751
1752          1752 1753 1754 1755 1756 1757 1758 1759
1760          1760 1761 1762 1763 1764 1765 1766 1767
1768          1768 1769 1770 1771 1772 1773 1774 1775
1776          1776 1777 1778 1779 1780 1781 1782 1783
1784          1784 1785 1786 1787 1788 1789 1790 1791
1792          1792 1793 1794 1795 1796 1797 1798 1799
1800          1800 1801 1802 1803 1804 1805 1806 1807
1808          1808 1809 1810 1811 1812 1813 1814 1815
1816          1816 1817 1818 1819 1820 1821 1822 1823
1824          1824 1825 1826 1827 1828 1829 1830 1831
1832          1832 1833 1834 1835 1836 1837 1838 1839
1840          1840 1841 1842 1843 1844 1845 1846 1847
```

Figure 8-46. DUT Definition File (8 of 12)

```
1848          1848 1849 1850 1851 1852 1853 1854 1855
1856          1856 1857 1858 1859 1860 1861 1862 1863
1864          1864 1865 1866 1867 1868 1869 1870 1871
1872          1872 1873 1874 1875 1876 1877 1878 1879
1880          1880 1881 1882 1883 1884 1885 1886 1887
1888          1888 1889 1890 1891 1892 1893 1894 1895
1896          1896 1897 1898 1899 1900 1901 1902 1903
1904          1904 1905 1906 1907 1908 1909 1910 1911
1912          1912 1913 1914 1915 1916 1917 1918 1919
1920          1920 1921 1922 1923 1924 1925 1926 1927
1928          1928 1929 1930 1931 1932 1933 1934 1935
1936          1936 1937 1938 1939 1940 1941 1942 1943
1944          1944 1945 1946 1947 1948 1949 1950 1951
1952          1952 1953 1954 1955 1956 1957 1958 1959
1960          1960 1961 1962 1963 1964 1965 1966 1967
1968          1968 1969 1970 1971 1972 1973 1974 1975
1976          1976 1977 1978 1979 1980 1981 1982 1983
1984          1984 1985 1986 1987 1988 1989 1990 1991
1992          1992 1993 1994 1995 1996 1997 1998 1999
2000          2000 2001 2002 2003 2004 2005 2006 2007
2008          2008 2009 2010 2011 2012 2013 2014 2015
2016          2016 2017 2018 2019 2020 2021 2022 2023
2024          2024 2025 2026 2027 2028 2029 2030 2031
2032          2032 2033 2034 2035 2036 2037 2038 2039
2040          2040 2041 2042 2043 2044 2045 2046 2047
2048          2048 2049 2050 2051 2052 2053 2054 2055
2056          2056 2057 2058 2059 2060 2061 2062 2063
2064          2064 2065 2066 2067 2068 2069 2070 2071
2072          2072 2073 2074 2075 2076 2077 2078 2079
2080          2080 2081 2082 2083 2084 2085 2086 2087
2088          2088 2089 2090 2091 2092 2093 2094 2095
2096          2096 2097 2098 2099 2100 2101 2102 2103
2104          2104 2105 2106 2107 2108 2109 2110 2111
2112          2112 2113 2114 2115 2116 2117 2118 2119
2120          2120 2121 2122 2123 2124 2125 2126 2127
2128          2128 2129 2130 2131 2132 2133 2134 2135
2136          2136 2137 2138 2139 2140 2141 2142 2143
2144          2144 2145 2146 2147 2148 2149 2150 2151
2152          2152 2153 2154 2155 2156 2157 2158 2159
2160          2160 2161 2162 2163 2164 2165 2166 2167
2168          2168 2169 2170 2171 2172 2173 2174 2175
2176          2176 2177 2178 2179 2180 2181 2182 2183
2184          2184 2185 2186 2187 2188 2189 2190 2191
2192          2192 2193 2194 2195 2196 2197 2198 2199
2200          2200 2201 2202 2203 2204 2205 2206 2207
2208          2208 2209 2210 2211 2212 2213 2214 2215
2216          2216 2217 2218 2219 2220 2221 2222 2223
2224          2224 2225 2226 2227 2228 2229 2230 2231
2232          2232 2233 2234 2235 2236 2237 2238 2239
2240          2240 2241 2242 2243 2244 2245 2246 2247
2248          2248 2249 2250 2251 2252 2253 2254 2255
2256          2256 2257 2258 2259 2260 2261 2262 2263
2264          2264 2265 2266 2267 2268 2269 2270 2271
2272          2272 2273 2274 2275 2276 2277 2278 2279
2280          2280 2281 2282 2283 2284 2285 2286 2287
2288          2288 2289 2290 2291 2292 2293 2294 2295
2296          2296 2297 2298 2299 2300 2301 2302 2303
2304          2304 2305 2306 2307 2308 2309 2310 2311
2312          2312 2313 2314 2315 2316 2317 2318 2319
2320          2320 2321 2322 2323 2324 2325 2326 2327
2328          2328 2329 2330 2331 2332 2333 2334 2335
2336          2336 2337 2338 2339 2340 2341 2342 2343
2344          2344 2345 2346 2347 2348 2349 2350 2351
2352          2352 2353 2354 2355 2356 2357 2358 2359
2360          2360 2361 2362 2363 2364 2365 2366 2367
2368          2368 2369 2370 2371 2372 2373 2374 2375
2376          2376 2377 2378 2379 2380 2381 2382 2383
2384          2384 2385 2386 2387 2388 2389 2390 2391
2392          2392 2393 2394 2395 2396 2397 2398 2399
2400          2400 2401 2402 2403 2404 2405 2406 2407
2408          2408 2409 2410 2411 2412 2413 2414 2415
```

Figure 8-47. DUT Definition File (9 of 12)

```
2416            2416 2417 2418 2419 2420 2421 2422 2423
2424            2424 2425 2426 2427 2428 2429 2430 2431
2432            2432 2433 2434 2435 2436 2437 2438 2439
2440            2440 2441 2442 2443 2444 2445 2446 2447
2448            2448 2449 2450 2451 2452 2453 2454 2455
2456            2456 2457 2458 2459 2460 2461 2462 2463
2464            2464 2465 2466 2467 2468 2469 2470 2471
2472            2472 2473 2474 2475 2476 2477 2478 2479
2480            2480 2481 2482 2483 2484 2485 2486 2487
2488            2488 2489 2490 2491 2492 2493 2494 2495
2496            2496 2497 2498 2499 2500 2501 2502 2503
2504            2504 2505 2506 2507 2508 2509 2510 2511
2512            2512 2513 2514 2515 2516 2517 2518 2519
2520            2520 2521 2522 2523 2524 2525 2526 2527
2528            2528 2529 2530 2531 2532 2533 2534 2535
2536            2536 2537 2538 2539 2540 2541 2542 2543
2544            2544 2545 2546 2547 2548 2549 2550 2551
2552            2552 2553 2554 2555 2556 2557 2558 2559
2560            2560 2561 2562 2563 2564 2565 2566 2567
2568            2568 2569 2570 2571 2572 2573 2574 2575
2576            2576 2577 2578 2579 2580 2581 2582 2583
2584            2584 2585 2586 2587 2588 2589 2590 2591
2592            2592 2593 2594 2595 2596 2597 2598 2599
2600            2600 2601 2602 2603 2604 2605 2606 2607
2608            2608 2609 2610 2611 2612 2613 2614 2615
2616            2616 2617 2618 2619 2620 2621 2622 2623
2624            2624 2625 2626 2627 2628 2629 2630 2631
2632            2632 2633 2634 2635 2636 2637 2638 2639
2640            2640 2641 2642 2643 2644 2645 2646 2647
2648            2648 2649 2650 2651 2652 2653 2654 2655
2656            2656 2657 2658 2659 2660 2661 2662 2663
2664            2664 2665 2666 2667 2668 2669 2670 2671
2672            2672 2673 2674 2675 2676 2677 2678 2679
2680            2680 2681 2682 2683 2684 2685 2686 2687
2688            2688 2689 2690 2691 2692 2693 2694 2695
2696            2696 2697 2698 2699 2700 2701 2702 2703
2704            2704 2705 2706 2707 2708 2709 2710 2711
2712            2712 2713 2714 2715 2716 2717 2718 2719
2720            2720 2721 2722 2723 2724 2725 2726 2727
2728            2728 2729 2730 2731 2732 2733 2734 2735
2736            2736 2737 2738 2739 2740 2741 2742 2743
2744            2744 2745 2746 2747 2748 2749 2750 2751
2752            2752 2753 2754 2755 2756 2757 2758 2759
2760            2760 2761 2762 2763 2764 2765 2766 2767
2768            2768 2769 2770 2771 2772 2773 2774 2775
2776            2776 2777 2778 2779 2780 2781 2782 2783
2784            2784 2785 2786 2787 2788 2789 2790 2791
2792            2792 2793 2794 2795 2796 2797 2798 2799
2800            2800 2801 2802 2803 2804 2805 2806 2807
2808            2808 2809 2810 2811 2812 2813 2814 2815
2816            2816 2817 2818 2819 2820 2821 2822 2823
2824            2824 2825 2826 2827 2828 2829 2830 2831
2832            2832 2833 2834 2835 2836 2837 2838 2839
2840            2840 2841 2842 2843 2844 2845 2846 2847
2848            2848 2849 2850 2851 2852 2853 2854 2855
2856            2856 2857 2858 2859 2860 2861 2862 2863
2864            2864 2865 2866 2867 2868 2869 2870 2871
2872            2872 2873 2874 2875 2876 2877 2878 2879
2880            2880 2881 2882 2883 2884 2885 2886 2887
2888            2888 2889 2890 2891 2892 2893 2894 2895
2896            2896 2897 2898 2899 2900 2901 2902 2903
2904            2904 2905 2906 2907 2908 2909 2910 2911
2912            2912 2913 2914 2915 2916 2917 2918 2919
2920            2920 2921 2922 2923 2924 2925 2926 2927
2928            2928 2929 2930 2931 2932 2933 2934 2935
2936            2936 2937 2938 2939 2940 2941 2942 2943
2944            2944 2945 2946 2947 2948 2949 2950 2951
2952            2952 2953 2954 2955 2956 2957 2958 2959
2960            2960 2961 2962 2963 2964 2965 2966 2967
2968            2968 2969 2970 2971 2972 2973 2974 2975
2976            2976 2977 2978 2979 2980 2981 2982 2983
```

Figure 8-48. DUT Definition File (10 of 12)

```
2984            2984 2985 2986 2987 2988 2989 2990 2991
2992            2992 2993 2994 2995 2996 2997 2998 2999
3000            3000 3001 3002 3003 3004 3005 3006 3007
3008            3008 3009 3010 3011 3012 3013 3014 3015
3016            3016 3017 3018 3019 3020 3021 3022 3023
3024            3024 3025 3026 3027 3028 3029 3030 3031
3032            3032 3033 3034 3035 3036 3037 3038 3039
3040            3040 3041 3042 3043 3044 3045 3046 3047
3048            3048 3049 3050 3051 3052 3053 3054 3055
3056            3056 3057 3058 3059 3060 3061 3062 3063
3064            3064 3065 3066 3067 3068 3069 3070 3071
3072            3072 3073 3074 3075 3076 3077 3078 3079
3080            3080 3081 3082 3083 3084 3085 3086 3087
3088            3088 3089 3090 3091 3092 3093 3094 3095
3096            3096 3097 3098 3099 3100 3101 3102 3103
3104            3104 3105 3106 3107 3108 3109 3110 3111
3112            3112 3113 3114 3115 3116 3117 3118 3119
3120            3120 3121 3122 3123 3124 3125 3126 3127
3128            3128 3129 3130 3131 3132 3133 3134 3135
3136            3136 3137 3138 3139 3140 3141 3142 3143
3144            3144 3145 3146 3147 3148 3149 3150 3151
3152            3152 3153 3154 3155 3156 3157 3158 3159
3160            3160 3161 3162 3163 3164 3165 3166 3167
3168            3168 3169 3170 3171 3172 3173 3174 3175
3176            3176 3177 3178 3179 3180 3181 3182 3183
3184            3184 3185 3186 3187 3188 3189 3190 3191
3192            3192 3193 3194 3195 3196 3197 3198 3199
3200            3200 3201 3202 3203 3204 3205 3206 3207
3208            3208 3209 3210 3211 3212 3213 3214 3215
3216            3216 3217 3218 3219 3220 3221 3222 3223
3224            3224 3225 3226 3227 3228 3229 3230 3231
3232            3232 3233 3234 3235 3236 3237 3238 3239
3240            3240 3241 3242 3243 3244 3245 3246 3247
3248            3248 3249 3250 3251 3252 3253 3254 3255
3256            3256 3257 3258 3259 3260 3261 3262 3263
3264            3264 3265 3266 3267 3268 3269 3270 3271
3272            3272 3273 3274 3275 3276 3277 3278 3279
3280            3280 3281 3282 3283 3284 3285 3286 3287
3288            3288 3289 3290 3291 3292 3293 3294 3295
3296            3296 3297 3298 3299 3300 3301 3302 3303
3304            3304 3305 3306 3307 3308 3309 3310 3311
3312            3312 3313 3314 3315 3316 3317 3318 3319
3320            3320 3321 3322 3323 3324 3325 3326 3327
3328            3328 3329 3330 3331 3332 3333 3334 3335
3336            3336 3337 3338 3339 3340 3341 3342 3343
3344            3344 3345 3346 3347 3348 3349 3350 3351
3352            3352 3353 3354 3355 3356 3357 3358 3359
3360            3360 3361 3362 3363 3364 3365 3366 3367
3368            3368 3369 3370 3371 3372 3373 3374 3375
3376            3376 3377 3378 3379 3380 3381 3382 3383
3384            3384 3385 3386 3387 3388 3389 3390 3391
3392            3392 3393 3394 3395 3396 3397 3398 3399
3400            3400 3401 3402 3403 3404 3405 3406 3407
3408            3408 3409 3410 3411 3412 3413 3414 3415
3416            3416 3417 3418 3419 3420 3421 3422 3423
3424            3424 3425 3426 3427 3428 3429 3430 3431
3432            3432 3433 3434 3435 3436 3437 3438 3439
3440            3440 3441 3442 3443 3444 3445 3446 3447
3448            3448 3449 3450 3451 3452 3453 3454 3455
3456            3456 3457 3458 3459 3460 3461 3462 3463
3464            3464 3465 3466 3467 3468 3469 3470 3471
3472            3472 3473 3474 3475 3476 3477 3478 3479
3480            3480 3481 3482 3483 3484 3485 3486 3487
3488            3488 3489 3490 3491 3492 3493 3494 3495
3496            3496 3497 3498 3499 3500 3501 3502 3503
3504            3504 3505 3506 3507 3508 3509 3510 3511
3512            3512 3513 3514 3515 3516 3517 3518 3519
3520            3520 3521 3522 3523 3524 3525 3526 3527
3528            3528 3529 3530 3531 3532 3533 3534 3535
3536            3536 3537 3538 3539 3540 3541 3542 3543
3544            3544 3545 3546 3547 3548 3549 3550 3551
```

Figure 8-49. DUT Definition File (11 of 12)

```
3552            3552 3553 3554 3555 3556 3557 3558 3559
3560            3560 3561 3562 3563 3564 3565 3566 3567
3568            3568 3569 3570 3571 3572 3573 3574 3575
3576            3576 3577 3578 3579 3580 3581 3582 3583
3584            3584 3585 3586 3587 3588 3589 3590 3591
3592            3592 3593 3594 3595 3596 3597 3598 3599
3600            3600 3601 3602 3603 3604 3605 3606 3607
3608            3608 3609 3610 3611 3612 3613 3614 3615
3616            3616 3617 3618 3619 3620 3621 3622 3623
3624            3624 3625 3626 3627 3628 3629 3630 3631
3632            3632 3633 3634 3635 3636 3637 3638 3639
3640            3640 3641 3642 3643 3644 3645 3646 3647
3648            3648 3649 3650 3651 3652 3653 3654 3655
3656            3656 3657 3658 3659 3660 3661 3662 3663
3664            3664 3665 3666 3667 3668 3669 3670 3671
3672            3672 3673 3674 3675 3676 3677 3678 3679
3680            3680 3681 3682 3683 3684 3685 3686 3687
3688            3688 3689 3690 3691 3692 3693 3694 3695
3696            3696 3697 3698 3699 3700 3701 3702 3703
3704            3704 3705 3706 3707 3708 3709 3710 3711
3712            3712 3713 3714 3715 3716 3717 3718 3719
3720            3720 3721 3722 3723 3724 3725 3726 3727
3728            3728 3729 3730 3731 3732 3733 3734 3735
3736            3736 3737 3738 3739 3740 3741 3742 3743
3744            3744 3745 3746 3747 3748 3749 3750 3751
3752            3752 3753 3754 3755 3756 3757 3758 3759
3760            3760 3761 3762 3763 3764 3765 3766 3767
3768            3768 3769 3770 3771 3772 3773 3774 3775
3776            3776 3777 3778 3779 3780 3781 3782 3783
3784            3784 3785 3786 3787 3788 3789 3790 3791
3792            3792 3793 3794 3795 3796 3797 3798 3799
3800            3800 3801 3802 3803 3804 3805 3806 3807
3808            3808 3809 3810 3811 3812 3813 3814 3815
3816            3816 3817 3818 3819 3820 3821 3822 3823
3824            3824 3825 3826 3827 3828 3829 3830 3831
3832            3832 3833 3834 3835 3836 3837 3838 3839
3840            3840 3841 3842 3843 3844 3845 3846 3847
3848            3848 3849 3850 3851 3852 3853 3854 3855
3856            3856 3857 3858 3859 3860 3861 3862 3863
3864            3864 3865 3866 3867 3868 3869 3870 3871
3872            3872 3873 3874 3875 3876 3877 3878 3879
3880            3880 3881 3882 3883 3884 3885 3886 3887
3888            3888 3889 3890 3891 3892 3893 3894 3895
3896            3896 3897 3898 3899 3900 3901 3902 3903
3904            3904 3905 3906 3907 3908 3909 3910 3911
3912            3912 3913 3914 3915 3916 3917 3918 3919
3920            3920 3921 3922 3923 3924 3925 3926 3927
3928            3928 3929 3930 3931 3932 3933 3934 3935
3936            3936 3937 3938 3939 3940 3941 3942 3943
3944            3944 3945 3946 3947 3948 3949 3950 3951
3952            3952 3953 3954 3955 3956 3957 3958 3959
3960            3960 3961 3962 3963 3964 3965 3966 3967
3968            3968 3969 3970 3971 3972 3973 3974 3975
3976            3976 3977 3978 3979 3980 3981 3982 3983
3984            3984 3985 3986 3987 3988 3989 3990 3991
3992            3992 3993 3994 3995 3996 3997 3998 3999
4000            4000 4001 4002 4003 4004 4005 4006 4007
4008            4008 4009 4010 4011 4012 4013 4014 4015
4016            4016 4017 4018 4019 4020 4021 4022 4023
4024            4024 4025 4026 4027 4028 4029 4030 4031
4032            4032 4033 4034 4035 4036 4037 4038 4039
4040            4040 4041 4042 4043 4044 4045 4046 4047
4048            4048 4049 4050 4051 4052 4053 4054 4055
4056            4056 4057 4058 4059 4060 4061 4062 4063
4064            4064 4065 4066 4067 4068 4069 4070 4071
4072            4072 4073 4074 4075 4076 4077 4078 4079
4080            4080 4081 4082 4083 4084 4085 4086 4087
4088            4088 4089 4090 4091 4092 4093 4094 4095

     END REGION

END SCRAMBLING
```

Figure 8-50. DUT Definition File (12 of 12)

Header Section

The file begins with header information (Figure 8-51). This includes the creation date, user's name, company name, device name, protocol, technology, number of columns, number of rows, number of I/Os, and number of package pins.

```
BEGIN DUT
          DATE=05/04/03
          USER=CSTD
          COMPANY=Agilent Technologies
          DEVICE=16IO
          PROTOCOL=parallel
          TECHNOLOGY=FLASH
          COLUMNS=4096       // Number of physical bit columns.
          ROWS=4096          // Number of physical rows.
          i/oS=16            // Number of i/os.
          PINS=48            // Number of pins device has that is specified in “PINOUT” section.
END DUT

BEGIN MISC
          anything=5 // Field is required but not currently used.

END MISC
```

Figure 8-51. Header Section

The DATE, USER, COMPANY, DEVICE, PROTOCOL, and TECHNOLOGY fields can be completed with entries of your choice.

The number of COLUMNS is determined by the number of physical columns in the device. It is the same as the maximum number of physical columns (+1) in the DestinationY column scrambling section (4095 + 1).

The number of ROWS is the number of physical rows in the device. It is the same as the maximum number of physical rows (+1) in the DestinationX row scrambling section (4095 + 1).

The number of PINS you specify must match the maximum number defined in the Pinout section. Typically this is the total number of pins.

Pinout Section

After the header and miscellaneous sections is the DUT definition itself. This includes the pinout and scrambling tables. Every pin on the device must be named, even if it is a not connect (NC).

Use the following rules when assigning names to the pins on the device (see Figure 8-52):

- The names of the data and address pins are predetermined to be IOn, and Xn and Yn, respectively.

- The clocks can be assigned any name which is not of the data or address name format.
- Data pins that are used for control instead of data may be given a non-data name.
- If a device has 16 I/Os then it should have 16 system I/Os connected to 16 pins on the device with the labels IO0, IO1, IO2, IO3, ... IO15.
- The same logic applies to the addresses. In other words, only pins called IOn are assumed to be true data pins, and only pins called Xn or Yn are assumed to be address pins.

```
BEGIN     PINOUT
          P1=x7,a15
          P2=x6,a14
          P3=x5,a13
          P4=x4,a12
          P5=x3,a11
          P6=x2,a10
          P7=x1,a9
          P8=x0,a8
          P9=x11,a19
          P10=unused
          P11=WE
          P12=unused
          P13=unused
          P14=unused
          P15=unused
          P16=x10,a18
          P17=x9,a17
          P18=y7,a7
          P19=y6,a6
          P20=y5,a5
          P21=y4,a4
          P22=y3,a3
          P23=y2,a2
          P24=y1,a1
          P25=y0,a0
          P26=CE
          P27=VSS
          P28=OE
          P29=IO0
          P30=IO8
          P31=IO1
          P32=IO9
          P33=IO2
          P34=IO10
          P35=IO3
          P36=IO11
          P37=VDD
          P38=IO4
          P39=IO12
          P40=IO5
          P41=IO13
          P42=IO6
          P43=IO14
          P44=IO7
          P45=IO15
          P46=VSS
          P47=unused
          P48=x8,a16

END PINOUT
```

Figure 8-52. Pinout Section

Scrambling Section

The scrambling section can be thought of as converting from logical (source) to physical format (destination) as illustrated for this example in Figure 8-53. Address bits A_0–A_7 are fed to a Y column decoder that controls column select lines Y_0–Y_7. Address bits A_8–A_{19} are fed to an X row decoder that controls row select lines X_0–X_{11}. The physical configuration of the device deter-mines the X row and Y column scrambling.

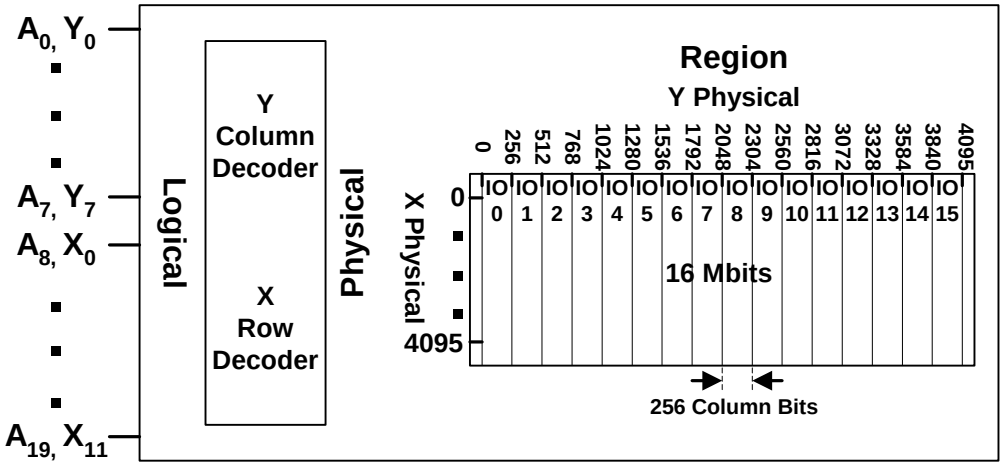

Figure 8-53. Logical to Physical Format

The scrambling section in the DUT definition file is defined in terms of rectangular regions, each of which has its own two sub-tables: DestinationY, DestinationX. One table is for the columns (DestinationY), and the other is for the rows (DestinationX). Devices that have more than one mapping of logical to physical addresses require scrambling tables with multiple regions so the Bitmap Tool can correctly display their bitmaps. This example has one region. See the "DUT Definition File" section on page 424 for additional examples with one and two regions and an example that demonstrates how regions can be copied to create multiple regions that make the DUT definition less tedious and error-prone.

Scrambling Table Definition

Each region needs a min X, max X, min Y, and max Y value as shown in Figure 8-54. This information should be the same as that found in the scrambling table itself.

```
BEGIN     SCRAMBLING Logical
          BEGIN REGION
               MINX=0          // Min physical X
               MAXX=4095       // Max physical X
               MINY=0          // Min physical Y
               MAXY=4095       // Max physical Y
```

Figure 8-54. Region Max and Min Values

Table 8-1 summarizes the physical scrambling information for this example.

Table 8-1. Physical Scrambling Summary

Array Dimension		Value	Notes
Physical X	Min	0	
	Max	4095	Equals: the number of row addresses – 1 = $2^{12} – 1 = 4095$
Physical Y	Min	0	
	Max	4095	Equals: the number of column addresses $\times$ the number of I/Os per address = $2^8 \times 16 – 1 = 4095$

As a cross-check, multiply the number of physical columns by the number of physical rows ($4096 \times 4096 = 16777216$) which should equal the total number of bits in the array (that is, 16 Mbit).

Column Scrambling Table

Across the top of the DestinationY column scrambling table (Figure 8-55) are the headers for the I/O pins (io0–io15). Down the first column on the left are the logical columns (0–255). On the right for each logical address and I/O pair is the corresponding physical column address. For example:

- Logical address 0 and io0 map to physical column 0.
- Logical address 0 and io4 map to physical column 1024.
- Logical address 7 and io0 map to physical column 7.
- Logical address 6 and io7 map to physical column 1798.

DestinationY	io0	io1	io2	io3	io4	io5	io6	io7	io8	io9	io10	io11	io12	io13	io14	io15
0	0	256	512	768	1024	1280	1536	1792	2048	2304	2560	2816	3072	3328	3584	3840
1	1	257	513	769	1025	1281	1537	1793	2049	2305	2561	2817	3073	3329	3585	3841
2	2	258	514	770	1026	1282	1538	1794	2050	2306	2562	2818	3074	3330	3586	3842
3	3	259	515	771	1027	1283	1539	1795	2051	2307	2563	2819	3075	3331	3587	3843
4	4	260	516	772	1028	1284	1540	1796	2052	2308	2564	2820	3076	3332	3588	3844
5	5	261	517	773	1029	1285	1541	1797	2053	2309	2565	2821	3077	3333	3589	3845
6	6	262	518	774	1030	1286	1542	1798	2054	2310	2566	2822	3078	3334	3590	3846
7	7	263	519	775	1031	1287	1543	1799	2055	2311	2567	2823	3079	3335	3591	3847
8	8	264	520	776	1032	1288	1544	1800	2056	2312	2568	2824	3080	3336	3592	3848
9	9	265	521	777	1033	1289	1545	1801	2057	2313	2569	2825	3081	3337	3593	3849
10	10	266	522	778	1034	1290	1546	1802	2058	2314	2570	2826	3082	3338	3594	3850
11	11	267	523	779	1035	1291	1547	1803	2059	2315	2571	2827	3083	3339	3595	3851
12	12	268	524	780	1036	1292	1548	1804	2060	2316	2572	2828	3084	3340	3596	3852
13	13	269	525	781	1037	1293	1549	1805	2061	2317	2573	2829	3085	3341	3597	3853
14	14	270	526	782	1038	1294	1550	1806	2062	2318	2574	2830	3086	3342	3598	3854
15	15	271	527	783	1039	1295	1551	1807	2063	2319	2575	2831	3087	3343	3599	3855
16	16	272	528	784	1040	1296	1552	1808	2064	2320	2576	2832	3088	3344	3600	3856
17	17	273	529	785	1041	1297	1553	1809	2065	2321	2577	2833	3089	3345	3601	3857
18	18	274	530	786	1042	1298	1554	1810	2066	2322	2578	2834	3090	3346	3602	3858
19	19	275	531	787	1043	1299	1555	1811	2067	2323	2579	2835	3091	3347	3603	3859
20	20	276	532	788	1044	1300	1556	1812	2068	2324	2580	2836	3092	3348	3604	3860
21	21	277	533	789	1045	1301	1557	1813	2069	2325	2581	2837	3093	3349	3605	3861
22	22	278	534	790	1046	1302	1558	1814	2070	2326	2582	2838	3094	3350	3606	3862
23	23	279	535	791	1047	1303	1559	1815	2071	2327	2583	2839	3095	3351	3607	3863
24	24	280	536	792	1048	1304	1560	1816	2072	2328	2584	2840	3096	3352	3608	3864
25	25	281	537	793	1049	1305	1561	1817	2073	2329	2585	2841	3097	3353	3609	3865
26	26	282	538	794	1050	1306	1562	1818	2074	2330	2586	2842	3098	3354	3610	3866
27	27	283	539	795	1051	1307	1563	1819	2075	2331	2587	2843	3099	3355	3611	3867
28	28	284	540	796	1052	1308	1564	1820	2076	2332	2588	2844	3100	3356	3612	3868
29	29	285	541	797	1053	1309	1565	1821	2077	2333	2589	2845	3101	3357	3613	3869
30	30	286	542	798	1054	1310	1566	1822	2078	2334	2590	2846	3102	3358	3614	3870
31	31	287	543	799	1055	1311	1567	1823	2079	2335	2591	2847	3103	3359	3615	3871
32	32	288	544	800	1056	1312	1568	1824	2080	2336	2592	2848	3104	3360	3616	3872
.																
.																
.																
223	223	479	735	991	1247	1503	1759	2015	2271	2527	2783	3039	3295	3551	3807	4063
224	224	480	736	992	1248	1504	1760	2016	2272	2528	2784	3040	3296	3552	3808	4064
225	225	481	737	993	1249	1505	1761	2017	2273	2529	2785	3041	3297	3553	3809	4065
226	226	482	738	994	1250	1506	1762	2018	2274	2530	2786	3042	3298	3554	3810	4066
227	227	483	739	995	1251	1507	1763	2019	2275	2531	2787	3043	3299	3555	3811	4067
228	228	484	740	996	1252	1508	1764	2020	2276	2532	2788	3044	3300	3556	3812	4068
229	229	485	741	997	1253	1509	1765	2021	2277	2533	2789	3045	3301	3557	3813	4069
230	230	486	742	998	1254	1510	1766	2022	2278	2534	2790	3046	3302	3558	3814	4070
231	231	487	743	999	1255	1511	1767	2023	2279	2535	2791	3047	3303	3559	3815	4071
232	232	488	744	1000	1256	1512	1768	2024	2280	2536	2792	3048	3304	3560	3816	4072
233	233	489	745	1001	1257	1513	1769	2025	2281	2537	2793	3049	3305	3561	3817	4073
234	234	490	746	1002	1258	1514	1770	2026	2282	2538	2794	3050	3306	3562	3818	4074
235	235	491	747	1003	1259	1515	1771	2027	2283	2539	2795	3051	3307	3563	3819	4075
236	236	492	748	1004	1260	1516	1772	2028	2284	2540	2796	3052	3308	3564	3820	4076
237	237	493	749	1005	1261	1517	1773	2029	2285	2541	2797	3053	3309	3565	3821	4077
238	238	494	750	1006	1262	1518	1774	2030	2286	2542	2798	3054	3310	3566	3822	4078
239	239	495	751	1007	1263	1519	1775	2031	2287	2543	2799	3055	3311	3567	3823	4079
240	240	496	752	1008	1264	1520	1776	2032	2288	2544	2800	3056	3312	3568	3824	4080
241	241	497	753	1009	1265	1521	1777	2033	2289	2545	2801	3057	3313	3569	3825	4081
242	242	498	754	1010	1266	1522	1778	2034	2290	2546	2802	3058	3314	3570	3826	4082
243	243	499	755	1011	1267	1523	1779	2035	2291	2547	2803	3059	3315	3571	3827	4083
244	244	500	756	1012	1268	1524	1780	2036	2292	2548	2804	3060	3316	3572	3828	4084
245	245	501	757	1013	1269	1525	1781	2037	2293	2549	2805	3061	3317	3573	3829	4085
246	246	502	758	1014	1270	1526	1782	2038	2294	2550	2806	3062	3318	3574	3830	4086
247	247	503	759	1015	1271	1527	1783	2039	2295	2551	2807	3063	3319	3575	3831	4087
248	248	504	760	1016	1272	1528	1784	2040	2296	2552	2808	3064	3320	3576	3832	4088
249	249	505	761	1017	1273	1529	1785	2041	2297	2553	2809	3065	3321	3577	3833	4089
250	250	506	762	1018	1274	1530	1786	2042	2298	2554	2810	3066	3322	3578	3834	4090
251	251	507	763	1019	1275	1531	1787	2043	2299	2555	2811	3067	3323	3579	3835	4091
252	252	508	764	1020	1276	1532	1788	2044	2300	2556	2812	3068	3324	3580	3836	4092
253	253	509	765	1021	1277	1533	1789	2045	2301	2557	2813	3069	3325	3581	3837	4093
254	254	510	766	1022	1278	1534	1790	2046	2302	2558	2814	3070	3326	3582	3838	4094
255	255	511	767	1023	1279	1535	1791	2047	2303	2559	2815	3071	3327	3583	3839	4095

Figure 8-55. Column Scrambling Table

The scrambling tables are generally computed in a spreadsheet application. Based on the fact that the columns have a certain periodicity associated with them, you need only define the one or two columns that form the base of the algorithm and the algorithm itself. Once the starting point is determined, you can see that each cell is offset by an amount from the cell above it or next to it. You can use the computational power of a spreadsheet application to fill in the table. After the table is generated using the spreadsheet application, it can be exported as a text file (.txt) and pasted into the DUT definition file.

Row Scrambling Table

The table shown in Figure 8-56 contains a partial listing of the DestinationX row scrambling. Down the first column on the left are the logical row addresses. The numbers across the first row at the top are offsets from the logical row addresses. This table is described in a by 8 fashion, that is, the logical row addresses increment by 8. The logical address for a given cell is equal to the value in the first column plus the value of the offset in the first row. The corresponding physical address appears in the cell. For example:

- Logical row 0 + 2 = 2 maps to physical row 2.
- Logical row 0 + 7 = 7 maps to physical row 7.
- Logical row 176 + 2 = 178 maps to physical row 178.

NOTE Currently the Bitmap Tool DUT definition file requires a carriage return before the “DestinationX” row scrambling header. After loading a DUT definition file without the carriage return, results in an application error and the program terminates without warning.

```
DestinationX   0    1    2    3    4    5    6    7
0              0    1    2    3    4    5    6    7
8              8    9    10   11   12   13   14   15
16             16   17   18   19   20   21   22   23
24             24   25   26   27   28   29   30   31
32             32   33   34   35   36   37   38   39
40             40   41   42   43   44   45   46   47
48             48   49   50   51   52   53   54   55
56             56   57   58   59   60   61   62   63
64             64   65   66   67   68   69   70   71
72             72   73   74   75   76   77   78   79
80             80   81   82   83   84   85   86   87
88             88   89   90   91   92   93   94   95
96             96   97   98   99   100  101  102  103
104            104  105  106  107  108  109  110  111
112            112  113  114  115  116  117  118  119
120            120  121  122  123  124  125  126  127
128            128  129  130  131  132  133  134  135
136            136  137  138  139  140  141  142  143
144            144  145  146  147  148  149  150  151
152            152  153  154  155  156  157  158  159
160            160  161  162  163  164  165  166  167
168            168  169  170  171  172  173  174  175
176            176  177  178  179  180  181  182  183
184            184  185  186  187  188  189  190  191
192            192  193  194  195  196  197  198  199
200            200  201  202  203  204  205  206  207
208            208  209  210  211  212  213  214  215
216            216  217  218  219  220  221  222  223
224            224  225  226  227  228  229  230  231
232            232  233  234  235  236  237  238  239
240            240  241  242  243  244  245  246  247
248            248  249  250  251  252  253  254  255
        .
        .
        .
3848           3848 3849 3850 3851 3852 3853 3854 3855
3856           3856 3857 3858 3859 3860 3861 3862 3863
3864           3864 3865 3866 3867 3868 3869 3870 3871
3872           3872 3873 3874 3875 3876 3877 3878 3879
3880           3880 3881 3882 3883 3884 3885 3886 3887
3888           3888 3889 3890 3891 3892 3893 3894 3895
3896           3896 3897 3898 3899 3900 3901 3902 3903
3904           3904 3905 3906 3907 3908 3909 3910 3911
3912           3912 3913 3914 3915 3916 3917 3918 3919
3920           3920 3921 3922 3923 3924 3925 3926 3927
3928           3928 3929 3930 3931 3932 3933 3934 3935
3936           3936 3937 3938 3939 3940 3941 3942 3943
3944           3944 3945 3946 3947 3948 3949 3950 3951
3952           3952 3953 3954 3955 3956 3957 3958 3959
3960           3960 3961 3962 3963 3964 3965 3966 3967
3968           3968 3969 3970 3971 3972 3973 3974 3975
3976           3976 3977 3978 3979 3980 3981 3982 3983
3984           3984 3985 3986 3987 3988 3989 3990 3991
3992           3992 3993 3994 3995 3996 3997 3998 3999
4000           4000 4001 4002 4003 4004 4005 4006 4007
4008           4008 4009 4010 4011 4012 4013 4014 4015
4016           4016 4017 4018 4019 4020 4021 4022 4023
4024           4024 4025 4026 4027 4028 4029 4030 4031
4032           4032 4033 4034 4035 4036 4037 4038 4039
4040           4040 4041 4042 4043 4044 4045 4046 4047
4048           4048 4049 4050 4051 4052 4053 4054 4055
4056           4056 4057 4058 4059 4060 4061 4062 4063
4064           4064 4065 4066 4067 4068 4069 4070 4071
4072           4072 4073 4074 4075 4076 4077 4078 4079
4080           4080 4081 4082 4083 4084 4085 4086 4087
4088           4088 4089 4090 4091 4092 4093 4094 4095

     END REGION

END SCRAMBLING
```

Figure 8-56. Row Scrambling Table

The DestinationX row scrambling table could have been designed in a number of different ways. It could have been described in by 1 fashion, by 2, by 3, and so forth. Anything less than 8 columns would have made the table longer with more rows, and anything more than 8 columns would have made it wider with more columns and less rows.

Figure 8-57 shows a partial listing of the physical row scrambling table if it were by 16. The same mapping still applies:

- Logical row 0 + 2 = 2 maps to physical row 2.
- Logical row 0 + 7 = 7 maps to physical row 7.
- Logical row 176 + 2 = 178 maps to physical row 178.

DestinationX	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
32	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
48	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
64	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
80	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
96	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
112	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
128	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
144	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
160	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
.																
.																
.																

Figure 8-57. Row Scrambling Table with By 16 Format

Bitmap Tool's View Pane Display with This DUT Definition File

After loading this DUT definition file and compatible bitmap files, the Bitmap Tool's View pane would display the defined region as shown in Figure 8-58 on page 405.

Each I/O has 256 logical and physical address columns. The logical column addresses are the same for each I/O (0–255). The physical column addresses are unique for each I/O.

Therefore, each I/O has the same logical column and row addressing but unique physical addressing. This means that, for a 16-bit data word being accessed by the external address lines, a bit would come from the same logical address for each I/O but a unique physical address. This is illustrated with the logical and physical coordinates of the different bits identified in Figure 8-58.

Notice how the Bitmap Tool configures physical column 0 and physical row 0 in the top left corner of the display. With physical column 0 in IO0, IO0 is the first I/O on the left side of the display. This also means that the DUT word least significant bit (LSB) will be on the left side of the display, and the DUT word most significant bit (MSB) will be on the right side of the display. This could lead to some confusion where $AAAA_{16}$ (1010 1010 1010 1010_2) could be mistaken for 5555_{16} (0101 0101 0101 0101_2) on the View pane display.

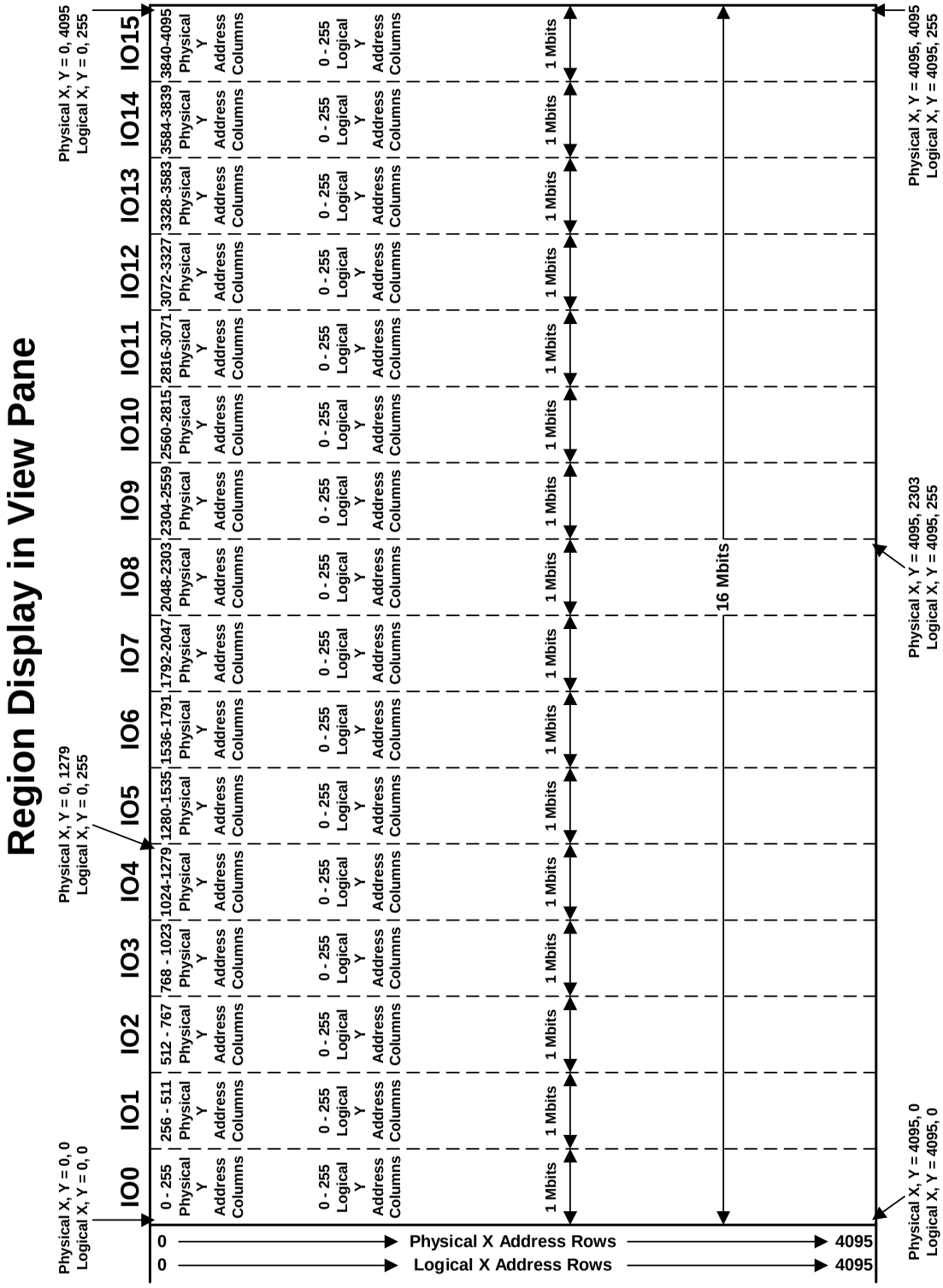

Figure 8-58. Defined Region Display in View Pane

Physical Columns Effect on Bitmap Tool's View Display

If physical column 0 had been associated with IO15, then IO15 and the DUT word MSB would be on the left side of the View pane display, and IO0 and the DUT word LSB would be on the right side of the display. Figure 8-59 is an example of this device scramble. Figure 8-60 would produce the same results as Figure 8-59, but its I/Os are listed across the top of the table from io15 to io0 rather than io0 to io15. Figure 8-61 shows another way of creating the actual column scrambling table shown in Figure 8-55 on page 400, but it has io15 to io0 across the top rather than io0 to io15.

DestinationY	io0	io1	io2	io3	io4	io5	io6	io7	io8	io9	io10	io11	io12	io13	io14	io15
0	3840	3584	3328	3072	2816	2560	2304	2048	1792	1536	1280	1024	768	512	256	0
1	3841	3585	3329	3073	2817	2561	2305	2049	1793	1537	1281	1025	769	513	257	1
2	3842	3586	3330	3074	2818	2562	2306	2050	1794	1538	1282	1026	770	514	258	2
3	3843	3587	3331	3075	2819	2563	2307	2051	1795	1539	1283	1027	771	515	259	3
4	3844	3588	3332	3076	2820	2564	2308	2052	1796	1540	1284	1028	772	516	260	4
5	3845	3589	3333	3077	2821	2565	2309	2053	1797	1541	1285	1029	773	517	261	5
6	3846	3590	3334	3078	2822	2566	2310	2054	1798	1542	1286	1030	774	518	262	6
7	3847	3591	3335	3079	2823	2567	2311	2055	1799	1543	1287	1031	775	519	263	7
8	3848	3592	3336	3080	2824	2568	2312	2056	1800	1544	1288	1032	776	520	264	8
9	3849	3593	3337	3081	2825	2569	2313	2057	1801	1545	1289	1033	777	521	265	9
10	3850	3594	3338	3082	2826	2570	2314	2058	1802	1546	1290	1034	778	522	266	10
11	3851	3595	3339	3083	2827	2571	2315	2059	1803	1547	1291	1035	779	523	267	11
12	3852	3596	3340	3084	2828	2572	2316	2060	1804	1548	1292	1036	780	524	268	12
.																
.																
.																

Figure 8-59. Column Scrambling Table that Configures IO15 on View Pane Left Side

DestinationY	io15	io14	io13	io12	io11	io10	io9	io8	io7	io6	io5	io4	io3	io2	io1	io0
0	0	256	512	768	1024	1280	1536	1792	2048	2304	2560	2816	3072	3328	3584	3840
1	1	257	513	769	1025	1281	1537	1793	2049	2305	2561	2817	3073	3329	3585	3841
2	2	258	514	770	1026	1282	1538	1794	2050	2306	2562	2818	3074	3330	3586	3842
3	3	259	515	771	1027	1283	1539	1795	2051	2307	2563	2819	3075	3331	3587	3843
4	4	260	516	772	1028	1284	1540	1796	2052	2308	2564	2820	3076	3332	3588	3844
5	5	261	517	773	1029	1285	1541	1797	2053	2309	2565	2821	3077	3333	3589	3845
6	6	262	518	774	1030	1286	1542	1798	2054	2310	2566	2822	3078	3334	3590	3846
7	7	263	519	775	1031	1287	1543	1799	2055	2311	2567	2823	3079	3335	3591	3847
8	8	264	520	776	1032	1288	1544	1800	2056	2312	2568	2824	3080	3336	3592	3848
9	9	265	521	777	1033	1289	1545	1801	2057	2313	2569	2825	3081	3337	3593	3849
10	10	266	522	778	1034	1290	1546	1802	2058	2314	2570	2826	3082	3338	3594	3850
11	11	267	523	779	1035	1291	1547	1803	2059	2315	2571	2827	3083	3339	3595	3851
12	12	268	524	780	1036	1292	1548	1804	2060	2316	2572	2828	3084	3340	3596	3852
.																
.																
.																

Figure 8-60. Another Column Scrambling Table that Configures IO15 on View Pane Left Side

DestinationY	io15	io14	io13	io12	io11	io10	io9	io8	io7	io6	io5	io4	io3	io2	io1	io0
0	3840	3584	3328	3072	2816	2560	2304	2048	1792	1536	1280	1024	768	512	256	0
1	3841	3585	3329	3073	2817	2561	2305	2049	1793	1537	1281	1025	769	513	257	1
2	3842	3586	3330	3074	2818	2562	2306	2050	1794	1538	1282	1026	770	514	258	2
3	3843	3587	3331	3075	2819	2563	2307	2051	1795	1539	1283	1027	771	515	259	3
4	3844	3588	3332	3076	2820	2564	2308	2052	1796	1540	1284	1028	772	516	260	4
5	3845	3589	3333	3077	2821	2565	2309	2053	1797	1541	1285	1029	773	517	261	5
6	3846	3590	3334	3078	2822	2566	2310	2054	1798	1542	1286	1030	774	518	262	6
7	3847	3591	3335	3079	2823	2567	2311	2055	1799	1543	1287	1031	775	519	263	7
8	3848	3592	3336	3080	2824	2568	2312	2056	1800	1544	1288	1032	776	520	264	8
9	3849	3593	3337	3081	2825	2569	2313	2057	1801	1545	1289	1033	777	521	265	9
10	3850	3594	3338	3082	2826	2570	2314	2058	1802	1546	1290	1034	778	522	266	10
11	3851	3595	3339	3083	2827	2571	2315	2059	1803	1547	1291	1035	779	523	267	11
12	3852	3596	3340	3084	2828	2572	2316	2060	1804	1548	1292	1036	780	524	268	12
.																
.																
.																

Figure 8-61. Another Way of Creating the Actual Column Scrambling Table

Loading a DUT Definition File and Displaying the Bitmap Tool Main Window

1 From the V4400 Series Tester Software IDE main window, selecting the `File > Open > Bitmap Tool DUT Document` command or toolbar button displays its Open dialog box (similar to Figure 8-62).

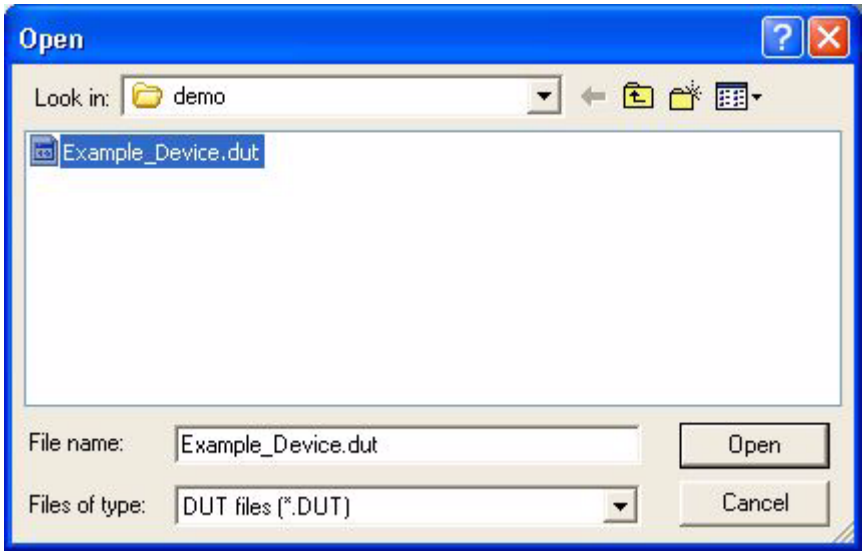

Figure 8-62. Load DUT Definition File Open Dialog Box

2 Selecting a .dut file and then the Open button displays the IDE main window with the DUT file loaded (Figure 8-63).

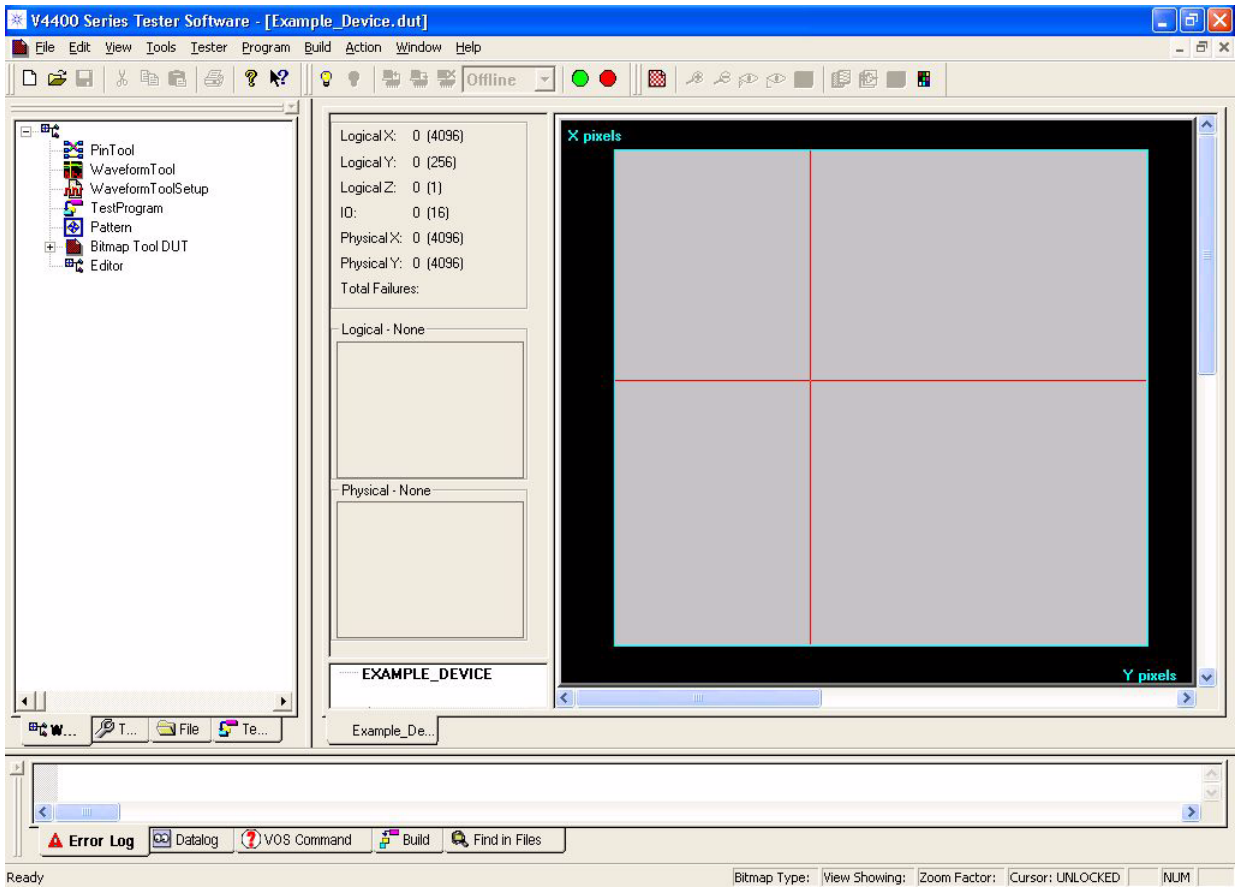

Figure 8-63. Bitmap Tool Main Window with DUT File Loaded

3 Selecting the `View > Navigator Pane` command and then the `View > Output Pane` command hides those panes and displays the Bitmap Tool main window full-screen (Figure 8-64).

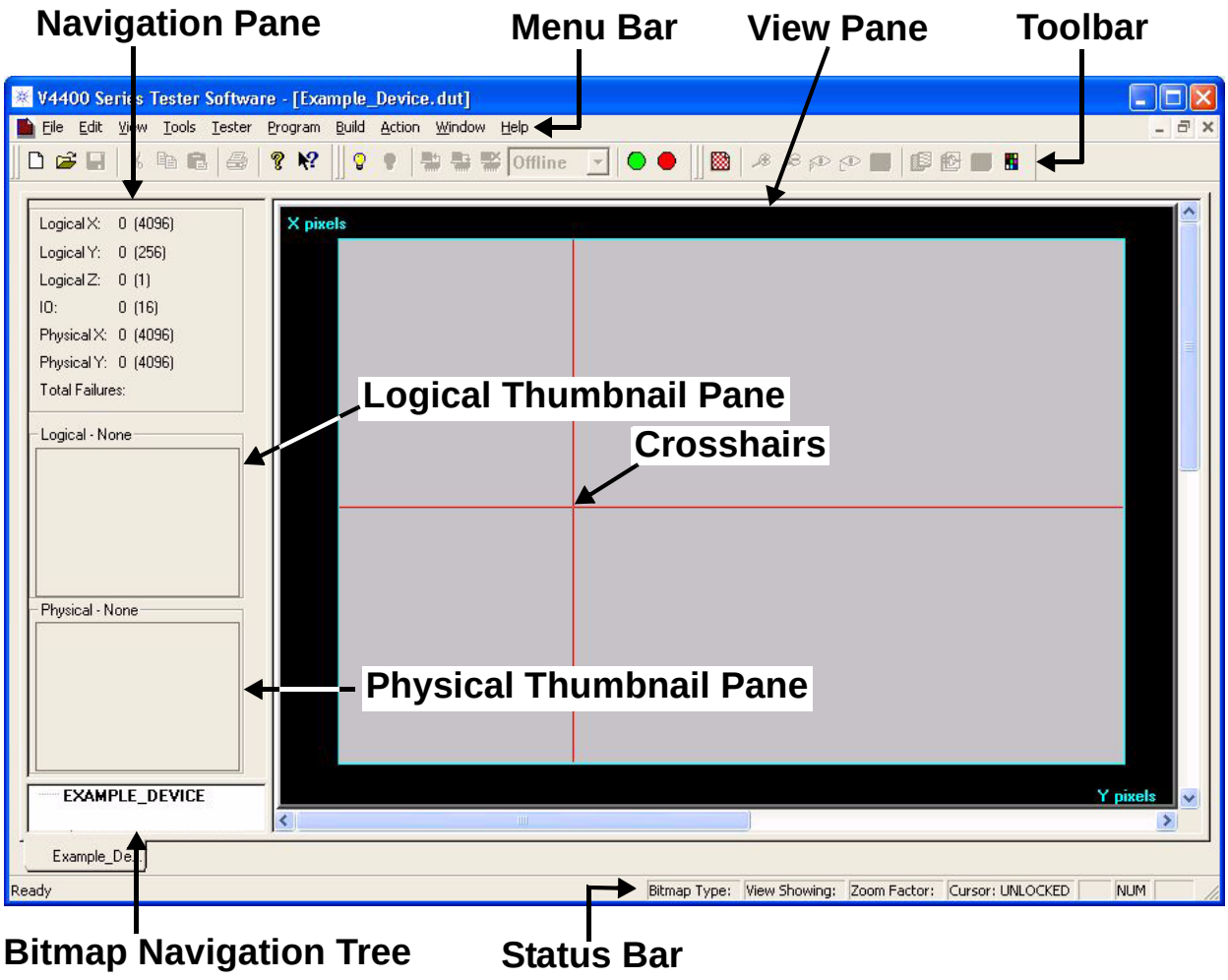

Figure 8-64. Bitmap Tool Main Window Displaying Full-Screen

Loading and Viewing Bitmap Files

1 Selecting the `Action > Load Bitmap` command or  toolbar button displays the Load Bitmap File Open dialog box (similar to Figure 8-65).

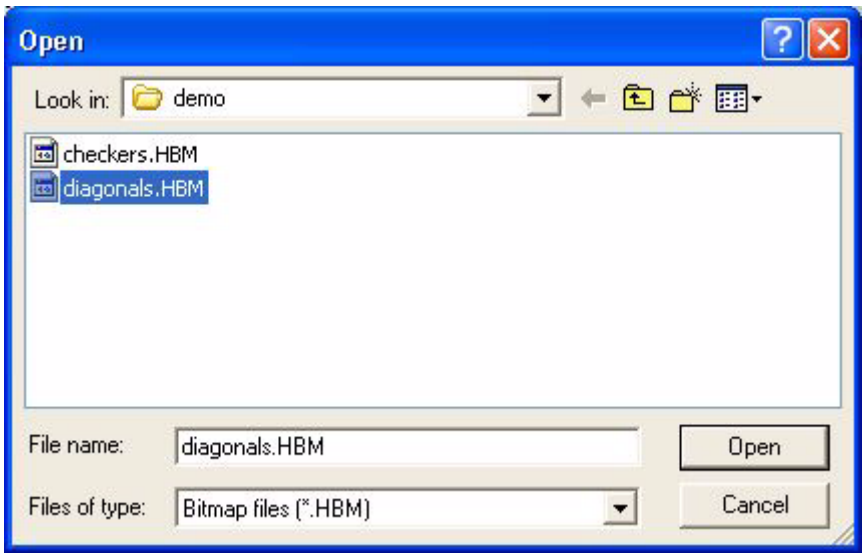

Figure 8-65. Load Bitmap File Open Dialog Box

2 Selecting the `diagonals.HBM` file and then Open displays the bitmap file in the default logical format (Figure 8-66). This bitmap was created to display diagonal failures. The passing bits are in black, and the failing bits are red.

The Bitmap Tool main window contains the following unique functional areas:

- Navigation Pane: Shows the logical and physical coordinates of the device layout. It also lists the total number of errors in this bitmap.
- Thumbnail Pane: Shows a thumbnail of the logical and physical layouts of the device. The highlighted area in the thumbnail indicates the current coverage area you are seeing in the View Pane (Figure 8-66). You can view other areas in the bitmap by using the scroll bars or clicking on an area in the Thumbnail pane.

- View Pane: Displays the bitmaps, overlays, and logical operations selected in the Bitmap Navigation Tree. The View Pane provides scroll bars on the right-hand side and bottom edge when the magnification of the bitmap within is set to cause the area of the bitmap to be larger than the pane size. By default the coordinate crosshairs follow the mouse cursor. You can freeze (lock) or unfreeze (unlock) the crosshairs by pressing the Ctrl key. You can also click and drag over a region in the View pane to zoom in and display that region in the View pane and make the corresponding display changes in the Navigation and Thumbnail panes.
- Status Bar: Displays the following information:
  - Bitmap Type: FLAT for a single bitmap, or OVERLAY, XOR, MULTI-LEVEL, and so forth for the logical operations displaying.
  - View Showing: LOGICAL or PHYSICAL.
  - Zoom Factor: The `Zoom Factor: 1X` shown in the Status Bar in Figure 8-66 means every pixel you see represents one pass or fail bit.
  - Cursor: UNLOCKED or LOCKED

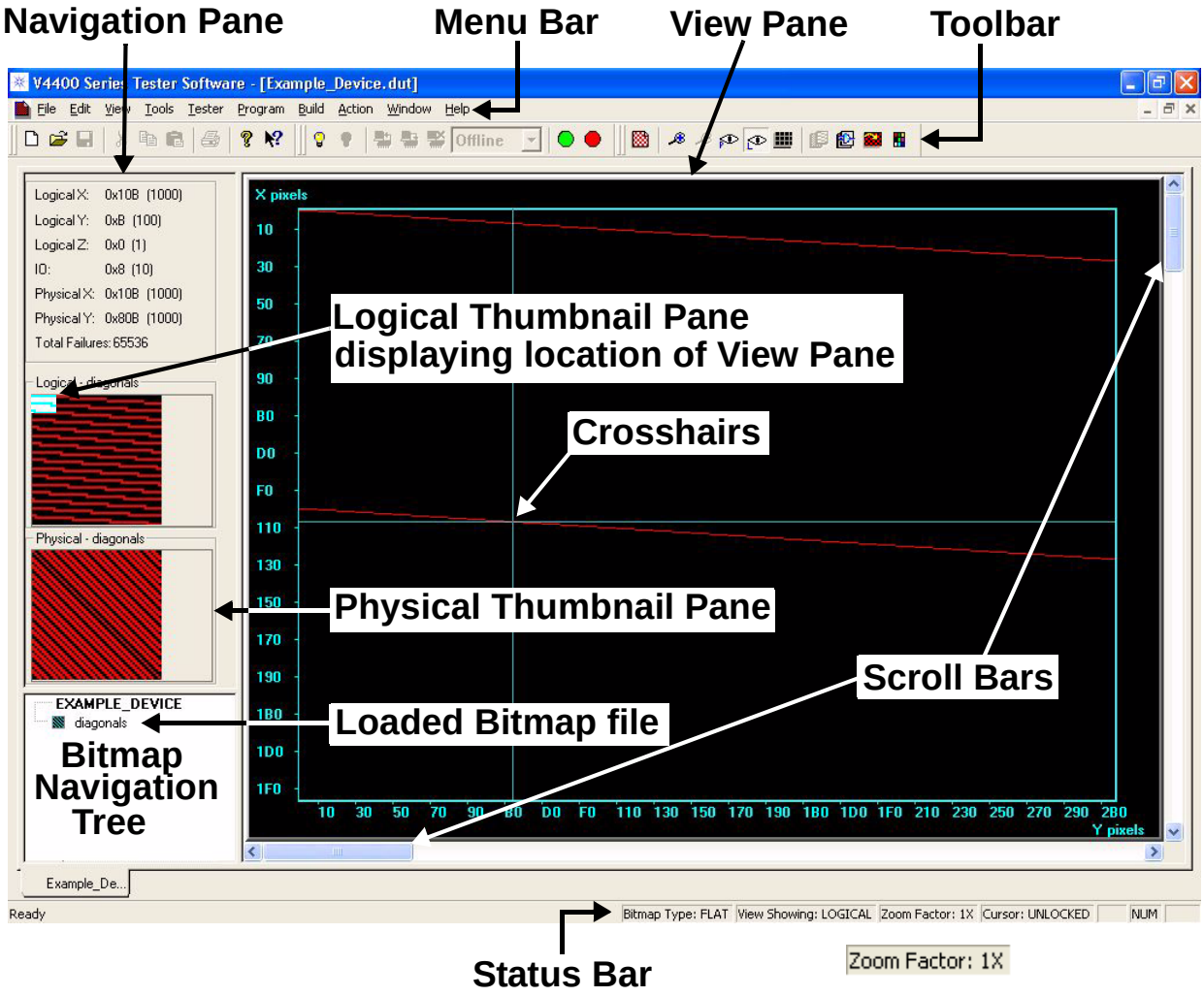

Figure 8-66. Bitmap File Loaded Displaying Logical Format

3 Selecting the `Action > Load Bitmap` command or  toolbar button again displays the Load Bitmap File Open dialog box (similar to Figure 8-65 on page 411).

4 Loading the `checkers.HBM` file displays the bitmap as shown in Figure 8-67. This bitmap was created to display checkerboard failures.

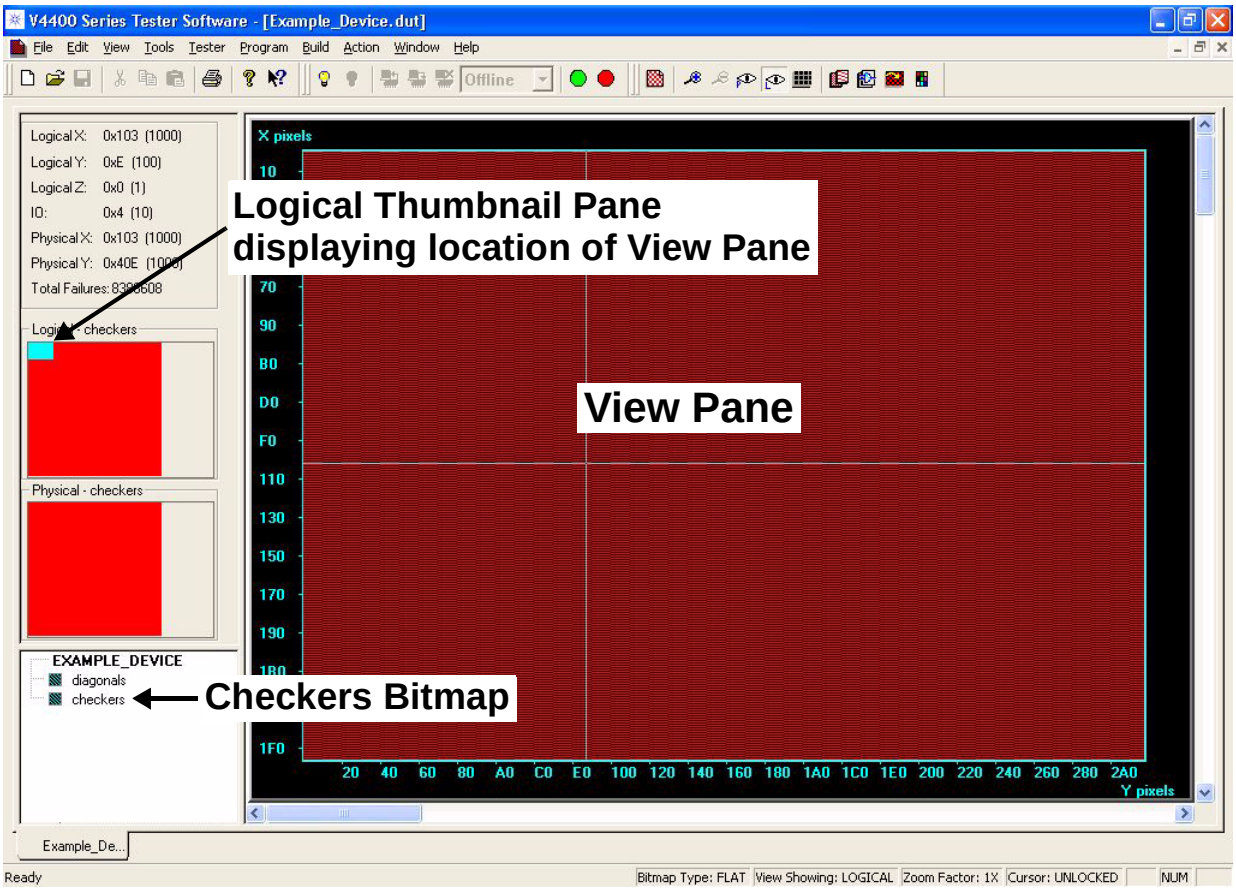

Figure 8-67. Main Window Displaying Second Bitmap File

Creating an Overlay

An overlay can be created when two or more bitmaps are loaded. This allows examination of failure patterns for multiple tests run on the same device. Besides plain overlays, multi-level overlays can be created for multi-dut mode. This example uses the loaded diagonals.HBM and checker.HBM bitmaps to create a simple two bitmap overlay.

1 Selecting the `Action > Overlay` command or  toolbar button displays the Overlay Bitmaps dialog box (similar to Figure 8-68).

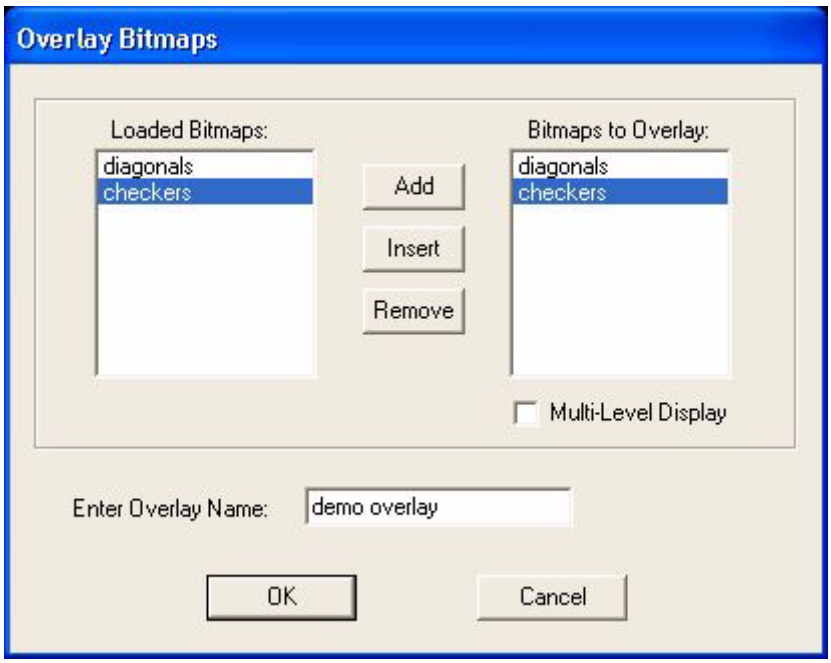

Figure 8-68. Overlay Bitmaps Dialog Box

2 Selecting `diagonals` in the `Loaded Bitmaps` pane and then the Add button adds it to the `Bitmaps to Overlay` pane. Repeating the process with the `checkers` bitmap adds it also to the `Bitmaps to Overlay` pane (similar to Figure 8-68).

3 Typing `demo overlay` in the `Enter Overlay Name` text box and then selecting OK displays the overlay in the main window (Figure 8-69). By default, bits where only one bitmap failed are dark red. Bits where both bitmaps failed are bright red.

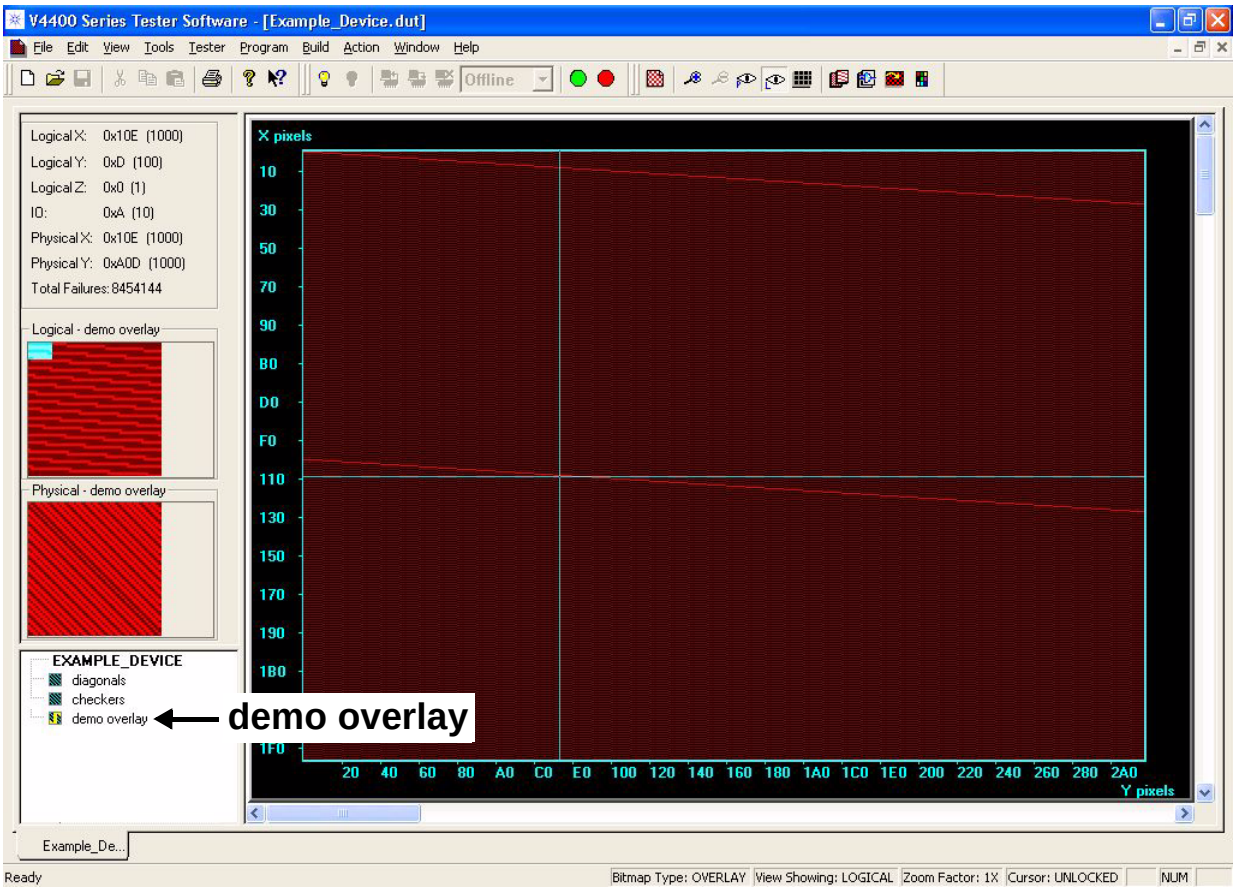

Figure 8-69. Main Window Displaying Overlay Bitmaps

Creating Logical Operations

The Bitmap Tool provides the capability to use logical operations to visualize other characteristics of failed and passing bits.

1 Selecting the Logical Operation button in the toolbar or the `Action > Logical Operation` command displays its dialog box (Figure 8-70).

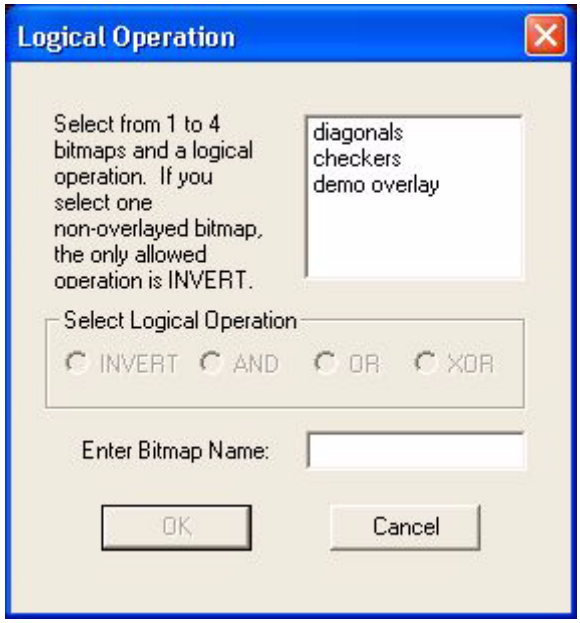

Figure 8-70. Logical Operation Dialog Box

The available operations are illustrated in Figure 8-71.

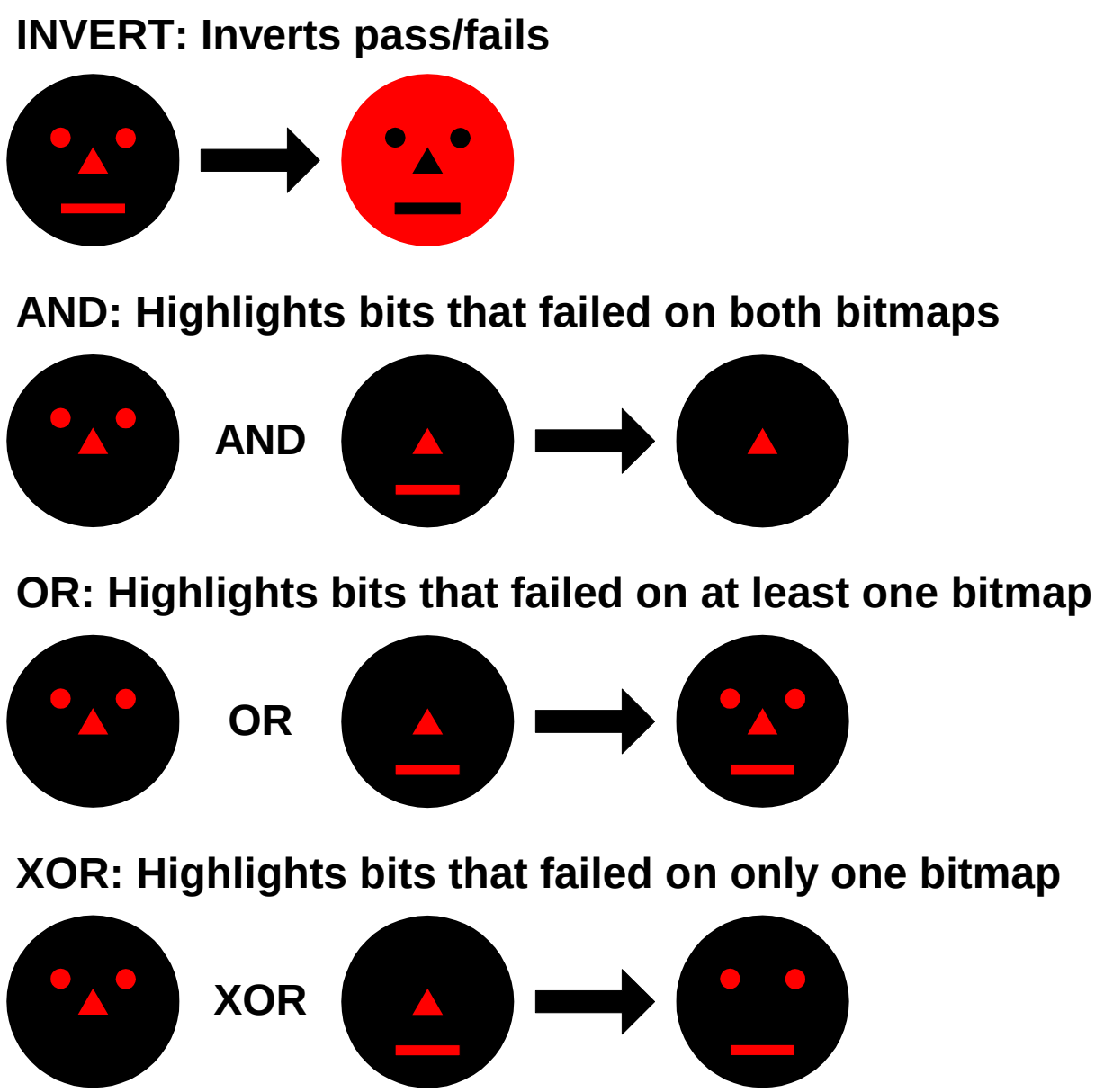

Figure 8-71. Logical Operations

2 For this example, we will use the AND operation (similar to Figure 8-72):

1. Selecting the `diagonals` and then the `checkers` bitmap in the dialog box highlights the bitmaps for the logical operation.
2. Selecting the `AND` option button specifies the type of logical operation.

3. Typing `demo and` in the `Enter Bitmap Name` text box specifies the name that will display in the main window Bitmap Navigation Tree.
4. Selecting the OK button closes the dialog box and displays the logical operation in the main window (Figure 8-73).

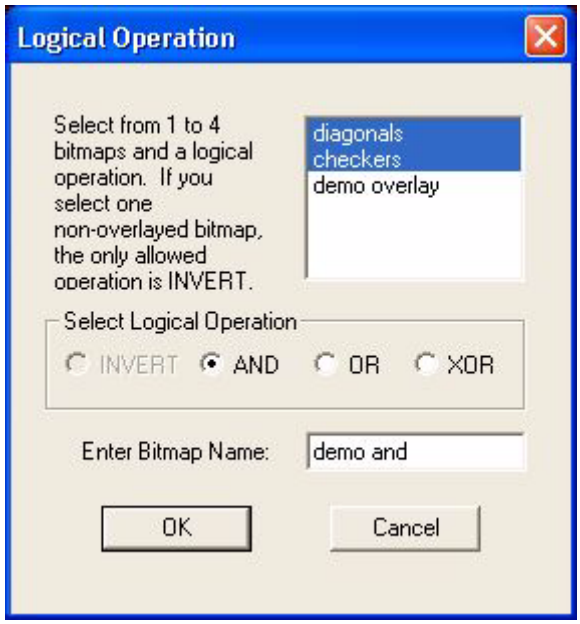

Figure 8-72. Logical Operation Dialog Box AND Operation

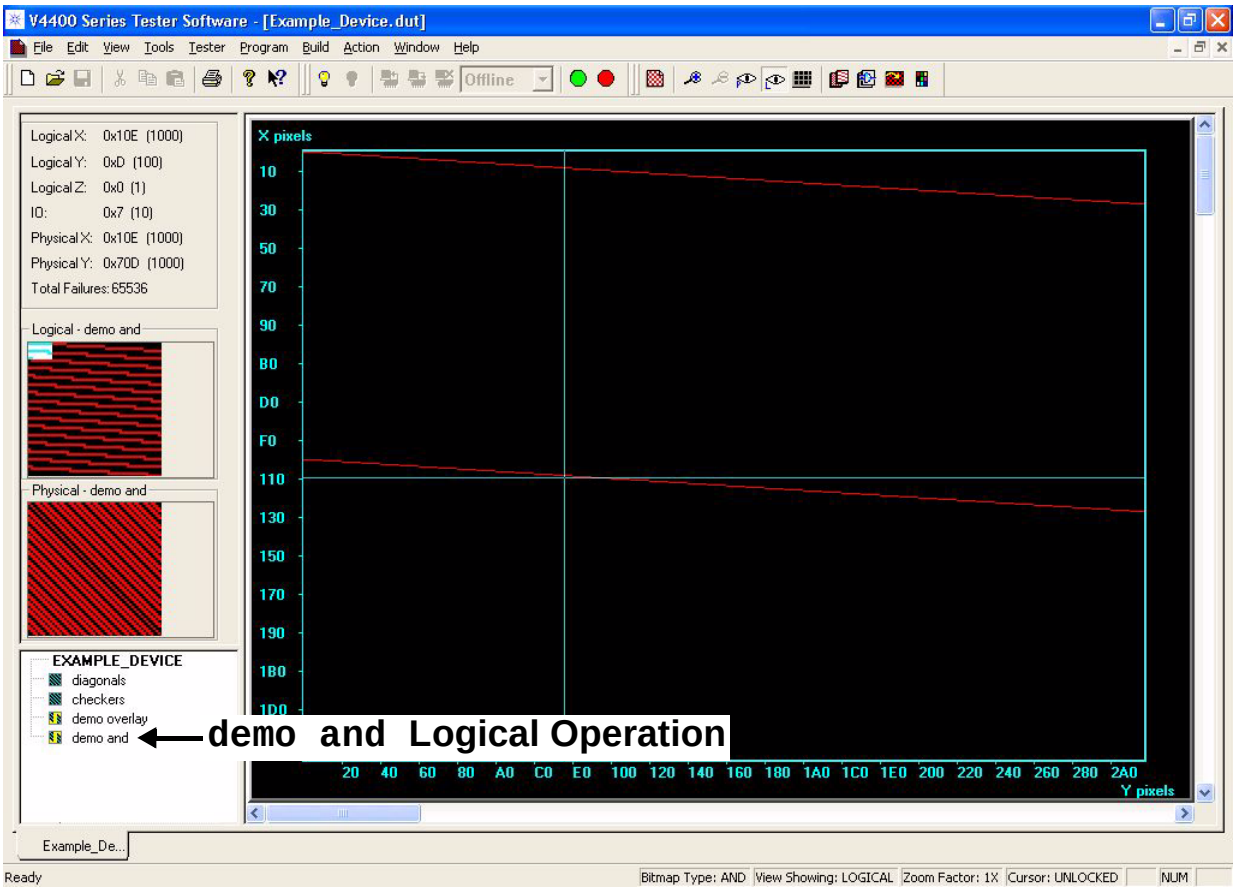

Figure 8-73. Main Window Displaying AND Logical Operation

Selecting Bitmap Error Colors

All bitmaps can be assigned different colors. This procedure will change the pass color from black to white for the `demo and` logical operation.

1 Selecting the `Action > Set Error Color` command or  toolbar button displays the Select System Colors tab on the Set Bitmap Colors dialog box (Figure 8-74). This tab allows you to set the pass and fail colors for the bitmaps. The defaults are black for pass and red for fail. The colors can be changed by selecting the corresponding drop-down list box to display a color palette from which additional colors can be selected or created.

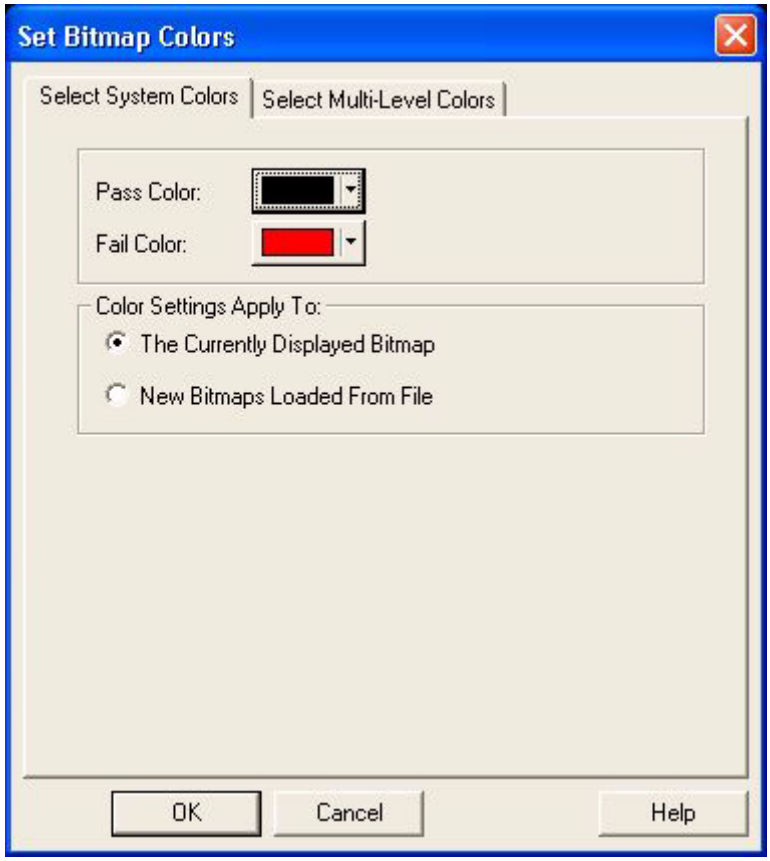

Figure 8-74. Set Bitmap Colors Dialog Box

2 Selecting the `Pass Color` drop-down list box displays its color palette and selecting the white color box in the palette changes the `Pass Color` to white (Figure 8-75).

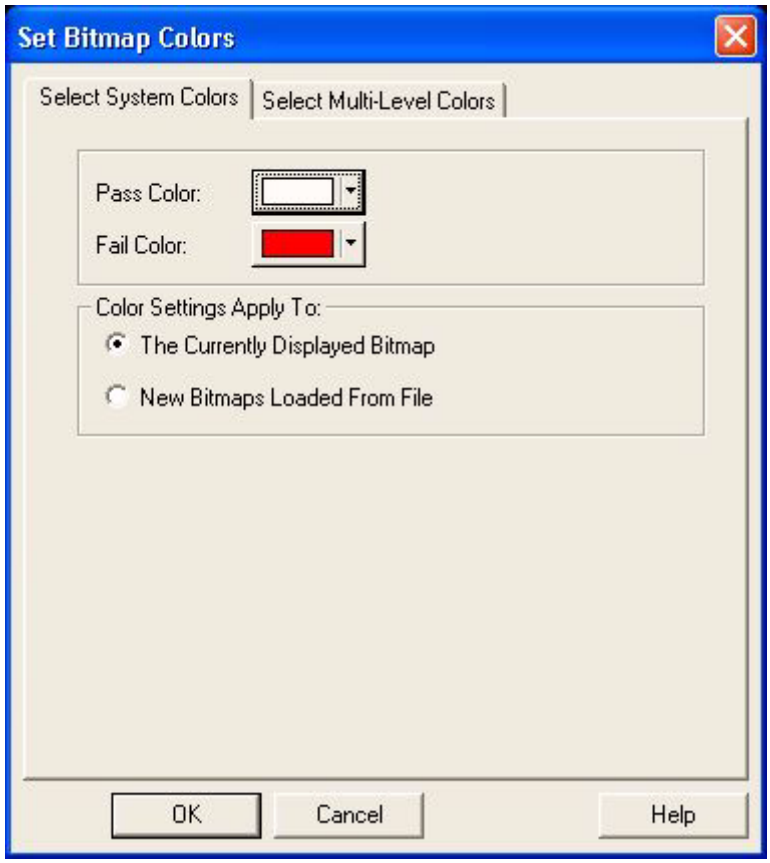

Figure 8-75. Set Bitmap Colors Dialog Box White Passing Bits

3 Selecting the OK button closes the dialog box and changes the demo and logical operation to display passing bits in white in the main window (Figure 8-76). Compare the white passing bits for the demo and logical operation with the black passing bits shown in Figure 8-73 on page 420.

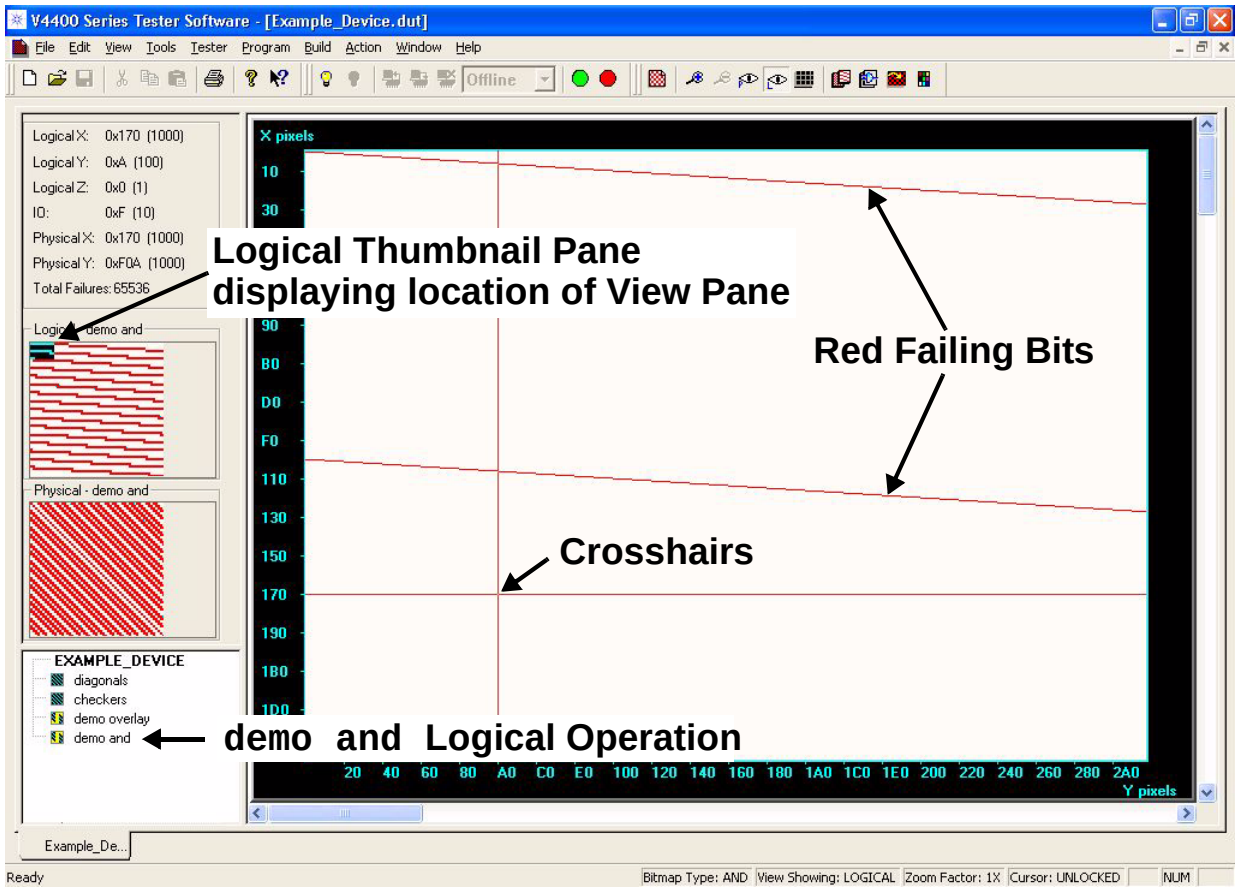

Figure 8-76. Main Window Displaying White Passing Bits

DUT Definition File

This section contains the information you need to create DUT (device under test) definition files. To view files with the Bitmap Tool, you must first create and load a DUT definition file. The file supplies the Bitmap Tool with the information it requires about the memory array's rows, columns, I/Os, and scrambling information. The file is loaded from the `File` > `Open` > `Bitmap Tool DUT Document` > DUT Definition File Open dialog box.

This section contains the following information:

- "DUT Definition File Limitations" on page 424 lists the current requirements that must be followed when creating a DUT definition file.
- "Creating a DUT Definition File with Two Regions Example" on page 425 describes a two-region DUT definition file and how it would display in the Bitmap Tool's View pane.
- "Creating a DUT Definition File with One Region Example" on page 443 illustrates a one-region DUT definition file and how it would display in the Bitmap Tool's View pane.

DUT Definition File Limitations

Currently the Bitmap Tool DUT definition file imposes the following limitations:

- Columns, rows, and I/Os must be a power of 2.
- Only one Z address block is currently supported.
- I/Os can be a function only of the Y column address.
- If specified, the number of Z address blocks must be set to 1 (ZBLOCKS=1).

NOTE Currently the Bitmap Tool DUT definition file requires a carriage return before the "DestinationX" row scrambling header. After loading a DUT definition file without the carriage return, results in an application error and the program terminates without warning.

Creating a DUT Definition File with Two Regions Example

This section describes a DUT definition file that is broken down into its component sections and how to create each section. The entire file is shown in Figure 8-77 through Figure 8-81. A DUT definition file must be saved as an ASCII text file with a .dut extension.

Structure

The DUT definition file consists of the following sections:

- Header Section
- Pinout Section
- Scrambling Section

Each section is described following the DUT definition file starting with the "Header Section" on page 431.

```
BEGIN      DUT
                DATE=10/12/2002
                USER=John Doe
                COMPANY=Agilent Technologies
                DEVICE=256 Kbit DRAM Example
                PROTOCOL=parallel
                TECHNOLOGY=DRAM
                COLUMNS=512       // Number of physical bit columns.
                ROWS=512          // Number of physical rows.
                i/oS=8            // Number of i/os.
                PINS=28           // Number of pins device has that is
END DUT                           //  specified in “PINOUT” section.

BEGIN MISC
                anything=5  // Field is required but not currently used.
END MISC

BEGIN      PINOUT
           P1=gnd
           P2=CE
           P3=R/!W
           P4=x0,a0
           P5=x1,a1
           P6=x2,a2
           P7=x3,a3
           P8=x4,a4
           P9=x5,a5
           P10=x6,a6
           P11=x7,a7
           P12=x8,a8
           P13=unused
           P14=unused
           P15=y0,a9
           P16=y1,a10
           P17=y2,a11
           P18=y3,a12
```

Figure 8-77. DUT Definition File with Two Regions Example (1 of 5)

```
            P19=y4,a13
            P20=y5,a14
            P21=IO0
            P22=IO1
            P23=IO2
            P24=IO3
            P25=IO4
            P26=IO5
            P27=IO6
            P28=IO7

END PINOUT

BEGIN       SCRAMBLING Logical
            BEGIN REGION
                  MINX=0            // Min physical X
                  MAXX=511          // Max physical X
                  MINY=0            // Min physical Y
                  MAXY=255          // Max physical Y

Destination Y     io7   io6   io5   io4   io3   io2   io1   io0
0                 31    63    95    127   159   191   223   255
1                 30    62    94    126   158   190   222   254
2                 29    61    93    125   157   189   221   253
3                 28    60    92    124   156   188   220   252
4                 27    59    91    123   155   187   219   251
5                 26    58    90    122   154   186   218   250
6                 25    57    89    121   153   185   217   249
7                 24    56    88    120   152   184   216   248
8                 23    55    87    119   151   183   215   247
9                 22    54    86    118   150   182   214   246
10                21    53    85    117   149   181   213   245
11                20    52    84    116   148   180   212   244
12                19    51    83    115   147   179   211   243
13                18    50    82    114   146   178   210   242
14                17    49    81    113   145   177   209   241
15                16    48    80    112   144   176   208   240
16                15    47    79    111   143   175   207   239
17                14    46    78    110   142   174   206   238
18                13    45    77    109   141   173   205   237
19                12    44    76    108   140   172   204   236
20                11    43    75    107   139   171   203   235
21                10    42    74    106   138   170   202   234
22                9     41    73    105   137   169   201   233
23                8     40    72    104   136   168   200   232
24                7     39    71    103   135   167   199   231
25                6     38    70    102   134   166   198   230
26                5     37    69    101   133   165   197   229
27                4     36    68    100   132   164   196   228
28                3     35    67    99    131   163   195   227
29                2     34    66    98    130   162   194   226
30                1     33    65    97    129   161   193   225
31                0     32    64    96    128   160   192   224

Destination X     0     1     2     3     4     5     6     7
0                 511   510   509   508   507   506   505   504
8                 503   502   501   500   499   498   497   496
16                495   494   493   492   491   490   489   488
```

Figure 8-78. DUT Definition File with Two Regions Example (2 of 5)

```
24                487   486   485   484   483   482   481   480
32                479   478   477   476   475   474   473   472
40                471   470   469   468   467   466   465   464
48                463   462   461   460   459   458   457   456
56                455   454   453   452   451   450   449   448
64                447   446   445   444   443   442   441   440
72                439   438   437   436   435   434   433   432
80                431   430   429   428   427   426   425   424
88                423   422   421   420   419   418   417   416
96                415   414   413   412   411   410   409   408
104               407   406   405   404   403   402   401   400
112               399   398   397   396   395   394   393   392
120               391   390   389   388   387   386   385   384
128               383   382   381   380   379   378   377   376
136               375   374   373   372   371   370   369   368
144               367   366   365   364   363   362   361   360
152               359   358   357   356   355   354   353   352
160               351   350   349   348   347   346   345   344
168               343   342   341   340   339   338   337   336
176               335   334   333   332   331   330   329   328
184               327   326   325   324   323   322   321   320
192               319   318   317   316   315   314   313   312
200               311   310   309   308   307   306   305   304
208               303   302   301   300   299   298   297   296
216               295   294   293   292   291   290   289   288
224               287   286   285   284   283   282   281   280
232               279   278   277   276   275   274   273   272
240               271   270   269   268   267   266   265   264
248               263   262   261   260   259   258   257   256
256               255   254   253   252   251   250   249   248
264               247   246   245   244   243   242   241   240
272               239   238   237   236   235   234   233   232
280               231   230   229   228   227   226   225   224
288               223   222   221   220   219   218   217   216
296               215   214   213   212   211   210   209   208
304               207   206   205   204   203   202   201   200
312               199   198   197   196   195   194   193   192
320               191   190   189   188   187   186   185   184
328               183   182   181   180   179   178   177   176
336               175   174   173   172   171   170   169   168
344               167   166   165   164   163   162   161   160
352               159   158   157   156   155   154   153   152
360               151   150   149   148   147   146   145   144
368               143   142   141   140   139   138   137   136
376               135   134   133   132   131   130   129   128
384               127   126   125   124   123   122   121   120
392               119   118   117   116   115   114   113   112
400               111   110   109   108   107   106   105   104
408               103   102   101   100   99    98    97    96
416               95    94    93    92    91    90    89    88
424               87    86    85    84    83    82    81    80
432               79    78    77    76    75    74    73    72
440               71    70    69    68    67    66    65    64
448               63    62    61    60    59    58    57    56
456               55    54    53    52    51    50    49    48
464               47    46    45    44    43    42    41    40
472               39    38    37    36    35    34    33    32
480               31    30    29    28    27    26    25    24
```

Figure 8-79. DUT Definition File with Two Regions Example (3 of 5)

```
488              23    22    21    20    19    18    17    16
496              15    14    13    12    11    10    9     8
504              7     6     5     4     3     2     1     0

END REGION

      BEGIN REGION
            MINX = 0          // min physical X
            MAXX = 511        // max physical X
            MINY = 256        // min physical Y
            MAXY = 511        // max physical Y

DestinationY     IO7   IO6   IO5   IO4   IO3   IO2   IO1   IO0
32               480   448   416   384   352   320   288   256
33               481   449   417   385   353   321   289   257
34               482   450   418   386   354   322   290   258
35               483   451   419   387   355   323   291   259
36               484   452   420   388   356   324   292   260
37               485   453   421   389   357   325   293   261
38               486   454   422   390   358   326   294   262
39               487   455   423   391   359   327   295   263
40               488   456   424   392   360   328   296   264
41               489   457   425   393   361   329   297   265
42               490   458   426   394   362   330   298   266
43               491   459   427   395   363   331   299   267
44               492   460   428   396   364   332   300   268
45               493   461   429   397   365   333   301   269
46               494   462   430   398   366   334   302   270
47               495   463   431   399   367   335   303   271
48               496   464   432   400   368   336   304   272
49               497   465   433   401   369   337   305   273
50               498   466   434   402   370   338   306   274
51               499   467   435   403   371   339   307   275
52               500   468   436   404   372   340   308   276
53               501   469   437   405   373   341   309   277
54               502   470   438   406   374   342   310   278
55               503   471   439   407   375   343   311   279
56               504   472   440   408   376   344   312   280
57               505   473   441   409   377   345   313   281
58               506   474   442   410   378   346   314   282
59               507   475   443   411   379   347   315   283
60               508   476   444   412   380   348   316   284
61               509   477   445   413   381   349   317   285
62               510   478   446   414   382   350   318   286
63               511   479   447   415   383   351   319   287

DestinationX     0     1     2     3     4     5     6     7
0                511   510   509   508   507   506   505   504
8                503   502   501   500   499   498   497   496
16               495   494   493   492   491   490   489   488
24               487   486   485   484   483   482   481   480
32               479   478   477   476   475   474   473   472
40               471   470   469   468   467   466   465   464
48               463   462   461   460   459   458   457   456
56               455   454   453   452   451   450   449   448
64               447   446   445   444   443   442   441   440
72               439   438   437   436   435   434   433   432
```

Figure 8-80. DUT Definition File with Two Regions Example (4 of 5)

```
80                431   430   429   428   427   426   425   424
88                423   422   421   420   419   418   417   416
96                415   414   413   412   411   410   409   408
104               407   406   405   404   403   402   401   400
112               399   398   397   396   395   394   393   392
120               391   390   389   388   387   386   385   384
128               383   382   381   380   379   378   377   376
136               375   374   373   372   371   370   369   368
144               367   366   365   364   363   362   361   360
152               359   358   357   356   355   354   353   352
160               351   350   349   348   347   346   345   344
168               343   342   341   340   339   338   337   336
176               335   334   333   332   331   330   329   328
184               327   326   325   324   323   322   321   320
192               319   318   317   316   315   314   313   312
200               311   310   309   308   307   306   305   304
208               303   302   301   300   299   298   297   296
216               295   294   293   292   291   290   289   288
224               287   286   285   284   283   282   281   280
232               279   278   277   276   275   274   273   272
240               271   270   269   268   267   266   265   264
248               263   262   261   260   259   258   257   256
256               255   254   253   252   251   250   249   248
264               247   246   245   244   243   242   241   240
272               239   238   237   236   235   234   233   232
280               231   230   229   228   227   226   225   224
288               223   222   221   220   219   218   217   216
296               215   214   213   212   211   210   209   208
304               207   206   205   204   203   202   201   200
312               199   198   197   196   195   194   193   192
320               191   190   189   188   187   186   185   184
328               183   182   181   180   179   178   177   176
336               175   174   173   172   171   170   169   168
344               167   166   165   164   163   162   161   160
352               159   158   157   156   155   154   153   152
360               151   150   149   148   147   146   145   144
368               143   142   141   140   139   138   137   136
376               135   134   133   132   131   130   129   128
384               127   126   125   124   123   122   121   120
392               119   118   117   116   115   114   113   112
400               111   110   109   108   107   106   105   104
408               103   102   101   100   99    98    97    96
416               95    94    93    92    91    90    89    88
424               87    86    85    84    83    82    81    80
432               79    78    77    76    75    74    73    72
440               71    70    69    68    67    66    65    64
448               63    62    61    60    59    58    57    56
456               55    54    53    52    51    50    49    48
464               47    46    45    44    43    42    41    40
472               39    38    37    36    35    34    33    32
480               31    30    29    28    27    26    25    24
488               23    22    21    20    19    18    17    16
496               15    14    13    12    11    10    9     8
504               7     6     5     4     3     2     1     0

      END REGION
END SCRAMBLING
```

Figure 8-81. DUT Definition File with Two Regions Example (5 of 5)

Header Section

The file begins with header information (Figure 8-82). This includes the creation date, user's name, company name, device name, protocol, technology, number of columns, number of rows, number of I/Os, and number of package pins.

```
BEGIN      DUT
                DATE=10/12/2002
                USER=John Doe
                COMPANY=Agilent Technologies
                DEVICE=256 Kbit DRAM Example
                PROTOCOL=parallel
                TECHNOLOGY=DRAM
                COLUMNS=512       // Number of physical bit columns.
                ROWS=512          // Number of physical rows.
                i/oS=8            // Number of i/os.
                PINS=28           // Number of pins device has that is
END DUT                           //  specified in “PINOUT” section.

BEGIN MISC
                anything=5  // Field is required but not currently used.
END MISC
```

Figure 8-82. Version 1.0 Header Section

The DATE, USER, COMPANY, DEVICE, PROTOCOL and TECHNOLOGY fields can be completed with entries of your choice.

The number of COLUMNS is determined by the number of physical bit columns in the device. It is the same as the maximum number of physical columns (+1) in the DestinationY column scrambling section (511 + 1).

The number of ROWS is the number of physical rows in the device. It is the same as the maximum number of physical rows (+1) in the DestinationX row scrambling section (511 + 1).

The number of PINS you specify must match the maximum number defined in the Pinout section. Typically this is the total number of pins.

Pinout Section

After the header and miscellaneous sections is the DUT definition itself. This includes the pinout and scrambling tables. Every pin on the device must be named, even if it is not connect (NC).

Use the following rules when assigning names to the pins on the device (Figure 8-83):

- The names of the data and address pins are predetermined to be IOn, Xn, and Yn, respectively.

- The clocks can be assigned any name which is not of the data or address name format.
- Data pins that are used for control instead of data may be given a non-data name.
- The same logic applies to the addresses. In other words, only pins called IOn are assumed to be true data pins, and only pins called Xn or Yn are assumed to be address pins.

```
BEGIN       PINOUT
            P1=gnd
            P2=CE
            P3=R/!W
            P4=x0,a0
            P5=x1,a1
            P6=x2,a2
            P7=x3,a3
            P8=x4,a4
            P9=x5,a5
            P10=x6,a6
            P11=x7,a7
            P12=x8,a8
            P13=unused
            P14=unused
            P15=y0,a9
            P16=y1,a10
            P17=y2,a11
            P18=y3,a12
            P19=y4,a13
            P20=y5,a14
            P21=IO0
            P22=IO1
            P23=IO2
            P24=IO3
            P25=IO4
            P26=IO5
            P27=IO6
            P28=IO7

END PINOUT
```

Figure 8-83. DUT File Pinout Section

Scrambling Section

This scrambling table can be thought of as converting from logical (source) to physical format (destination) as illustrated for this example in Figure 8-84. Address bits A_0–A_8 are fed to an X row decoder that controls row select lines X_0–X_8. Address bits A_9–A_{14} are fed to a Y column decoder that controls column select lines Y_0–Y_5. The physical configuration of the device determines the X row and Y column scrambling.

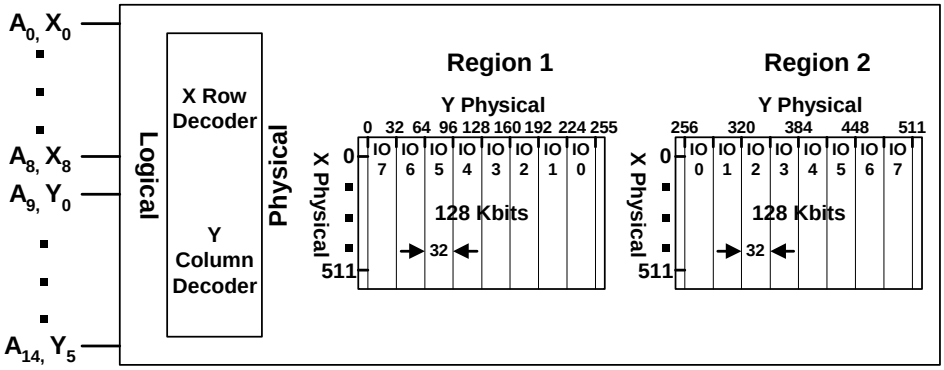

Figure 8-84. Logical to Physical Format

The scrambling section in the DUT definition file is defined in terms of rectangular regions, each of which has its own two sub-tables: DestinationY and DestinationX. One table is for the columns (DestinationY), and the other is for the rows (DestinationX). Devices that have more than one mapping of logical to physical addresses require scrambling tables with multiple regions so BitMapView can correctly display their bitmaps.

This example has two regions. See "Creating a DUT Definition File with One Region Example" on page 443 for an example with one region. The column scrambling tables of Region 1 and 2 are mirror images of each other. The Region 1 physical columns decrement from IO0 to IO7 (255–0), and the Region 2 physical columns increment from IO0 to IO7 (256–511).

The number of logical columns (for both regions A_9–A_{14} [Y_0–Y_5] = 2^6 = 64) times the I/Os per DUT word (IO0–IO7 = 8) times the number of rows (A_0–A_8 [X_0–X_8] = 2^9 = 512) should be equal to the total number of bits in the device (256 Kbits). (Note that each I/O in both regions has 32 logical and physical columns.) The equivalent is the total number of physical columns (256 + 256 = 512) times the number of physical rows (512) for the total number of bits (256 Kbits).

Region 1 Scrambling Table Definition

The first region is defined below in Figure 8-85, and the second region is defined in Figure 8-90 on page 439. A contiguous physical region of the device is specified. Each region needs a min X, max X, min Y, and max Y value. This information should be the same as that found in the scrambling table itself.

```
BEGIN       SCRAMBLING Logical
            BEGIN REGION
                  MINX=0              // Min physical X
                  MAXX=511            // Max physical X
                  MINY=0              // Min physical Y
                  MAXY=255            // Max physical Y
```

Figure 8-85. Region 1 Max and Min Values

Region 1 Column Scrambling Table

The DestinationY column scrambling table for region 1 is shown in Figure 8-86. Across the top of the table are the headers for the I/O pins (io7–io0). Down the first column on the left side are the logical columns (0–31). On the right for each logical address and I/O pair is the corresponding physical column address. For example:

- Logical address 0 and io0 map to physical column 255.
- Logical address 0 and io4 map to physical column 127.
- Logical address 7 and io0 map to physical column 248.
- Logical address 6 and io7 map to physical column 25.
- Logical address 10 and io4 map to physical column 117.

Destination Y	io7	io6	io5	io4	io3	io2	io1	io0
0	31	63	95	127	159	191	223	255
1	30	62	94	126	158	190	222	254
2	29	61	93	125	157	189	221	253
3	28	60	92	124	156	188	220	252
4	27	59	91	123	155	187	219	251
5	26	58	90	122	154	186	218	250
6	25	57	89	121	153	185	217	249
7	24	56	88	120	152	184	216	248
8	23	55	87	119	151	183	215	247
9	22	54	86	118	150	182	214	246
10	21	53	85	117	149	181	213	245
11	20	52	84	116	148	180	212	244
12	19	51	83	115	147	179	211	243
13	18	50	82	114	146	178	210	242
14	17	49	81	113	145	177	209	241
15	16	48	80	112	144	176	208	240
16	15	47	79	111	143	175	207	239
17	14	46	78	110	142	174	206	238
18	13	45	77	109	141	173	205	237
19	12	44	76	108	140	172	204	236
20	11	43	75	107	139	171	203	235
21	10	42	74	106	138	170	202	234
22	9	41	73	105	137	169	201	233
23	8	40	72	104	136	168	200	232
24	7	39	71	103	135	167	199	231
25	6	38	70	102	134	166	198	230
26	5	37	69	101	133	165	197	229
27	4	36	68	100	132	164	196	228
28	3	35	67	99	131	163	195	227
29	2	34	66	98	130	162	194	226
30	1	33	65	97	129	161	193	225
31	0	32	64	96	128	160	192	224

Figure 8-86. Region 1 Column Scrambling Table

The scrambling tables are generally computed in a spreadsheet application. Based on the fact that the columns have a certain periodicity associated with them, you need only define the one or two columns that form the base of the algorithm and the algorithm itself. Once the starting point is determined, you can see that each cell is offset by an amount from the cell above it or next to it. You can use the computational power of a spreadsheet application to fill in the table. After the table is generated using the spreadsheet application, it can be exported as a text file (.txt) and pasted into the DUT definition file.

Region 1 Row Scrambling Table

The table shown in Figure 8-87 and Figure 8-88 contains the DestinationX row scrambling. Down the first column on the left are the logical row addresses. The numbers across the first row at the top are offsets from the logical row addresses. The table is described in a by 8

fashion, that is, the logical row addresses increment by 8. The logical address for a given cell is equal to the value in the first column plus the value of the offset in the first row. The corresponding physical address appears in the cell. For example:

- Logical row 0 + 2 = 2 maps to physical row 509.
- Logical row 0 + 7 = 7 maps to physical row 504.
- Logical row 176 + 2 = 178 maps to physical row 333.

Destination X	0	1	2	3	4	5	6	7
0	511	510	509	508	507	506	505	504
8	503	502	501	500	499	498	497	496
16	495	494	493	492	491	490	489	488
24	487	486	485	484	483	482	481	480
32	479	478	477	476	475	474	473	472
40	471	470	469	468	467	466	465	464
48	463	462	461	460	459	458	457	456
56	455	454	453	452	451	450	449	448
64	447	446	445	444	443	442	441	440
72	439	438	437	436	435	434	433	432
80	431	430	429	428	427	426	425	424
88	423	422	421	420	419	418	417	416
96	415	414	413	412	411	410	409	408
104	407	406	405	404	403	402	401	400
112	399	398	397	396	395	394	393	392
120	391	390	389	388	387	386	385	384
128	383	382	381	380	379	378	377	376
136	375	374	373	372	371	370	369	368
144	367	366	365	364	363	362	361	360
152	359	358	357	356	355	354	353	352
160	351	350	349	348	347	346	345	344
168	343	342	341	340	339	338	337	336
176	335	334	333	332	331	330	329	328
184	327	326	325	324	323	322	321	320
192	319	318	317	316	315	314	313	312
200	311	310	309	308	307	306	305	304
208	303	302	301	300	299	298	297	296
216	295	294	293	292	291	290	289	288
224	287	286	285	284	283	282	281	280
232	279	278	277	276	275	274	273	272
240	271	270	269	268	267	266	265	264
248	263	262	261	260	259	258	257	256
256	255	254	253	252	251	250	249	248
264	247	246	245	244	243	242	241	240
272	239	238	237	236	235	234	233	232
280	231	230	229	228	227	226	225	224
288	223	222	221	220	219	218	217	216
296	215	214	213	212	211	210	209	208
304	207	206	205	204	203	202	201	200
312	199	198	197	196	195	194	193	192
320	191	190	189	188	187	186	185	184
328	183	182	181	180	179	178	177	176
336	175	174	173	172	171	170	169	168
344	167	166	165	164	163	162	161	160

Figure 8-87. Region 1 Row Scrambling Table (1 of 2)

```
352                159   158   157   156   155   154   153   152
360                151   150   149   148   147   146   145   144
368                143   142   141   140   139   138   137   136
376                135   134   133   132   131   130   129   128
384                127   126   125   124   123   122   121   120
392                119   118   117   116   115   114   113   112
400                111   110   109   108   107   106   105   104
408                103   102   101   100   99    98    97    96
416                95    94    93    92    91    90    89    88
424                87    86    85    84    83    82    81    80
432                79    78    77    76    75    74    73    72
440                71    70    69    68    67    66    65    64
448                63    62    61    60    59    58    57    56
456                55    54    53    52    51    50    49    48
464                47    46    45    44    43    42    41    40
472                39    38    37    36    35    34    33    32
480                31    30    29    28    27    26    25    24
488                23    22    21    20    19    18    17    16
496                15    14    13    12    11    10    9     8
504                7     6     5     4     3     2     1     0

END REGION
```

Figure 8-88. Region 1 Row Scrambling Table (2 of 2)

The DestinationX row scrambling table could have been designed in a number of different ways. It could have been described in by 1 fashion, by 2, by 3, and so forth. Anything less than 8 columns would have made the table longer with more rows, and anything more than 8 columns would have made it wider with more columns and less rows.

Figure 8-89 shows a partial listing of the physical row scrambling table if it were by 16. The same mapping still applies:

- Logical row 0 + 2 = 2 maps to physical row 509.
- Logical row 0 + 7 = 7 maps to physical row 504.
- Logical row 176 + 2 = 178 maps to physical row 333.

```
DestinationX    0    1    2    3    4    5    6    7    8    9    10   11   12   13   14   15
0               511  510  509  508  507  506  505  504  503  502  501  500  499  498  497  496
16              495  494  493  492  491  490  489  488  487  486  485  484  483  482  481  480
32              479  478  477  476  475  474  473  472  471  470  469  468  467  466  465  464
48              463  462  461  460  459  458  457  456  455  454  453  452  451  450  449  448
64              447  446  445  444  443  442  441  440  439  438  437  436  435  434  433  432
80              431  430  429  428  427  426  425  424  423  422  421  420  419  418  417  416
96              415  414  413  412  411  410  409  408  407  406  405  404  403  402  401  400
112             399  398  397  396  395  394  393  392  391  390  389  388  387  386  385  384
128             383  382  381  380  379  378  377  376  375  374  373  372  371  370  369  368
144             367  366  365  364  363  362  361  360  359  358  357  356  355  354  353  352
160             351  350  349  348  347  346  345  344  343  342  341  340  339  338  337  336
176             335  334  333  332  331  330  329  328  327  326  325  324  323  322  321  320
...
```

Figure 8-89. Row Scrambling Table with By 16 Format

Region 2 Scrambling Section

Figure 8-90 and Figure 8-91 show the second region within the device. Again, the main reason for having multiple regions is to correctly display devices that have more than one mapping of logical to physical addresses. Two regions may have duplicate physical x addresses, but it is not possible to have duplicate physical y addresses in multiple regions. The column address mapping of region 2 is essentially a mirror image of region 1 for the second 128 Kbits.

NOTE

Currently the Bitmap Tool DUT definition file requires a carriage return before the “DestinationX” row scrambling header. After loading a DUT definition file without the carriage return, results in an application error and the program terminates without warning.

```
      BEGIN REGION
            MINX = 0
            MAXX = 511
            MINY = 256
            MAXY = 511

DestinationY      IO7   IO6   IO5   IO4   IO3   IO2   IO1   IO0
32                480   448   416   384   352   320   288   256
33                481   449   417   385   353   321   289   257
34                482   450   418   386   354   322   290   258
35                483   451   419   387   355   323   291   259
36                484   452   420   388   356   324   292   260
37                485   453   421   389   357   325   293   261
38                486   454   422   390   358   326   294   262
39                487   455   423   391   359   327   295   263
40                488   456   424   392   360   328   296   264
41                489   457   425   393   361   329   297   265
42                490   458   426   394   362   330   298   266
43                491   459   427   395   363   331   299   267
44                492   460   428   396   364   332   300   268
45                493   461   429   397   365   333   301   269
46                494   462   430   398   366   334   302   270
47                495   463   431   399   367   335   303   271
48                496   464   432   400   368   336   304   272
49                497   465   433   401   369   337   305   273
50                498   466   434   402   370   338   306   274
51                499   467   435   403   371   339   307   275
52                500   468   436   404   372   340   308   276
53                501   469   437   405   373   341   309   277
54                502   470   438   406   374   342   310   278
55                503   471   439   407   375   343   311   279
56                504   472   440   408   376   344   312   280
57                505   473   441   409   377   345   313   281
58                506   474   442   410   378   346   314   282
59                507   475   443   411   379   347   315   283
60                508   476   444   412   380   348   316   284
61                509   477   445   413   381   349   317   285
62                510   478   446   414   382   350   318   286
63                511   479   447   415   383   351   319   287

DestinationX      0     1     2     3     4     5     6     7
0                 511   510   509   508   507   506   505   504
8                 503   502   501   500   499   498   497   496
16                495   494   493   492   491   490   489   488
24                487   486   485   484   483   482   481   480
32                479   478   477   476   475   474   473   472
40                471   470   469   468   467   466   465   464
48                463   462   461   460   459   458   457   456
56                455   454   453   452   451   450   449   448
64                447   446   445   444   443   442   441   440
72                439   438   437   436   435   434   433   432
80                431   430   429   428   427   426   425   424
88                423   422   421   420   419   418   417   416
96                415   414   413   412   411   410   409   408
104               407   406   405   404   403   402   401   400
112               399   398   397   396   395   394   393   392
120               391   390   389   388   387   386   385   384
128               383   382   381   380   379   378   377   376
```

Figure 8-90. Region 2 Scrambling Section (1 of 2)

```
136                375   374   373   372   371   370   369   368
144                367   366   365   364   363   362   361   360
152                359   358   357   356   355   354   353   352
160                351   350   349   348   347   346   345   344
168                343   342   341   340   339   338   337   336
176                335   334   333   332   331   330   329   328
184                327   326   325   324   323   322   321   320
192                319   318   317   316   315   314   313   312
200                311   310   309   308   307   306   305   304
208                303   302   301   300   299   298   297   296
216                295   294   293   292   291   290   289   288
224                287   286   285   284   283   282   281   280
232                279   278   277   276   275   274   273   272
240                271   270   269   268   267   266   265   264
248                263   262   261   260   259   258   257   256
256                255   254   253   252   251   250   249   248
264                247   246   245   244   243   242   241   240
272                239   238   237   236   235   234   233   232
280                231   230   229   228   227   226   225   224
288                223   222   221   220   219   218   217   216
296                215   214   213   212   211   210   209   208
304                207   206   205   204   203   202   201   200
312                199   198   197   196   195   194   193   192
320                191   190   189   188   187   186   185   184
328                183   182   181   180   179   178   177   176
336                175   174   173   172   171   170   169   168
344                167   166   165   164   163   162   161   160
352                159   158   157   156   155   154   153   152
360                151   150   149   148   147   146   145   144
368                143   142   141   140   139   138   137   136
376                135   134   133   132   131   130   129   128
384                127   126   125   124   123   122   121   120
392                119   118   117   116   115   114   113   112
400                111   110   109   108   107   106   105   104
408                103   102   101   100   99    98    97    96
416                95    94    93    92    91    90    89    88
424                87    86    85    84    83    82    81    80
432                79    78    77    76    75    74    73    72
440                71    70    69    68    67    66    65    64
448                63    62    61    60    59    58    57    56
456                55    54    53    52    51    50    49    48
464                47    46    45    44    43    42    41    40
472                39    38    37    36    35    34    33    32
480                31    30    29    28    27    26    25    24
488                23    22    21    20    19    18    17    16
496                15    14    13    12    11    10    9     8
504                7     6     5     4     3     2     1     0

      END REGION
END SCRAMBLING
```

Figure 8-91. Region 2 Scrambling Section (2 of 2)

View Pane Display with This DUT Definition File

After loading this DUT definition file and compatible bitmap files, the Bitmap Tool's View pane would display regions 1 and 2 of the bitmaps side by side. Figure 8-92 and Figure 8-93 illustrate the format how each region would display in the physical format.

Each I/O in both regions has 32 logical and physical address columns. The logical column addresses are the same for the I/Os in their respective regions (Region 1: 31–0, Region 2: 32–63). The physical column addresses are unique for each I/O. The I/Os in both regions have the same logical and physical row addresses. This is consistent with both regions having the same row scrambling table.

Therefore, each region has the same logical column and row addressing for each I/O but unique physical addressing. This means that, for an 8-bit data word being accessed by the external address lines, a bit would come from the same logical address for each I/O but a unique physical address. This is illustrated with the logical and physical coordinates of the different bits identified in Figure 8-92 and Figure 8-93.

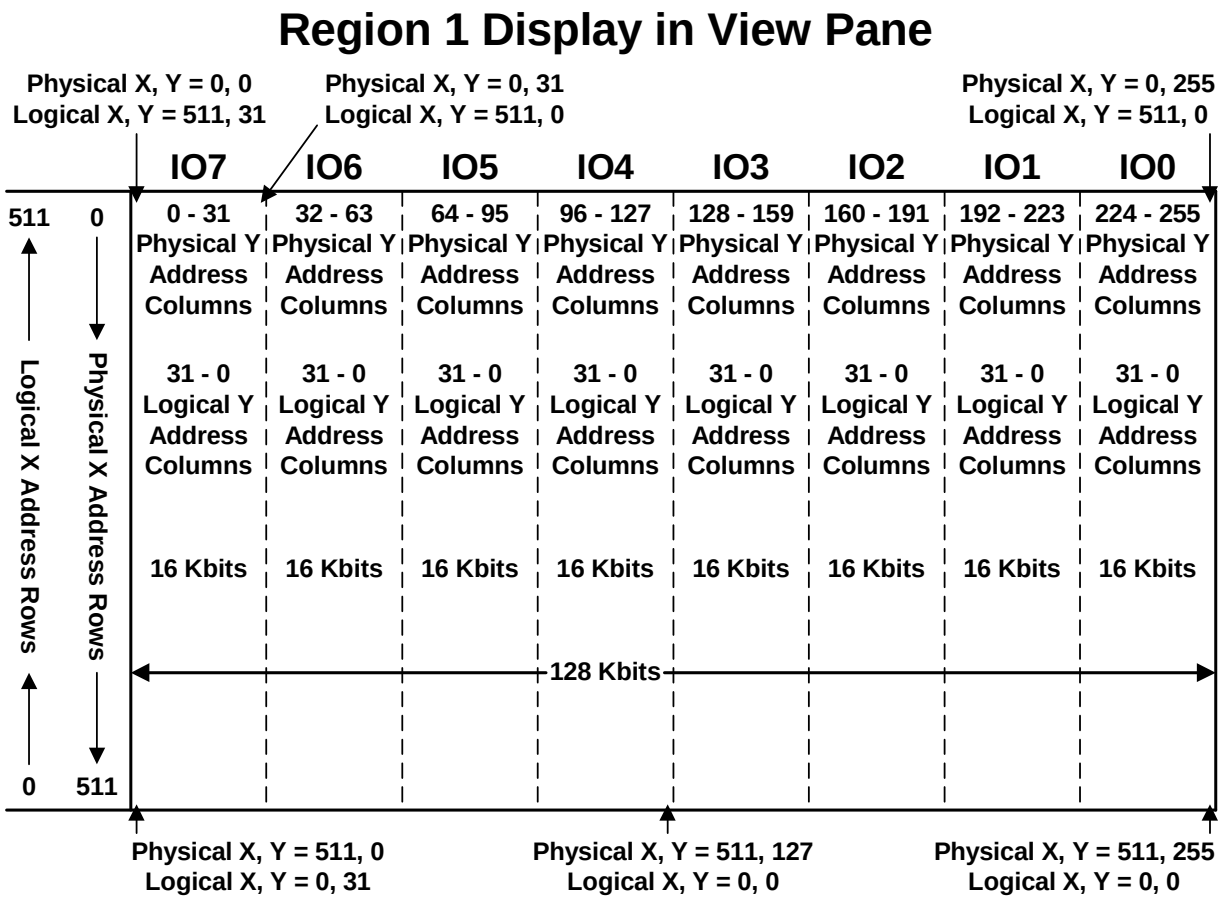

Figure 8-92. Region 1 Display in View Pane

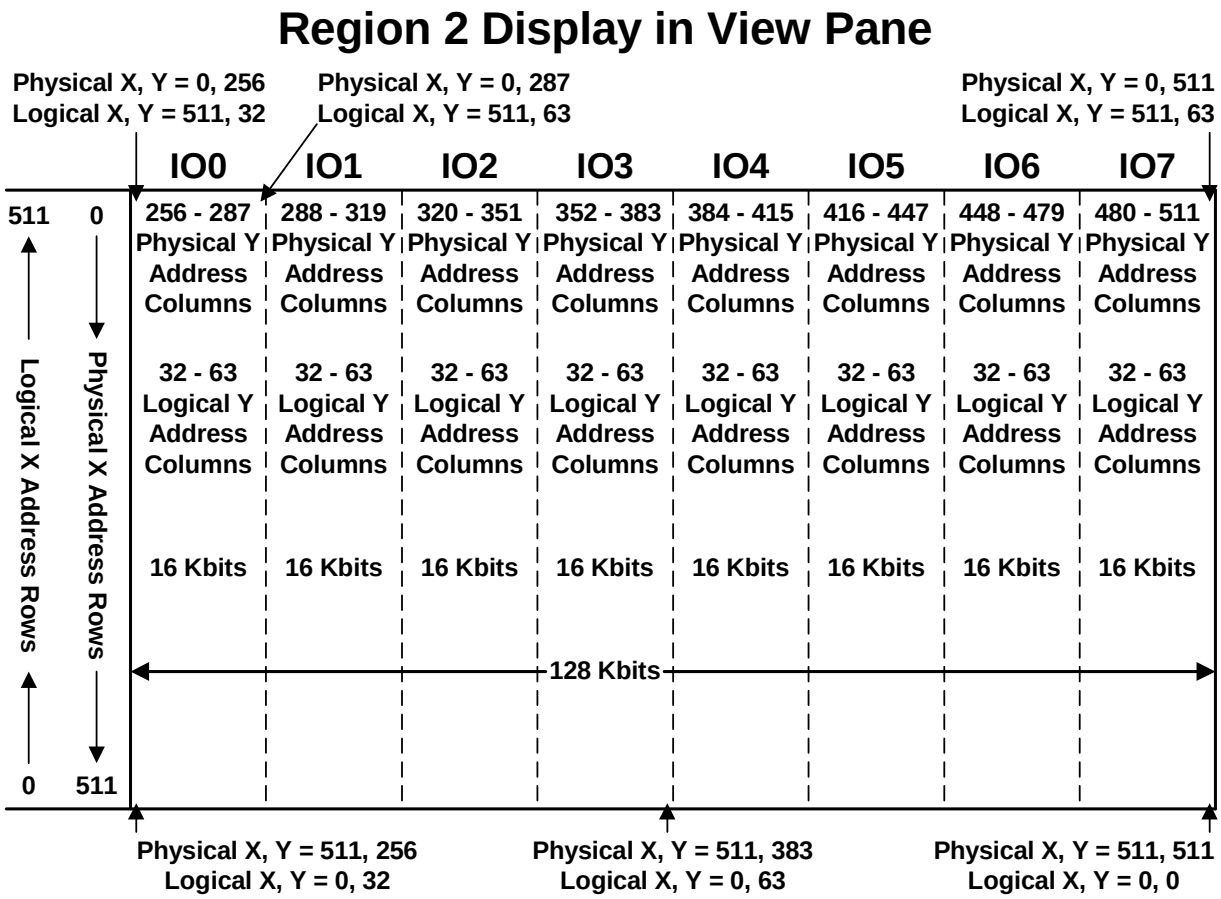

Figure 8-93. Region 2 Display in View Pane

Creating a DUT Definition File with One Region Example

Figure 8-94 and Figure 8-95 display an example of a DUT definition file with one region. Figure 8-96 illustrates the format how compatible bitmaps would display in the Bitmap Tool's View pane with this DUT definition file in the physical format. Figure 8-97 shows an alternate way of laying out the column and row scrambling tables that would achieve the same results. The alternate DestinationY column scrambling table displays the I/Os across the top from io0 to io7 rather than io7 to io0. The alternate DestinationX row scrambling table shows the equivalent table in a by 4 format.

```
BEGIN      DUT
                DATE=10/12/2002
                USER=John Doe
                COMPANY=Agilent Technologies
                DEVICE=1 KByte Example
                PROTOCOL=parallel
                TECHNOLOGY=FLASH
                COLUMNS=64        // number of physical bit columns.
                ROWS=128          // number of physical rows.
                i/oS=8            // number os i/os.
                PINS=18           // The max number found in the
                                  //  “PINOUT” section.
END DUT

BEGIN MISC
                anything=5  // Field is required but not currently used.
END MISC

BEGIN      PINOUT
           P1=y0,a7
           P2=y1,a8
           P3=y2,a9
           P4=x0,a0
           P5=x1,a1
           P6=x2,a2
           P7=x3,a3
           P8=x4,a4
           P9=x5,a5
           P10=x6,a6
           P11=IO0
           P12=IO1
           P13=IO2
           P14=IO3
           P15=IO4
           P16=IO5
           P17=IO6
           P18=IO7

END PINOUT
```

Figure 8-94. DUT Definition File with One Region Example (1 of 2)

```
BEGIN       SCRAMBLING Logical
            BEGIN REGION
                  MINX=0            // min physical X
                  MAXX=127          // max physical X
                  MINY=0            // min physical Y
                  MAXY=63           // max physical Y

DestinationY      io7   io6   io5   io4   io3   io2   io1   io0
0                 56    48    40    32    24    16    8     0
1                 57    49    41    33    25    17    9     1
2                 58    50    42    34    26    18    10    2
3                 59    51    43    35    27    19    11    3
4                 60    52    44    36    28    20    12    4
5                 61    53    45    37    29    21    13    5
6                 62    54    46    38    30    22    14    6
7                 63    55    47    39    31    23    15    7

DestinationX      0     1     2     3     4     5     6     7
0                 0     1     2     3     4     5     6     7
8                 8     9     10    11    12    13    14    15
16                16    17    18    19    20    21    22    23
24                24    25    26    27    28    29    30    31
32                32    33    34    35    36    37    38    39
40                40    41    42    43    44    45    46    47
48                48    49    50    51    52    53    54    55
56                56    57    58    59    60    61    62    63
64                64    65    66    67    68    69    70    71
72                72    73    74    75    76    77    78    79
80                80    81    82    83    84    85    86    87
88                88    89    90    91    92    93    94    95
96                96    97    98    99    100   101   102   103
104               104   105   106   107   108   109   110   111
112               112   113   114   115   116   117   118   119
120               120   121   122   123   124   125   126   127

      END REGION
END SCRAMBLING
```

Figure 8-95. DUT Definition File with One Region Example (2 of 2)

NOTE Currently the Bitmap Tool DUT definition file requires a carriage return before the “DestinationX” row scrambling header. After loading a DUT definition file without the carriage return, results in an application error and the program terminates without warning.

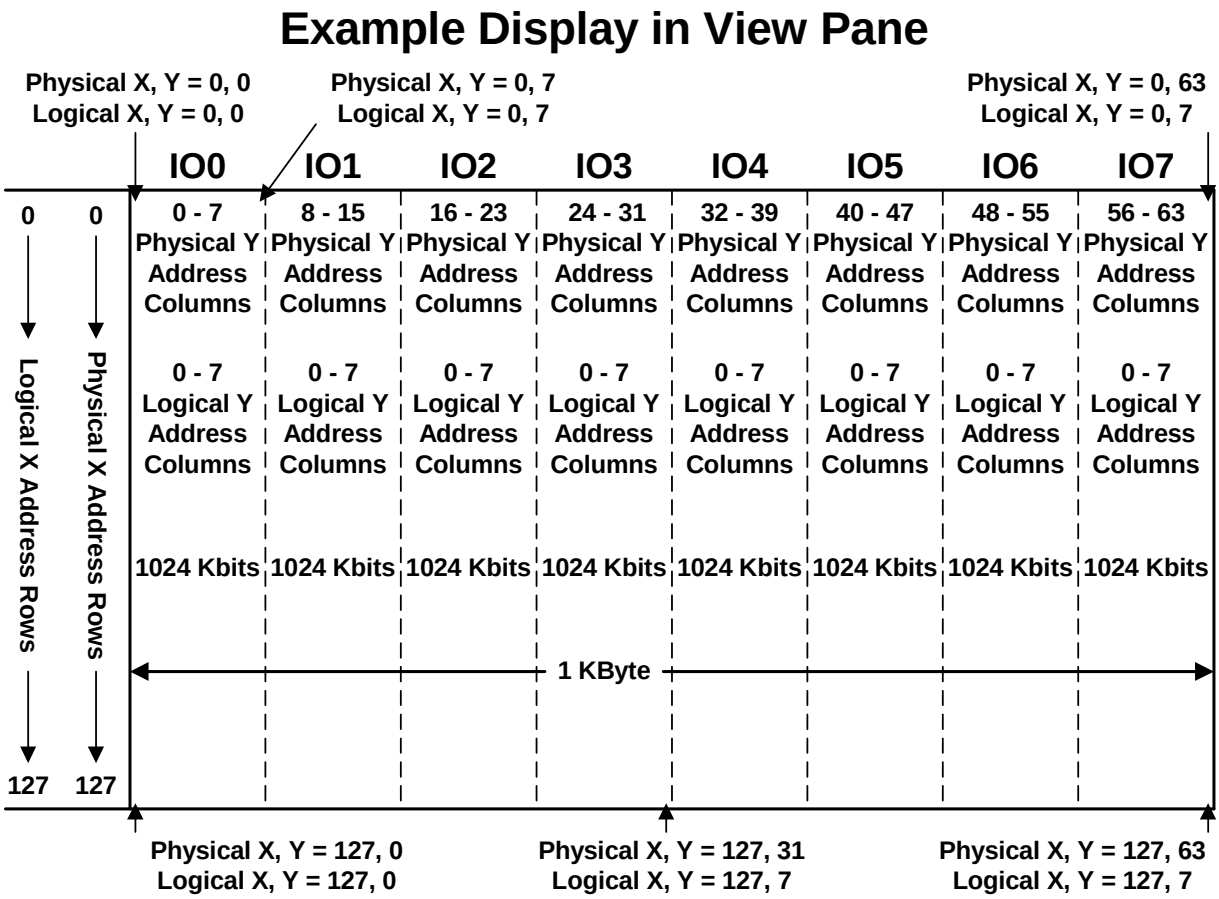

Figure 8-96. View Pane Display for DUT Definition File with One Region Example

DestinationY	io0	io1	io2	io3	io4	io5	io6	io7
0	0	8	16	24	32	40	48	56
1	1	9	17	25	33	41	49	57
2	2	10	18	26	34	42	50	58
3	3	11	19	27	35	43	51	59
4	4	12	20	28	36	44	52	60
5	5	13	21	29	37	45	53	61
6	6	14	22	30	38	46	54	62
7	7	15	23	31	39	47	55	63

DestinationX	0	1	2	3
0	0	1	2	3
4	4	5	6	7
8	8	9	10	11
12	12	13	14	15
16	16	17	18	19
20	20	21	22	23
24	24	25	26	27
28	28	29	30	31
32	32	33	34	35
36	36	37	38	39
40	40	41	42	43
44	44	45	46	47
48	48	49	50	51
52	52	53	54	55
56	56	57	58	59
60	60	61	62	63
64	64	65	66	67
68	68	69	70	71
72	72	73	74	75
76	76	77	78	79
80	80	81	82	83
84	84	85	86	87
88	88	89	90	91
92	92	93	94	95
96	96	97	98	99
100	100	101	102	103
104	104	105	106	107
108	108	109	110	111
112	112	113	114	115
116	116	117	118	119
120	120	121	122	123
124	124	125	126	127

Figure 8-97. Alternate Example Column and Row Scrambling Tables

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