Actel® Silicon Sculptor

User's Guide

Windows® Environments

Actel

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SILICON SCULPTOR LIMITED WARRANTY

The Silicon Sculptor is manufactured by BP Microsystems, Inc. for Actel Corporation under an OEM agreement. There are two versions of the Silicon Sculptor; a single site version, which will be referred to as the Silicon Sculptor, and a six site concurrent programming version which will be referred to as the Silicon Sculptor 6X. Actel Corporation warrants the single site Silicon Sculptor product against defects in material or workmanship for a period of three years, and the Silicon Sculptor 6X for a period of one year, as follows:

For a period of three years for the Silicon Sculptor and one year for the Silicon Sculptor 6X, from date of purchase, Actel Corporation, through BP Microsystems, Inc., will repair or replace any defective product at no charge. Whether the warranted product should be repaired or replaced is wholly within the discretion of Actel Corporation and BP Microsystems, Inc.

This warranty does not cover any damage due to accident, misuse, abuse or negligence nor does it cover normal wear items such as socket modules and filters.

You should retain your dated bill of sale as evidence of the date of purchase.

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This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

Table of Contents

Introduction

Thank you for selecting the Silicon Sculptor Programming System. This *User's Guide* is designed to help you take full advantage of the Silicon Sculptor's capabilities. The bulk of this manual describes operation of the single site version of the Silicon Sculptor. However, the software is identical for the six site Silicon Sculptor 6X, and command descriptions apply for both.

Document Organization

The *Silicon Sculptor User's Guide* is divided into the following chapters:

Chapter 1 - Getting Started is a quick reference for beginning usage of a programmer through the ActelWin software.

Chapter 2 - Command Reference is organized by function and command – listing details and usage.

Chapter 3 - Troubleshooting covers error messages that are not self-explanatory and helps you identify problems.

Appendix A - Product Support provides information about contacting Actel for customer technical support.

Appendix B - Glossary defines some useful terms that appear in this manual.

Document Assumptions

The information in this guide is based on the following assumptions:

1. You are familiar with PCs and are running Windows 95/98 or Windows NT 4.0 or later.

2. You are familiar with Actel FPGA architecture and Actel FPGA design software.

Document Conventions

This manual uses the following conventions:

Information input by the user follows this format:

   keyboard input

The contents of a file follows this format:

   file contents

Messages displayed on the screen appear as follows:

Screen Message

Actel Manuals

Actel's Designer Series software includes printed and online manuals. The online manuals are in PDF format on the Designer CD-ROM and the DeskTOP CD-ROM in the "\manuals" directory. These manuals are also installed onto your a system when you install the Designer software. To view the online manuals, you must install Adobe Acrobat Reader from the CD-ROM. For the most up-to-date documentation, go to the Actel Website (http:\\www.actel.com). The Designer Series includes the following manuals, which provide additional information on designing Actel FPGAs:

Getting Started User's Guide. This manual describes the design flow and user interface for the Actel Designer Series software, including information about using the ACTgen Macro Builder.

Using Designer. This manual provides an introduction to the Designer series software as well as an explanation of its tools and features.

PinEdit User's Guide. This guide provides a detailed description of the PinEdit tool in Designer. It includes cross-platform explanations of all the PinEdit features.

ChipEdit User's Guide. This guide provides a detailed description of the ChipEdit tool in Designer. It includes a detailed explanation of the ChipEdit functionality.

Timer User's Guide. This guide provides a detailed description of the Timer tool in Designer. It includes a detailed explanation of the Timer functionality.

Actel HDL Coding Style Guide. This guide provides preferred coding styles for the Actel architecture and information about optimizing your HDL code for Actel devices.

Silicon Expert User's Guide. This guide contains information to assist designers in the use of Actel's Silicon Expert tool.

DeskTOP Interface Guide. This guide contains information about using the integrated VeriBest® and Synplicity®CAE software tools with the Actel Designer Series FPGA development tools to create designs for Actel Devices.

Cadence® Interface Guide. This guide contains information to assist designers in the design of Actel devices using Cadence CAE software and the Designer Series software.

Mentor Graphics® Interface Guide. This guide contains information to assist designers in the design of Actel devices using Mentor Graphics CAE software and the Designer Series software.

Synopsys®Synthesis Methodology Guide. This guide contains preferred HDL coding styles and information to assist designers in the design of Actel devices using Synopsys CAE software and the Designer Series software.

Viewlogic®Powerview®Interface Guide. This guide contains information to assist designers in the design of Actel devices using Powerview CAE software and the Designer Series software.

Viewlogic® eProduct® Designer Interface Guide. This guide contains information to assist designers in the design of Actel devices using Workview Office CAE software and the Designer Series software.

VHDL Vital Simulation Guide. This guide contains information to assist designers in simulating Actel designs using a Vital compliant VHDL simulator.

Verilog Simulation Guide. This guide contains information to assist designers in simulating Actel designs using a Verilog simulator.

*Activator and APS Programming System
Installation and User's Guide.* This guide contains information about how to program and debug Actel devices, including information about using the Silicon Explorer diagnostic tool for system verification.

Silicon Sculptor User's Guide. This guide contains information about how to program Actel devices using the Silicon Sculptor software and device programmer.

Silicon Explorer Quick Start. This guide contains information about connecting the Silicon Explorer diagnostic tool and using it to perform system verification.

Actel FPGA Data Book. This guide contains detailed specifications on Actel device families. Information such as propagation delays, device package pinout, derating factors, and power calculations are found in this guide.

Macro Library Guide. This guide provides descriptions of Actel library elements for Actel device families. Symbols, truth tables, and module count are included for all macros.

A Guide to ACTgen Macros. This Guide provides descriptions of macros that can be generated using the Actel ACTgen Macro Builder software.

Online Help

The Designer Series software comes with online help. Online help specific to each software tool is available in Designer, ACTgen, Silicon Expert, Silicon Explorer, Silicon Sculptor, and APSW. online help is also available within the Veribest software tools and Synplicity Synplify® software.

1

Getting Started

This chapter describes how to install and test the software. It also contains important operating information that is useful when programming chips. For more detailed information about each command listed in this chapter, refer to Chapter 2.

Compatibility

Silicon Sculptor is designed to operate with any PC running Microsoft Windows™ 95, 98, or NT®. The computer must have a parallel printer port (LPT1, LPT2, or LPT3), at least 64M of memory, a CD-ROM disk drive, and a hard drive.

Hardware Installation

After you unpack the equipment, you are ready to connect the Silicon Sculptor to your PC.

To connect the Silicon Sculptor to your PC:

1. **Connect the programmer to a parallel printer port on your PC.** Connect one end of the cable to the programmer's connector and tighten the screws. Plug the other end of the cable into your parallel printer port.

2. **Verify that you have connected to the correct parallel port on your computer.** Actel recommends that you dedicate a port to the programmer. Connecting to a serial port or a third party card may damage the programmer. This type of damage is not covered by the warranty.

3. **Power up the programmer.** Plug the programmer AC power cord into a power socket.

   Note: The Silicon Sculptor power supply operates from 90 to 250 VAC for simplified worldwide use.

4. **Turn on the computer and programmer.** Both the Power LED and Active LED on each programmer site will light up. The Silicon Sculptor is performing a self-test when the Active LED is on. After

several minutes the Active LED will turn off and only the Power LED will remain on. If any of the Fail LED's have turned on, the Silicon Sculptor has detected an error during the self-test. If this occurs, make a notation of which unit displays the Fail LED and call Actel's technical support line @ (888) 99-ACTEL.

Software Installation

Your software installation procedure depends on whether you downloaded the software from the internet or are installing from a CD-ROM. Follow the instructions below to install the Silicon Sculptor software on your computer.

To install the software from the Internet download:

Go to http://www.actel.com/updates/sculptor.html and download the latest Windows version of Sculptor programming software.

When prompted, choose the drive and directory the self-extracting .EXE file will be saved in. Once the download is complete, double-click the .EXE filename to install the software.

To install the software from CD-ROM:

1. **Insert the Silicon Sculptor CD.** If the CD start-up browser screen does not start automatically when you insert the Silicon Sculptor CD, choose Run from the Start menu. Type the following command in the Open box:

   ```
   d:\setup.exe
   ```

   The "d" in the above command represents the drive letter of your CD-ROM. If your CD-ROM is not the "d" drive, substitute the letter of your CD-ROM for "d" above.

2. **Select a location for the SculptW program files.** Once activated, the installation screen for the software opens. The installation prompts you to choose a folder name and location for the SculptW program files. The installation software provides a default location, but if you wish to place these files in an alternate location, click in the field provided and type the location address.

If you have a previous version of the software installed on your computer, the installation procedure prompts you to uninstall the older version before continuing the new installation procedures.

3. Run Silicon Sculptor. Select Silicon Sculptor from the Programs list under the Start menu.

Silicon Sculptor Basics

SculptW utilizes all the standard functions of windows based formats including pull-down menus, action buttons, and hot keys along with on-line Help files. Refer to Chapter 2 for more information on these functions.

The initial screen of the SculptW software divides into two sections. The uppermost section is the main program window. It contains the software title and version number, as well as the pull-down menus and the tracking system for the devices you are about to program (Figure 1-1).
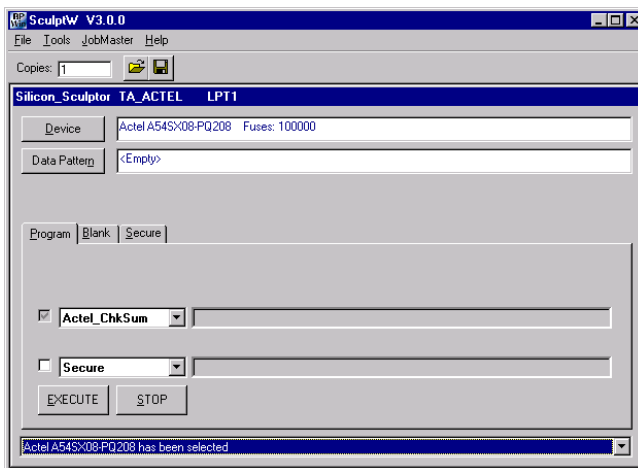
Figure 1-1. SculptW Main Screen

Use the secondary, floating window (known as the Action/Function window) to designate devices and data patterns and start and stop programming actions (refer to Chapter 2 for a more information on these functions). The title bar of the Action/Function window displays the following information:

- **Programmer detected or selected.** In the example shown in Figure 1-2 the selected programmer is "TA_ACTEL."

- **The technology adapter and socket module detected by SculptW.** In the example shown in Figure 1-2 the technology and socket module is "SM208PQBACT."

- **The location of the parallel port that detects the programmer.** In the example shown in Figure 1-2, the parallel port is "LPT1."

Note: If the software does not detect a programmer, it automatically starts in DEMO mode, allowing you all the functionality possible without a device programmer (Figure 1-1).

The software executes all actions/functions available in the DEMO mode except programming a device. You can add a programmer after startup in DEMO mode by selecting the Configure command from the File menu.
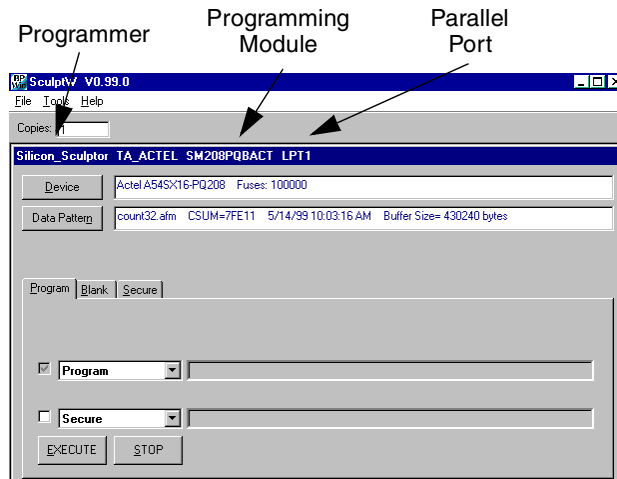
Figure 1-2. SculptW Detects Silicon Sculptor

The bottom pull-down menu, visible only when the program window is fully expanded, tracks the device(s) you select. This menu keeps a running list of all the devices you select during active use of the software. Once you exit the software the tracking list is reset.

Selecting a Chip

Click the Device button in the Action/Function window to select a chip. The Device button opens the Select Device dialog box. The list of parts in the Select Device dialog box contains every device currently supported by your programmer (Figure 1-3). Choose a device by scrolling down the available list, or use the search engine by typing directly into the "Look for" text field.
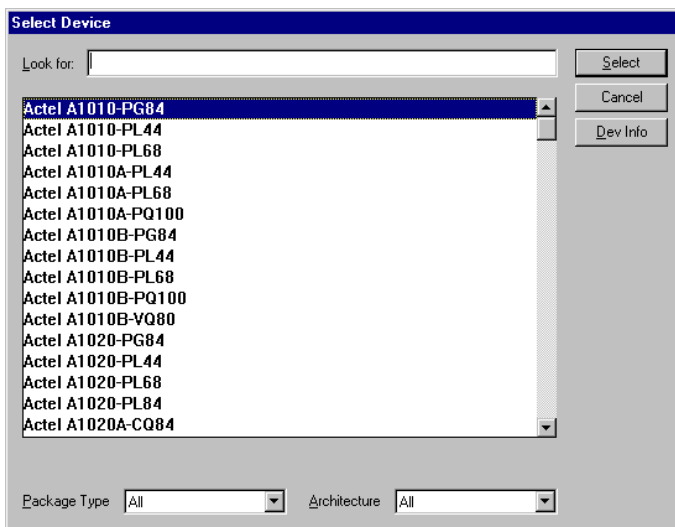
Figure 1-3. Select Device window

The search engine associates characters typed in the "Look for" field with the characters that are found in one or more string items listed in the software's device inventory. These characters do not have to be the beginning of the string line (i.e. the manufacturer's name).

If you type the letters "s" and "x," the software narrows the list down to any parts listed with those two letters in that particular order, shortest

name first. As you type, the list becomes more refined until you select a particular device.
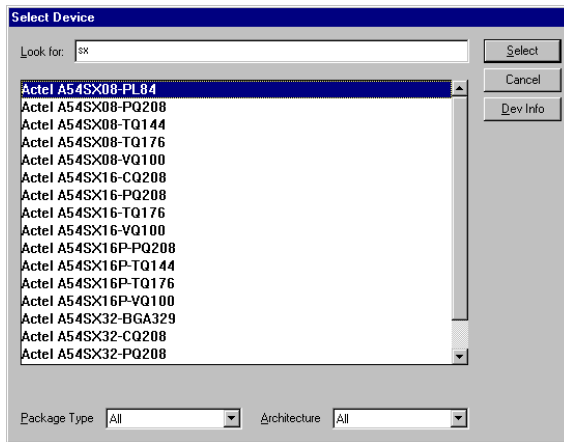
Figure 1-4. SculptW Search Engine

To narrow your choices before you search, select a Package Type and/or Architecture from the pull-down menus. Any package type or architecture not matching the type selected in the pull-down menu is excluded from the search. Refer to Chapter 2 for more information on the device selector.

To load a Data Pattern:

1. **Open the Data Pattern window.** Click the Data Pattern button in the Action/Function window.

2. **Select a file.** Select a file and press the Open button to display the file information. Confirm the file information and select OK to continue.

Click the Data Pattern button in the Action/Function window. To select one of the listed files, highlight the file and select Open. The software automatically identifies the file type and displays the information in a

secondary window for verification. Once you confirm the file information, select OK and the file loads into the data buffer.
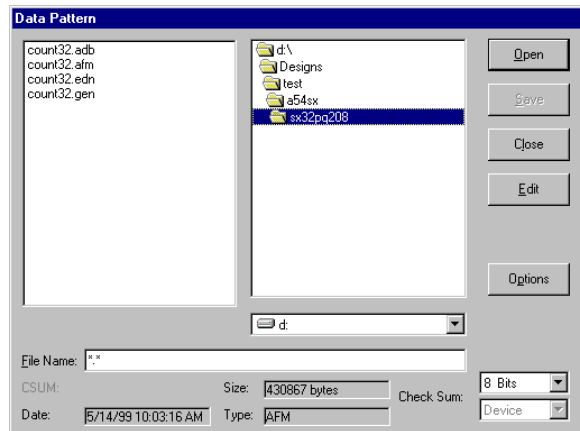
Figure 1-5. Data Pattern Window

Placing a Chip in the Socket

Refer to the appropriate device programmer manual to place a device in the socket module.

Note: Parts must not be inserted or removed when the ACTIVE LED is on.

2

Command Reference

The Actel Silicon Sculptor software places standard, device-specific functions at your command. Commands are located in drop down menus and file tabs in the main screen as well as hot-link buttons on each active dialog box. To execute a command, select the appropriate button or option.

Pull-Down Menus

The following section describes the Pull-Down menus available in Actel Silicon Sculptor software.

File
Use the commands under the file menu to control the communication with the programmer, input special code to enable advanced features, and monitor the number of copies you want to make. In addition, use the commands under the file menu to reset the program settings to their defaults and modify certain global options.

Configure

Configure re-establishes communication with the programmer. This allows you to change programmers if necessary. It also opens a dialog box that lists several options. This dialog box enables you to switch the

handler type from manual to auto-handler status and specify an experience level (novice or experienced).
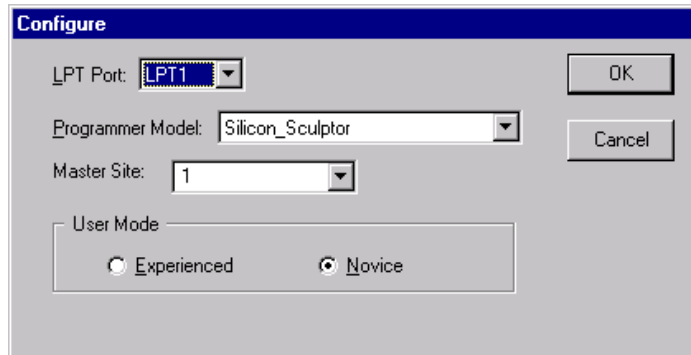
Figure 2-1. Configure Dialog Box for Actel Silicon Sculptor

The following menus are available in the Command dialog box in Silicon Sculptor:

• **LPT Port** identifies which parallel port is connected to the programmer. Choose from DEMO, LPT1, LPT2, or LPT3. Selecting DEMO disables communications with the programmer. You may utilize any of the software's functions while in DEMO mode, but you may not program a device.

  Note: DEMO is default selection if Sculptor cannot detect a programmer.

• **Master Site** indicates the Silicon Sculptor programmer that is connected to the PC.

• **Programmer Model** identifies which model programmer you are using. Select any programmer in DEMO mode and view the list of devices supported on that particular model in the Device Select dialog box.

• **User Mode** distinguishes between Experienced and Novice modes. Experienced mode permits options not allowed in Novice mode. For example, clearing the buffer and displaying ICC measurements on Verify and Test is available only in Experienced mode.

Selecting Novice instructs the program to prompt you to accept or cancel before you perform each operation. Novice is the default setting.

Upgrade

The Upgrade dialog box (Figure 2-2) allows you to input a special code, which enables Advanced Features (AFS) in the software. This code is required in order to enable the Actel Silicon Sculptor program to continue communications with the device programmer and to get support for all Actel devices. For more information, refer to "Troubleshooting" on page 31.
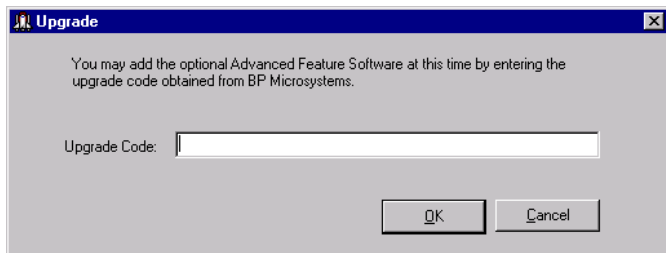
Figure 2-2. Upgrade Dialog Box

To receive an upgrade code, contact Actel Technical Support. Refer to Appendix A for a complete list of Technical Support contact information.

Tools

Use the commands in the Tools menu to reset the configuration of Silicon Sculptor.

Programmer Diagnostic

Programmer Diagnostic runs the programmer diagnostic test (Figure 2-3). The Silicon Sculptor diagnostics ensure that the power supplies

function properly and test the integrity of all the pin drivers. Select Actel diagnostic from the Device tab.
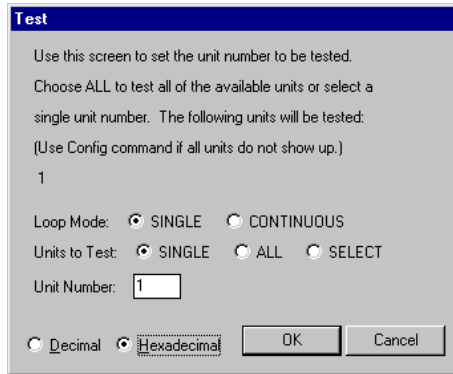
Figure 2-3. Diagnostics Dialog Box

Click OK to run the test on the: CPU, RAM, ROM, and logic communications; power supplies; motherboard analog; pin driver boards; current regulators; and mother board. The Diagnostics Report dialog box (Figure 2-4) opens when the tests are complete.
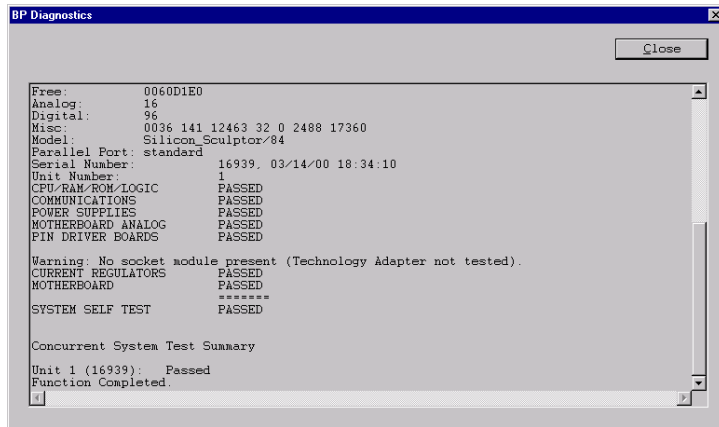
Figure 2-4. Diagnostics Report Dialog Box

Default Configure

Default Configure (Figure 2-5) enables you to reset all the settings to the default configuration. When this option is selected, you are asked to confirm whether or not you want to reset to the default configuration. This option is available to allow you to reset any given command back to its original settings whether or not you have changed the command.

For example, if a device calls for a mandatory verify and the operator changes it to Verify Twice, the Default Configure option will allow the user to change the setting back to a single verify.
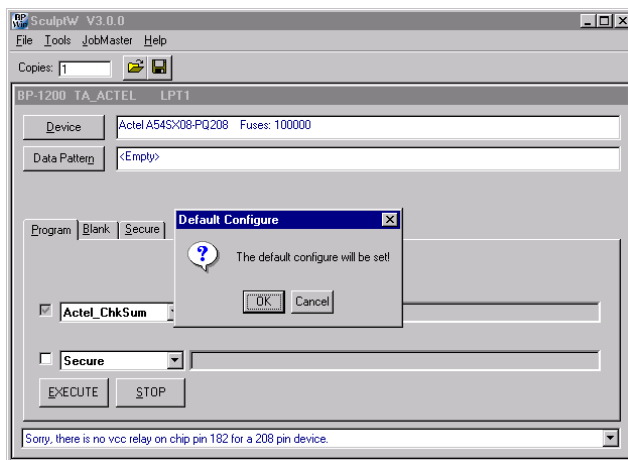
Figure 2-5. Default Configure Dialog Box

Options

The Options dialog box enables you to set global options.

Figure 2-6. User Options Dialog Box

- **Error Beep** turns on or off the sounds used to indicate completion, errors, end of job, etc.
- **Elapsed Time** displays the duration of time of a specific operation, i.e. Read, Program, etc.

Copies

The Copies field enables you to enter the number of devices you want to program. The software automatically tracks how many you have finished, how many failed, and how many remain to be programmed. When Sculptor reaches the Copies number successfully, it displays a Job Summary report for printing.

Help

Help/Tech Support lists the phone numbers and e-mail address for reaching Technical Support. Refer to Appendix A for Technical Support contact information.

Help/About Actel Silicon Sculptor displays the current Silicon Sculptor version number and specifics about the software.

Action Buttons

Actel Silicon Sculptor includes action button links (commonly known as "buttons") as well as pull-down menus and file tabs, which enable

you to direct the program to specific locations and tasks. The following is a list of the Action Buttons and their functions.

Device Button

The Device button enables you to access to the list of devices supported by the designated device programmer via the Select Device dialog box.

Select Device Dialog Box

The Select Device Dialog Box (Figure 2-7) offers a list of devices supported on the programmer model you selected in Configure. Select a device to configure the programmer with the correct programming algorithm. The algorithm is specified by Actel and contains the voltage, timing, and pin-out requirements.
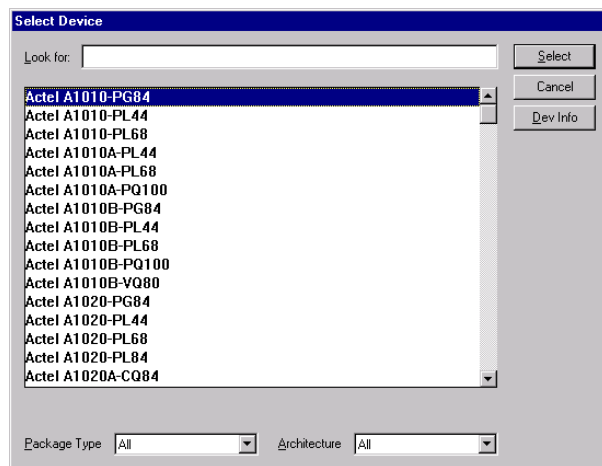
Figure 2-7. Select Device Dialog Box

Type the part number in the Look for text box. Notice that as you type the characters, the device list narrows to show only those devices containing the characters you have typed, in the order you type them. To further narrow the list, designate a particular Package Type or Architecture.

Click the desired selection from the list of supported devices. It is important to select the correct device for programming. Some character suffixes at the end of the part number pertain to temperature or speed ratings and are not of importance for programming. Choose the device that most closely matches your device part number.

When you have highlighted the correct device is highlighted and entered the appropriate information, click the Select button to load the algorithm for that device or Cancel to escape without selecting.

The Package Type dialog box narrows the search by listing only devices with the package type you select.

The Architecture dialog box narrows the search by listing only devices with the type of architecture you select.

Note: Changing the Package Type and Architecture fields may cause the changed options to revert to the default settings.

Dev Info Button

The Dev Info button lists information for the highlighted device including certain notes and relevant precautions (Figure 2-8). The notes and precautions include algorithm settings, incorrect data pattern information, erasing procedures, etc.

Device Information

Manufacturer: Actel
Part Number: A1010B-PQ100
Fuses: 112000
Vcc(program): 5.5V
Vpp(program): 6V
Secure: Yes
Packages: QFP(100)
Socket Modules: ASM100PQRB, Silicon Sculptor: SM100PQ-ACTEL
Supported by: BP-1400 BP-2200 BP-2500 Silicon_Sculptor
Notes: Programmable Logic Device

OK
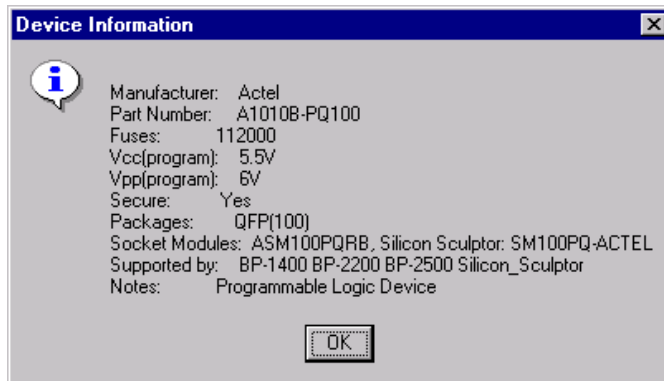
Figure 2-8. Device Information Dialog Box

Once you select a device and the Select Device window closes, the device information appears in the field next to the Device button. A note or

warning may appear in the Device Information window to inform you of any additional relevant information.

Data Pattern Button

Once you make a device selection, you must choose a data pattern. Click the Data Pattern button to display the Data Pattern dialog box (Figure 2-9). Use this dialog box to load data into the buffer from a file or another device. Browse to your file and load as necessary. The Data Pattern dialog box enables you to designate .HEX or .DEC files, and edit the buffer.
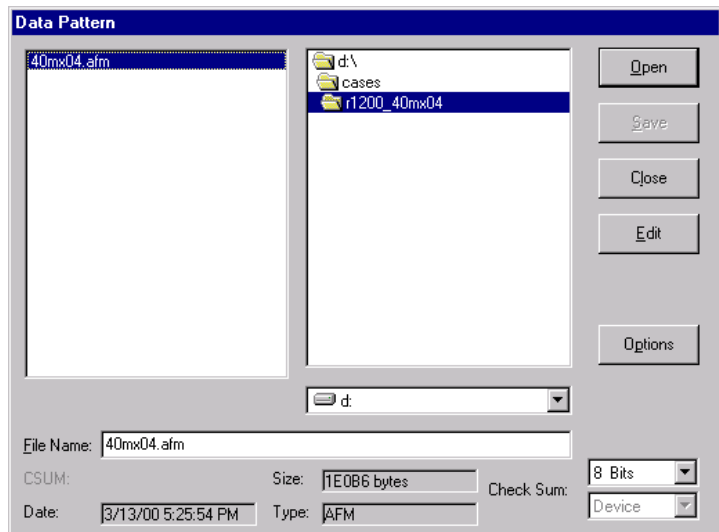
Figure 2-9. Data Pattern Dialog Box

Check Sum displays two fields with pull-down menus. You may select an 8- or 16-bit sum method. Device sums the number of bytes in the buffer equal to the byte count in the device you selected. If you load a file that is smaller than the device you selected, Silicon Sculptor uses the Default Buffer Value when summing the remaining bytes.

Open Button

The Open button brings up the Load File into Buffer window. Several options are available before loading the file. Actel devices use the AFM file.
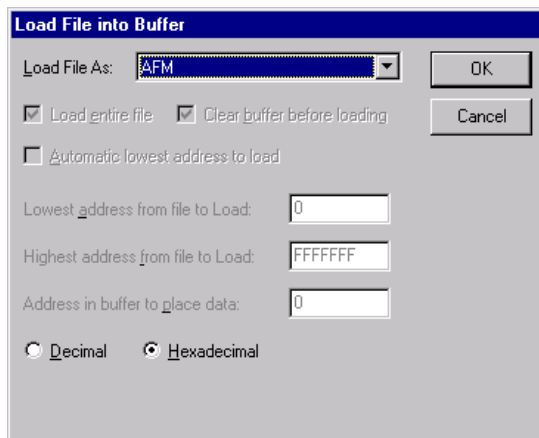
Figure 2-10. Load File Into Buffer Dialog Box

The **Load File As** pull-down menu allows you to specify the file type of the data you wish to load. Even though the software interrogates the file and automatically chooses the file type, it is important that you select the correct file type so that the correct data is loaded at the correct address. If the file type you select is not consistent with the type you wish to load, use the pull-down menu option to choose the appropriate type.

When you load the AFM or DIO file from the Data Pattern dialog box, then Silicon Sculptor automatically disables the following options:

- Load entire file (checked as default)

- Clear buffer before loading (checked as default)

- Automatic lowest address to load

- Lowest address from file to load

- Highest address from file to load

- Address in buffer to place data

Decimal or Hexadecimal enables you to select a preference for viewing address information in any preceding fields.

Once you determine your specs and are ready to load the file into the buffer, click OK. If you wish to exit without loading the buffer, click Cancel.

To load the buffer from a file - select the drive, directory, folder and file. Select the file you wish to load, and then click the Open button. The Load File into Buffer window appears and prompts you to designate the file type. After you designate the data type for the file, the data is loaded into the buffer.

Save Button

The Save button brings up the Save File from Buffer dialog box and saves the buffer contents to disk. You may choose any local or network drive available when you save the file.
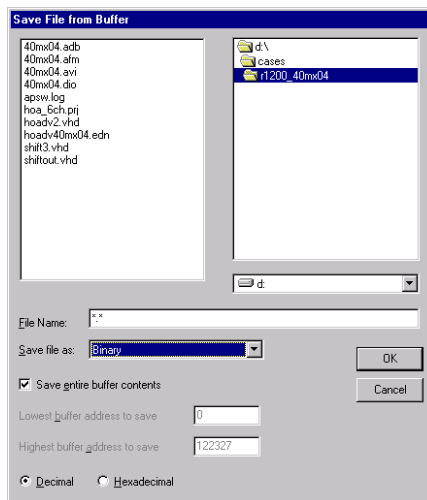
Figure 2-11. Save File from Buffer Dialog Box

- **File Name** text field is where you type the name of the data file. Actel recommends that you adhere to the standard 8/3 format (eight-

character name followed by three-character extension for file type) for fluidity.

- **Save file as** field allows you to designate the file type when formatting the data file.

- **Save entire buffer contents** is checked as default. Uncheck this box if you wish to save a specific address range. When unchecked, the Lowest buffer address to save and the Highest buffer address to save options become available.

- **Lowest buffer address to save** field allows you to specify the lowest buffer address to save.

- **Highest buffer address to save** field allows you to specify the highest buffer address to save.

- **Decimal** or **Hexadecimal** enables you to select viewing address information in any preceding fields.

To save the file, click OK. To exit without saving, click Cancel.

Close Button

The Close button closes the Data Pattern dialog box without opening a file. If you save a file or make any checksum selections, these changes are saved over the original file and are active when you retrieve the file later.

Edit Button

Click the Edit button to edit the buffer contents.
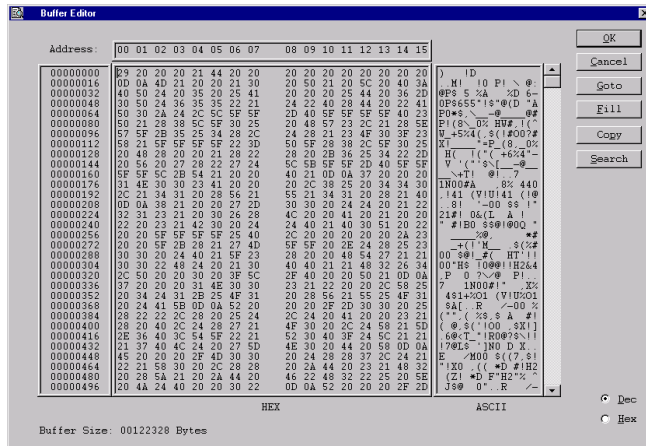
Figure 2-12. Buffer Editor Dialog Box

The Buffer Editor dialog box lists the addresses on the left of the screen, the data for each address in the middle with the fuse legend directly above, and the ASCII version of the file on the right.

The Buffer Editor window enables you to:

- **Goto** a certain memory location within the buffer

- **Fill** a range of addresses with a certain value

- **Copy** a specified memory range to another location within the buffer

- **Search** for a data pattern within the buffer

- Specify **Dec** or **Hex** via a button

The Search function enables you to start your search from a particular address (in the Start Address field) or search for a particular pattern of data (in the Pattern field). The Pattern field enables you to specify whether the pattern you are searching for is in hex or ASCII and whether the search goes forward or backward from the starting address.

Note: Actel recommends that you do not edit the programming file to avoid corruption.

Clear Button

The Clear button clears the buffer contents to the value specified as the default buffer value. This button only appears when the Configure menu option is set to Experienced Mode.

Options Button

The Options button enables you to set options specific to the data buffer. The default buffer value is 0x00. This option will fill the address locations not specified in the file to 0x00 or 0xFF, whichever is selected.
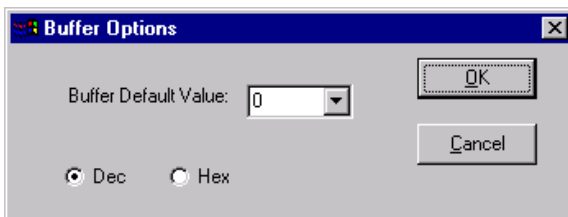
Figure 2-13. Buffer Options Dialog Box

Device Config Button

The Device Config Button can only be found in Demo mode.

Main Screen File Tabs

Depending on the device you select, any of the following action/ function file tabs may appear in your viewing screen.

Actel_ChkSum

Calculates, displays, and verifies the Actel design checksum for single-site operation. Verifies the design checksum of the program file to the checksum value programmed into the device. Also displays the 16 bit checksum and the 20 bit user defined design ID.

Blank   Verifies that a device is blank (all fuses unprogrammed, or open). Prior to programming, verifies that a device has not been previously programmed. This operation is automatically executed prior to programming any device.

Program   Programs a device from data in the buffer. The program button programs your design into the device. It also verifies that the correct device type is inserted into the socket and verifies the device is blank (unprogrammed) before programming begins.

Secure   Programs the security fuse(s) to prevent unwanted probing of the device. You can program Security fuses on an Actel device that has had its Array fuses previously programmed. The ability to program Security fuses after programming Array fuses is designed to allow you to debug your device design with the Silicon Explorer diagnostic tool. After you debug your design, you can program the security fuses to secure the device from further probing.

ACT 1 or 40MX Security Fuse Configurations

The ACT 1 devices contain two security fuses: Probe and Program. Programming the Probe fuse disables the Probe Circuitry, which disables the use of the Debugger, ActionProbe, and Silicon Explorer diagnostic tools. Programming the Program fuse prevents further programming of the device, including programming the Probe fuse. Table 2-1 summarizes the effects of programming the Security fuses on the PRA, PRB, SDI, and DCLK pins. In the normal operating mode (MODE=0), all undefined device pins in a design are automatically configured as active LOW outputs. Two exceptions are the SDI and DCLK pins. If the Program fuse is not programmed and SDI and DCLK are undefined, they are configured as inactive inputs. In this case, SDI and DCLK pins

should be tied to ground. If the Program fuse is programmed and SDI and DCLK are undefined, they will become active LOW outputs.

Table 2-1. Security Fuse Configurations- ACT1 or 40 MX Devices

Mode[a]	Program	Probe	PRA, PRB	SDI, DCLK
Low	No (deselect)	No	User-defined I/O	User-defined Input Only[b]
Low	No	Yes[c]	User-defined I/O	User-defined Input Only[b]
Low	Yes[d]	No	User-defined I/O	User-defined I/O
Low	Yes[d]	Yes[c]	User-defined I/O	User-defined I/O
High	No	No	Action-probe Out-puts[e]	Actionprobe Inputs[f]
High	No	Yes[c]	Actionprobe Disabled	Actionprobe Disabled
High	Yes[d]	No	Action-probe Out-puts[e]	Actionprobe Inputs[f]
High	Yes[d]	Yes[c]	Actionprobe Disabled	Actionprobe Disabled

a. The MODE pin switches the device between the normal operating mode (MODE=0) and the Probe Circuit mode (MODE=1).

b. The Program fuse must be programmed if the SDI or DCLK pins are to be used as an output or a bidirectional pin.

c. If the Probe fuse is programmed, the Probe Circuit is permanently disabled, which disables the Silicon Explorer diagnostic tool.

d. If the Program fuse is programmed, all programming of the device is disabled, including programming the array fuses and the Probe fuse.

e. The PRA output and a separate I/O buffer share the use of a single device pin. The PRA output and the output function of the I/O buffer are multiplexed. The same is true for PRB. The Probe Mode that is loaded into the Mode Register determines which output buffer is active during probing. There are three possible Probe Modes: "PRA only," "PRB only," and "PRA and PRB."

When you select the "PRA only" mode, the PRA output becomes active and the output function of the I/O buffer associated with the PRA pin is inhibited. However, the input buffer portion of the I/O buffer associated with the PRA pin is still active. Any internal signal that appears on the PRA output is fed back through that input buffer to the internal Logic Modules. This could interfere with the expected function of the design during probing. Actel recommends that you use an input latch on PRA and PRB to prevent the feedback while probing. PRB functions as a normal I/O in the "PRA only" mode.

The "PRB only" mode is functionally equivalent to the "PRA only" mode. PRA also functions as a normal user I/O in the "PRB only" mode.

When you select the "PRA and PRB" mode, both the PRA and PRB outputs become active and the output function of the I/O buffers associated with both pins are inhibited. However, the input buffer of the I/O buffers associated with both pins are still active. Any internal signals that appear on the PRA and PRB outputs are fed back through the input buffers to the internal Logic Modules. This could interfere with the expected function of the design while probing. Actel recommends that you use an input latch on PRA and PRB to prevent the feedback during probing.

f. The SDI input and a separate I/O buffer share the use of a single device pin. The SDI input and the input function of the I/O buffer are connected in parallel. When the Mode pin is high, both inputs are active. The same is true for DCLK. External Probe Circuit control signals sent to those pins are also sent to the internal Logic Modules. This could interfere with the expected function of the design while probing. Actel recommends that you use an input latch on SDI and DCLK to prevent the external Probe Circuit control signals from effecting the functionality of your design during probing. If either SDI or DCLK are configured so that the output function of the I/O buffer is active, the Program fuse must be programmed. In this configuration, the signals from your design are fed back to the Shift Register and will interfere with the function of the Probe Circuitry. In addition, the I/O drivers will conflict the external SDI and DCLK drivers. Damage to both drivers could occur.

Non-ACT 1 or 40MX Security Fuse Configurations

All Actel devices other than ACT 1 or 40MX devices contain one Security fuse. Programming the Security fuse disables the Probe Circuitry, which disables the use of the ActionProbe and Silicon Explorer diagnostic tools. Table 2-2 summarizes the effect or programming the security fuse on the PRA, PRB, SDI, and DCLK pins.

In the normal operating mode (MODE=0), all undefined device pins in a design are automatically configured as active LOW outputs. You do not need to program the Security fuse to enable SDI and DCLK as active LOW outputs.

Table 2-2. Security Fuse Configurations- Non-ACT1 or 40MX Devices

Mode[a]	Security	PRA, PRB	SDI, DCLK
Low	-	User-defined I/O	User-defined I/O
High	No	Actionprobe Outputs[b]	Actionprobe Inputs[c]
High	Yes[d]	Actionprobe Inputs	Actionprobe Inputs

a. The MODE pin switches the device between the normal operating mode (MODE=0) and the Probe Circuit mode (MODE=1).

b. Please refer to Table 2-1, item e.

c. The SDI input and a separate I/O buffer share the use of a single device pin. The SDI input and the input function of the I/O buffer are connected in parallel. When the Mode pin is high, both inputs are active. The same is true for DCLK. External Probe Circuit control signals sent to those pins are also sent to the internal Logic Modules. This could interfere with the expected function of the design while probing. Actel recommends that you use an input latch on SDI and DCLK to prevent the external Probe Circuit control signals from effecting the functionality of your design during probing. An input latch is an integral part of the I/O buffers in the non-ACT 1 devices. The output function of the I/O buffers associated with SDI and DCLK do not interfere with the function of the Probe Circuitry while in the Probe Mode. When the Mode pin is driven high, these outputs are inhibited. The I/O drivers do not interfere with the external drivers. However, these outputs are not observable in the Probe Mode

d. If the Security fuse is programmed, the Probe Circuit is permanently disabled, which in turn disables the ActionProbe and the Silicon Explorer diagnostic tools.

Keyboard Usage and Hot-Keys

Actel Silicon Sculptor utilizes keystroke combinations, called hot-keys or quick-keys, to allow you more freedom in invoking the program functions. Listed below are common keys and keystroke combinations used within the software. You may also use the keystroke combination ALT + [Underlined character] wherever applicable.

For example, press the ALT+F keys to open the File pull-down menu. Instead of using your mouse.

Table 2-3. Common Usage Keys

KEY	FUNCTION
Esc	Close the current window/retain original information. *Does not work in Configure window, must actually click on the Cancel button.
<-, ->,	Move left or right to a selection.
Up arrow, down arrow	Move up or down to a selection.
Enter	Execute function command that is selected.

Table 2-4. Common Hot-Keys (Quick Keys)

KEY COMBINATION	FUNCTION
ALT-C	Device Configure window (available only in Demo mode).
ALT-D	Brings up Select Device window.
ALT-E	Execute or test depending on device selected.
ALT-F	Select File drop down menu.
ALT-H	Selects Help drop down menu.
ALT-O	Used only in Data Pattern window; selects Open button.
ALT-P	Selects Program file tab.
ALT-S	Selects Secure file tab or Stop button if Secure tab is not available.

Table 2-4. Common Hot-Keys (Quick Keys) (Continued)

KEY COMBINATION	FUNCTION
ALT-T	Selects Tools drop down menu.
ALT-V	Selects Verify file tab.

Table 2-5. Dialog Box Command Functions

KEY	FUNCTION
Esc	Cancel the active window and return to Main Screen.
Enter	Exit the dialog box and execute command.
Home	Move to first selection of current line.
End	Move to last selection of current line.

Table 2-6. Edit Command Functions

KEY	FUNCTION
Up arrow, down arrow, left arrow, right arrow	Move cursor.
Home	Move to front of current line.
End	Move to end of current line.
CTRL-U	Upgrade window.
Enter	Make selection.

3

Troubleshooting

The information in this chapter may help you solve or identify a problem with your software and/or programmer. If you have a problem that you cannot solve, please call us. We are dedicated to making Actel software and programmers as trouble-free as possible.

Tech Support Program

Refer to Appendix A for contact information. You can get technical support from Actel anytime that you experience a problem that you cannot solve. We kindly request that you have the following information ready when you contact us:

- The model number of the Actel programmer (title bar of secondary screen).

- Your software version number (from the top of the main screen).

- The exact error message and error number you received.

- The exact algorithm that was selected.

- The exact part number on the chip you were trying to program.

- The command you executed.

- The results of running the self-test command on your programmer (BP Microsystems Diagnostics).

It is also useful to have a print-screen of the error. You may be asked to upload your file and/or send in your devices so we can analyze the error at the factory.

If you need to return your programmer to Actel for any reason, you must call and get a Return Material Authorization (RMA) number before shipping; mark the RMA number clearly on the shipping container. Be sure to include a description of the problem experienced, a return address, contact person and a phone number.

Testing the Hardware

The programmer can test its hardware quite extensively. The self-test routine can detect problems in the pin-drivers, power supply, microprocessor, data cable, printer port, and several other circuits.

The hardware test cannot detect problems resulting from a dirty socket.

Note: Remove any chips from the programmer site(s) before you proceed.

The ActelWin software enables you to test all applicable parts within the device programmer for accuracy. This test helps to ensure that the programmer is running at performance standards.
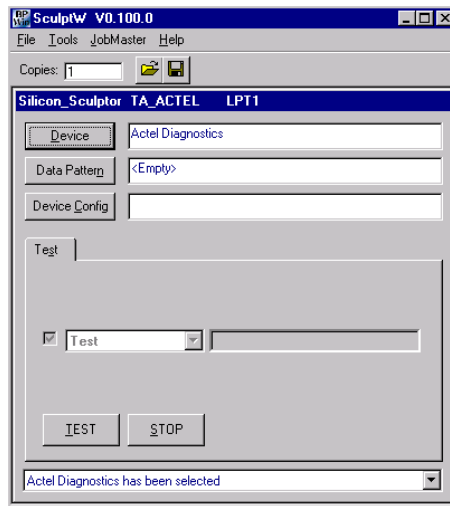
Figure 3-1. SculptW Dialog Box with Test Information

To begin running the self-test on your device programmer, click the Device button, and select Actel Diagnostics from the list of available devices (type "diagnostics"). Once selected, the main window displays the Actel Diagnostics label in the Device field and a Test file tab

appears (Figure 3-1). To begin testing the programmer, click the Test button. The Text dialog box opens, as shown in Figure 3-2.
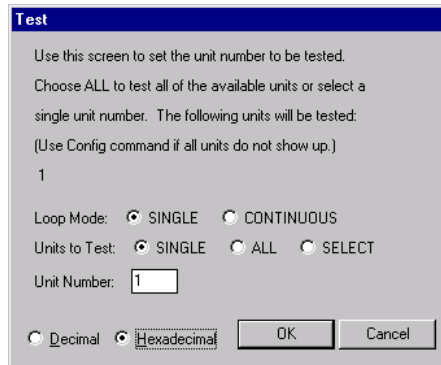
Figure 3-2. Test Dialog Box

The Test dialog box verifies how many units you wish to test. After you click OK to begin the test, a window appears to prompt you that there is no chip in the socket (Figure 3-3).
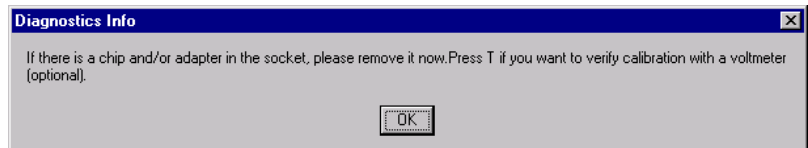
Figure 3-3. Diagnostics Info for Self Test Window

The test begins and runs until it is done or until you click on the Stop button. If you decide to cancel the self-test, click on the Stop button at any time during the procedure. A window appears to acknowledge the

operation was aborted (Figure 3-4). To re-execute the test, simply click the Test button again.

Figure 3-4. Self-test Abort Window

Your programmer should pass the test. Verify by checking the green PASS LED on the chassis of the programmer. If your programmer does not pass the test, the red FAIL LED activates and an error message presented on-screen:

Error 47: Self-test failed. This unit may need service. Please call technical support.

If this should happen, double-check the fidelity of the cable connections and try again. Note the exact error message and call us for technical assistance if you are still having trouble (refer to Appendix A for Technical Support contact information.).

Software Updates

The control software for your programmer is updated on a frequent basis (typically every two months) to add features and provide you with support for new chips. Software updates can be obtained from Actel corporation.

Software upgrades may be obtained through our Internet address (http://www.actel.com), but depending on the type of programmer you have (engineer, production or automated), upgrades and renewals may need to be made by contacting our sales department.

If you decline the software/hardware upgrade and your software support runs out, you will receive the following message when you select a part:

```
Error Code 57: Device Not Enabled
```

Your programmer is designed to be highly flexible and programmable, allowing it to program a wide variety of chips. Consequently, when a problem does arise, it can usually be fixed with a software update.

We recommend that you obtain the latest software revision before calling our support line with a software problem. The solution for many of our technical support calls is the latest version of the software.

FAQ's

The questions below represent a list of the most commonly asked questions from callers. It does not represent a complete list. Please visit the Actel website for more information.

Why does the ActelWin NT 4.0 software keep failing?

The device drivers are not installed or are not being recognized by the software. The Actel software that runs on an NT environment is attempting to establish communication with the device programmer through the drivers. When the drivers are not found, it fails the software. To remedy this, you need to install, or re-install, the device drivers for the software. Please refer to the steps listed below the following question to obtain the device drivers and verify that the software is recognizing them.

Why isn't ActelWin running in the NT environment?

The Windows NT 4.0 system requires the installation of a systems device driver. The first step to take is to find out whether a device driver is installed or not.

1. **Open the control panel.** Select Control Panel from the Settings menu, under the Start menu.

2. **Open Devices.** Double-click the Devices icon.

3. **Select the device BPNTDriver.** Verify that the device driver status is set to "started" and startup is set to "automatic." If these selections are not designated for the device driver, click to select the driver. To set the status to "start," click the Start button. NT attempts to start the device driver when you click the Start button. To set the driver startup to automatic, click the startup button and select automatic.

If for some reason the device driver does not install or you need to uninstall the driver, go to the command prompt. Go to the NTDrvr sub directory of the default installation directory. For example, the default installation directory for Silicon Sculptor is C:\siliconwin.

- To uninstall from this directory type: drvinstl -u

- To install from this directory type: drvinstl -i

There are registry settings for the device driver and as soon as there is a full definition they will be added here.

In the DOS version, the configuration settings were saved to a file. Where did they go?

With the introduction of the Actel software, the configuration settings are no longer saved to a file. These settings are now being saved in the Windows 95/98/NT 4.0 Registry and are not deleted when they are uninstalled. This allows you to continue to use previous settings when upgrading to a new version of the software. There may be cases however, when you are required to delete these settings. To do so, execute the following steps:

1. **Run "regedit."** Select Run from the Start menu in the Windows taskbar.

2. **Select ActelWin.** Select ActelWin from the VB and VBA Program Settings file list.

3. **Delete the ActelWin registry settings.** The ActelWin registry settings have now been deleted. The new registry settings appear in this directory upon re-installation or upgrade of the software.

Errors While Programming

If you experience problems while trying to program a chip, try to narrow down the problem. If you receive a Cannot program or Cannot erase error messages while programming:

- Make sure you have selected the proper programming algorithm.

- The device may have been previously secured; use Blank Check to verify whether or not the device is blank.

- The device may have a newer die than the one supported by the programming algorithm

Cleaning a Dirty DIP Socket

If the DIP socket becomes dirty, it sometimes fails to make contact with all the chip pins. The simple fix is to place your chip in the socket, push the lever down, and slide the chip left and right a few times.   Actel also recommends cleaning sockets with a blast of high-pressure air on a regular basis.

If this does not resolve the problem, run the hardware self-test described above. If your hardware passes the self-test, there may be an error in the programming algorithm you are using or Actel may have updated the programming algorithm for your device. In either event, your can probably correct your problem with a software update.

Error Messages and Suggested Actions

Error messages are usually generated by the device programmer. When you receive an error message, refer to the appropriate device programmer manual's Troubleshooting section. The following is a list of error messages that could originate from the software.

Version Mismatch - BPEng.dll and BPAlg.db versions mismatched.

The engine and Algorithm database versions do not match. Accepting this error message prompts an exit from the software. Please contact technical support for further assistance. Refer to Appendix A for Technical Support contact information.

BPPgmr.ocx - BPPgmr.ocx internal error

ActWin generates this error when the unique coding sequence attached to both the BPPgmr.ocx and the BPEng.dll do not match. Accepting this error message prompts an exit from the software. Please contact technical support for further assistance.

Algo Database Error - Error loading BPAlg.db

This is a 'catch all' error code. ActWin generates this error if anything not listed above causes an error while loading the Algorithm Database. Accepting this error message prompts an exit from the software. Please contact technical support for further assistance. Refer to Appendix A for Technical Support contact information.

BPNtIoDll - No parallel port is available.

ActelWin NT 4.0 generates an error if the device drivers are not installed. The software attempts to establish communication with the programmer through the driver. When the driver is not found, it fails the software. In order to remedy this, you must install the device drivers for the software. Please refer to "FAQ's" on page 35 for procedures.

Error 3: Cannot reset hardware.

The software cannot establish communication with the programmer. Here are some suggested actions:

- Be sure the programmer has proper power and that the green PASS LED is on. Since the programmer performs an automatic Power On Self Test (POST) upon startup, it could be that the programmer failed the test and has signaled the software into the default DEMO mode. If this should happen contact Technical Support.

- Make sure the cable from the programmer to the computer is properly connected to a parallel printer port. If you are using a ribbon cable, this is probably the problem (ribbon cable connectors are designed for use inside a chassis where the cable is not flexed). You should use a shielded 25-conductor cable (not an RS-232 cable).

- Check your LPT port. If you have multiple parallel ports, you may have the ports configured incorrectly; that is, two at the same address. Some laptops have the ability to disable the port. If you have one, make sure the LPT port is enabled.

- Another program (such as a print cache) may be interfering with the port. When running under Windows, you increase the likelihood of another program trying to access the same parallel port and changing the expected status at the port.

- If you have a hardware lock key between the programmer and the port, try removing it.

- Last but not least, the programmer may be damaged. Try another computer and/or parallel port and see if it works there.

Error 5: Hardware time-out.

The software issues this error message when it is waiting on a response from the programmer while executing a command and the programmer does not respond within the expected amount of time. This error may result from several causes. You may be experiencing communication errors (see "Error 3: Cannot reset hardware" above). There may be a bug in the software for this particular algorithm (see Error 10: Error in programming algorithm" below). Refer to "Testing the Hardware" on page 31 for more information.

Error 6: Wrong model number.

See "Error 3: Cannot reset hardware" above for possible causes.

Error 8: LPTx: is not a functioning port.

The parallel port LPTx (where x=1, 2, or 3) that is selected with the Configure command does not exist in your computer, is not functional, or has a bad cable connected to it.

Error 9: Programmer execution error.

The programmer failed an internal consistency check. See "Error 3: Cannot reset hardware," and "Error 5: Hardware time-out," for possible causes.

Error 10: Error in programming algorithm. Please call technical support.

The software has detected an internal error. You should contact Actel to report the error. You may need to upgrade your system with the most recent release of the software. Refer to Appendix A for Technical Support contact information.

Error 11: There is no data in the buffer. You must load a file or read

a chip.

A command tried to read data from the buffer to program or verify a chip, but nothing has been loaded into the buffer yet or the buffer was recently cleared.

Error 14: There is no chip in the programmer site.

Be certain that you inserted your chip correctly. If the chip was inserted correctly, remove it and run the hardware self-test to be sure your programmer is functioning correctly (Actel Diagnostics). A defective chip may cause this error. When using an autohandler, the contactor may not have closed or the connection between the programmer and the contactor may be disconnected.

Error 15: The chip is not inserted in the programmer site correctly.

The continuity test determined that the chip in the programmer site does not have continuity on all the proper pins. You should examine these pins carefully. Possible causes are:

- A bent pin.

- The chip is not in the proper position in the programmer site.

- The chip has a different number of pins than the chip selected.

- The algorithm selected has a "*", indicating it requires an adapter, but you did not use the adapter, or vice-versa.

- The socket is dirty and not making a connection. Refer to "Cleaning a Dirty DIP Socket" on page 37 for more information.

- The wrong socket module or adapter is being used for this part.

- The device may be a very low power device that is not properly detected by our continuity methodology. If so, please let us know.

Note: It's not easy to get continuity on an LCC device in a PLCC socket. If you are trying to do that, then you may need to add a spacer between the chip and the lid in order to apply the proper force to the device pins. The best solution is to purchase an LCC socket module that does not require any such modification. Also, LCC devices do not work at all in the autoeject sockets designed strictly for PLCC devices.

Error 16: The chip is inserted backwards.

The chip has passed the continuity tests, but appears to have the GND and Vcc pins improperly placed in the socket. If LCC, PLCC, or QFP is not accidentally rotated, then the device is probably defective. Try a known good device.

Error 17: Out of base memory. You should have at least 200K free.

Your computer's configuration does not have enough RAM available to run the software. You should have 640K RAM installed with at least 200K available for program execution. Memory resident programs, such as network drivers, may reduce the RAM available to the programmer, so you may need to remove these programs from your CONFIG.SYS and AUTOEXEC.BAT files. If you are using DOS 5.00, you can specify that DOS be loaded into high memory, saving base memory for Silicon Sculptor software. See your Microsoft Windows manual for details.

Error 18: Temporary file error.

Our software's virtual memory manager is trying to store data that is currently not needed in RAM to the disk. The program was unable to create a temporary file or the disk is full. You should make sure you have plenty of disk space (the larger the data files, the larger the requirement for temporary disk space). The program does take advantage of EMS memory if you have an expanded memory manager installed. This is much faster than using the disk for temporary swap space.

Error 21: Cannot program.

Not able to program the device in the programmer site. Refer to "Errors While Programming" on page 36 for more information.

Error 23: Invalid electronic signature in chip (device ID).

The chip may be damaged or the programming algorithm may have changed.

Error 24: Invalid electronic signature in chip (algorithm ID).

The chip may be damaged or the programming algorithm may have changed.

Error 26: Device is not blank.

The Device/Blank command was executed or the "Blank check before programming:" option was enabled in the Device/Options dialog box and the device in the programmer site is determined to have programmed data. You ma have used the wrong algorithm or the device has been programmed previously.

Error 27: Device is not secured.

An attempt to secure a device was made, but it failed. Refer to "Errors While Programming" on page 36 for more information.

Error 31: Database file is invalid. The .EXE file is corrupted.

The .EXE file you are executing has been corrupted. You should uninstall and then reinstall the software to fix the executable. Refer to Appendix A for Technical Support contact information.

Error 32: Sorry, algorithm not found. Please call technical support.

The .EXE file you are executing has been corrupted. You should get a new copy from Actel. Refer to Appendix A for Technical Support contact information.

Error 33: You must reselect the chip you want to program.

The device was selected before establishing communications with the programmers, perhaps prior to turning on the programmer or before switching to a different programmer. Reselect the chip and the error should not re-occur.

Error 36: You must properly install the correct socket module.

You get this error message if:

- There is no socket module installed.

- The socket module installed does not support the device you have selected.

- The socket module installed is not supported by the version of the software you are using. Use the latest version.

- The pinout has not yet been defined for this package type. It may be an oversight on our part. If so, check the different potential situation

and in case of persistent error, please call technical support and inform us of this problem.

Error 39: Device already secured.

The device cannot be legitimately programmed, read, etc., because it is secured. If it is a PLD it may still be functionally tested with the Test command under the Test file tab.

Error 44: Internal error. Please call technical support.

The software detected an internal inconsistency. This may be caused by the computer not performing correctly. Refer to Appendix A for Technical Support contact information.

Error 46: AFS software required to execute this function.

This is a function that is available to users that have purchased the Advanced Feature Software only. In order to use the chosen function you must buy the AFS upgrade.

Error 47: Self-test failed. This unit may need service. Please call technical support.

The self-test (Actel Diagnostics) has detected a hardware problem. The unit may need to be returned for repair. Note the exact error message and contact Technical Support. Refer to Appendix A for Technical Support contact information.

Error 57: You must purchase support for this device to use it.

The device that you selected is not supported in the default device set for this programmer. Call Actel Sales line to purchase an upgrade code for your programmer (refer to Appendix A for contact information).

Error 70: The buffer data cannot be used to program this device.

You loaded a file type that is not a valid option for the currently selected device. Re-select the device and load the buffer again. If the error persists, call Actel Technical Support. Refer to Appendix A for Technical Support contact information.

Product Support

Actel backs its products with various support services including Customer Service, a Customer Applications Center, a web site, an FTP site, electronic mail, and worldwide sales offices. This appendix contains information about contacting Actel and using these support services.

Actel U.S. Toll-Free Line

Use the Actel toll-free line to contact Actel for sales information, technical support, requests for literature about Actel and Actel products, Customer Service, investor information, and using the Action Facts service.

The Actel toll-free line is (888) 99-ACTEL.

Customer Service

Contact Customer Service for nontechnical product support, such as product pricing, product upgrades, update information, order status, and authorization.

From Northeast and North Central U.S.A., call (408) 522-4480.
From Southeast and Southwest U.S.A., call (408) 522-4480.
From South Central U.S.A., call (408) 522-4434.
From Northwest U.S.A., call (408) 522-4434.
From Canada, call (408) 522-4480.
From Europe, call (408) 522-4252 or +44 (0) 1256 305600.
From Japan, call (408) 522-4743.
From the rest of the world, call (408) 522-4743.
Fax, from anywhere in the world (408) 522-8044.

Customer Applications Center

Actel staffs its Customer Applications Center with highly skilled engineers who can help answer your hardware, software, and design questions. The Applications Center spends a great deal of time creating application notes and answers to FAQs. So, before you contact us, please visit our online resources. It is very likely we have already answered your question(s).

Guru Automated Technical Support

Guru is a web-based automated technical support system accessible through the Actel home page (**http://www.actel.com/guru/**). Guru provides answers to technical questions about Actel products. Many answers include diagrams, illustrations, and links to other resources on the Actel web site. Guru is available 24 hours a day, seven days a week.

Web Site

Actel has a World Wide Web home page where you can browse a variety of technical and nontechnical information. Use a Net browser (Netscape recommended) to access Actel's home page.

The URL is **http://www.actel.com**. You are welcome to share the resources provided on the Internet.

Be sure to visit the "Actel User Area" on our web site, which contains information regarding products, technical services, current manuals, and release notes.

FTP Site

Actel has an anonymous FTP site located at **ftp://ftp.actel.com**. Here you can obtain library updates, software patches, design files, and data sheets.

Contacting the Customer Applications Center

Highly skilled engineers staff the Customer Applications Center from 7:30 A.M. to 5:00 P.M., Pacific Time, Monday through Friday. Several ways of contacting the Center follow:

Electronic Mail

You can communicate your technical questions to our e-mail address and receive answers back by e-mail, fax, or phone. Also, if you have design problems, you can e-mail your design files to receive assistance. We constantly monitor the e-mail account throughout the day. When sending your request to us, please be sure to include your full name, company name, and your contact information for efficient processing of your request.

The technical support e-mail address is **tech@actel.com**.

Telephone

Our Technical Message Center answers all calls. The center retrieves information, such as your name, company name, phone number and your question, and then issues a case number. The Center then forwards the information to a queue where the first available application engineer receives the data and returns your call. The phone hours are from 7:30 A.M. to 5:00 A.M., Pacific Time, Monday through Friday.

The Customer Applications Center number is (800) 262-1060.

European customers can call +44 (0) 1256 305600.

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Glossary

The following a collection of useful terms.

BGA
Ball Grid Array. A surface mount device with solder balls and a high pin count, similar to PGA.

Blank Check
A test performed by a device programmer to ascertain whether a device has been programmed (partial or total) or is in a virgin state.

Checksum
A number that results by adding up every element of a pattern. Typically either a four or eight digit hex number, it is a quick way to identify a pattern, since it is very unlikely that two patterns will have the same checksum.

Compare
Reading a programmable device and displaying any discrepancies from the desired pattern. Each error is displayed on the screen. This comparison is slower to perform than a verify on the programmer.

Concurrent programmer
A multiple-socket programmer that starts programming each device as soon as it is inserted in a socket, without all sockets having to be filled.

Device
Microchip or Integrated Circuit chip.

Dialog box
The method used by the device programmer's user-interface software to allow the user to select options and specify information. The user can specify any options and fill any blanks in the box then press ENTER to force the software to process the information.

Die
The silicon chip that is located within an IC package. It is a small rectangular flat piece of silicon that has been fabricated with many transistors to perform a specific function. It is glued into a plastic or ceramic package and connected to the external metal interconnect pins of the IC with very small bonding wires.

FPGA
Field Programmable Gate Array. A very complex PLD. The FPGA usually has an architecture that comprises a large number of simple logic blocks, a number of input/output pads, and a method to make random connections between the elements.

Gang Programmer
A multiple-socket programmer that requires each device to be placed in a socket before any can be programmed. See *Concurrent Programmer*.

Ground Bounce
A phenomenon that limits the testability of high-speed PLDs on some device programmers. The term refers to the voltage on the ground terminal of the PLD's die rising and falling when many outputs switch simultaneously. This voltage can induce extraneous clock signals that will make a device fail a functional test or reduce programming yield.

Hex file
A human-readable ASCII file that represents any binary data. Each byte in the binary pattern is represented by two hex characters (0-9, A-F) so that any of the 256 possible bytes, which include both control and unprintable characters, may be printed. The hex file may also contain address or checksum information. The pattern represented by the hex file may be represented by a binary file or any of the hex file formats – any file format may contain any pattern.

I/O
Input / Output.

JEDEC
Joint Electron Device Engineering Council (pronounced JED'eck). A group organized by the IEEE (Institute of Electrical and Electronics Engineers) that has defined a standard file format for PLDs.

JEDEC file
A file conforming to a standard format that specifies the configuration and testing procedure for a PLD. The file is in a human-readable ASCII format and consists of fields that start with a letter and end with an asterisk. Fields specify the pattern to program into the part, whether to secure the device, a set of test vectors to perform a functional test, and checksums to verify the integrity of the file.

LCC
Leadless Chip Carrier. A square ceramic package that has no leads; instead it has metal areas that are surface-mount soldered to the target circuit. This package is usually used only for military and aerospace applications. Available up to 84 pins.

Oscillator
A device that produces an alternating output current.

OTP	One-time programmable. The characteristic of a memory device that can be programmed once but cannot be erased. When an EPROM is described as OTP, this means that its die is erasable when exposed to ultraviolet light, but because of its package, which is not transparent, it cannot be exposed to light and thus it cannot be erased.
Package	The plastic or ceramic that protects an IC die and connects it to the target circuit.
Parallel printer port	A standard port on virtually every PC designed for connection to a printer. This port has eight data lines and several control lines. Parallel ports may be either unidirectional or bi-directional. If your computer has a unidirectional port, the programmer will use the status lines to read data back from the programmer. The port allows high-speed communication (many times faster than a serial port). There may be up to three parallel ports in most PCs designated LPT1, LPT2, and LPT3.
PGA	Pin Grid Array. A square, through-hold IC package that has pins located on a square grid with 0.1000-inch pitch. It may have up to several hundred pins. Used primarily for military and prototype designs.
PLCC	Plastic Leaded Chip Carrier. A square plastic package that has J-shaped leads on four sides. This can be surface mounted or placed in a socket for through-hole use. Available in 20 to 84 pins.
PLD Compiler	A software package that allows an engineer to specify the functionality of a PLD through a high-level language or schematic diagram. The software will convert the design into a JEDEC or other file for the PLD programmer. PLD compilers are available from numerous IC manufacturers and from third parties. The packages from IC manufacturers support only one brand of device and may be free, inexpensive or expensive.
Pneumatic	Of or pertaining to air, gases or wind.
PQFP	Plastic Quad Flat Pack. See *QFP*.
QFP	Quad Flat Pack. A square IC package that has surface-mount leads coming from four sides. It is used for high-density applications, usually over 100 pins. Lead pitch may be 0.025 inches or smaller.
Socket module	An interchangeable metal chassis that contains a programming socket.

TQFP   Thin Quad Flat Pack. Similar to QFP but with a lower profile and physically smaller in length and width.