Actel® FlashPro v3.3

User's Guide

Actel

Windows®

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Trademarks

Table of Contents

Introduction

Thank you for selecting the FlashPro Programming System. This User's Guide is designed to help you take full advantage of FlashPro's capabilities.

Document Organization

This guide provides detailed information about FlashPro. Step-by-step instructions for using FlashPro on Windows are included in this guide. This guide is based on FlashPro version 3.2.

The FlashPro User's Guide is divided into the following chapters:

- Chapter 1 - "Getting Started" explains how to install the hardware and software for FlashPro and FlashPro Lite. Details about the graphical user interface are included.
- Chapter 2 - "Using FlashPro" describes how to use the FlashPro software to program ProASIC and ProASIC PLUS devices.
- Chapter 3 - "Using FlashPro Lite" describes how to use FlashPro Lite to program ProASIC PLUS devices.
- Chapter 4 - "Using FlashPro3" describes how to use the FlashPro3 software to program ProASIC3/E devices
- Appendix A - "Error Messages & Troubleshooting Tips" contains actions for error messages and warnings.
- Appendix B - "Software Freeze" describes the steps to take if the FlashPro software crashes.
- Appendix C - "Electrical Pin Outs" shows electrical pin out diagrams of FlashPro, FlashPro Lite, and FlashPro3.
- Appendix D - "Product Support" describes our support services.

Document Assumptions

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

- You are familiar with the Actel Designer software.
- You are familiar with FPGA architecture and FPGA design software.

Platform Support

Supported platforms for the PC include:

- WinNT 4.0 SP6
- Win2000 SP4
- WinXP SP1

Actel Application Notes

Application Notes are available at our website, http://www.actel.com/products/tools/prog.asp.

Several Application Notes are specifically helpful to programming ProASIC and ProASIC^{PLUS} devices.

- *Programming Actel Devices*
- *Implementation of Security in Actel's ProASIC and ProASIC^{PLUS} Flash Based FPGAs*
- *In-System Programming ProASIC^{PLUS} Devices*

Actel User Manuals

Other Actel user manuals are available at our web site, under Technical Documentation http://www.actel.com/techdocs/manuals/default.asp.

1 Getting Started

This chapter describes what is included in the FlashPro and FlashPro Lite kits and how to install the FlashPro software and hardware. It also contains an overview of the graphical user interface and commands.

For specific details about the board layout, please refer to the Actel application note, *In-System Programming ProASIC*^{PLUS} *Devices.*

FlashPro Kit

The FlashPro kit contains:

- FlashPro CD
- FlashPro Actel Programmer
- IEEE-1284 25 pin cable, Type A-C, 10 ft.
- Loop Back Test board
- Power supply brick and cable
- USB A to B Cable

FlashPro Lite Kit

The FlashPro Lite kit contains:

- FlashPro CD
- FlashPro Lite Programmer
- IEEE-1284 25 pin extension cable, Type A-A, 10 ft.
- 18 inch programmer target cable, 26 pin

FlashPro3 Kit

The FlashPro3 kit contains:

- FlashPro CD
- FlashPro3 programmer
- USB cable A to mini B 5 pin
- 10 pin target cable, 6 inch

Hardware Installation

For Hardware installation for FlashPro, FlashPro Lite and FlashPro3 refer to the following:

- For FlashPro, see "Hardware Installation" on page 19
- For FlashPro Lite, see "Hardware Installation" on page 41
- For FlashPro3, see "Hardware Installation" on page 57

Software Installation

Installing and use of the FlashPro software requires that you have administrative privileges on your local machine. After installing the FlashPro software, you must install the most recent service packs available from our website at:

http://www.actel.com/custsup/updates/flashpro/index.html.

To install the FlashPro software:

1. **Insert the FlashPro CD into your drive. The installation wizard starts, as shown in Figure 1-1.**

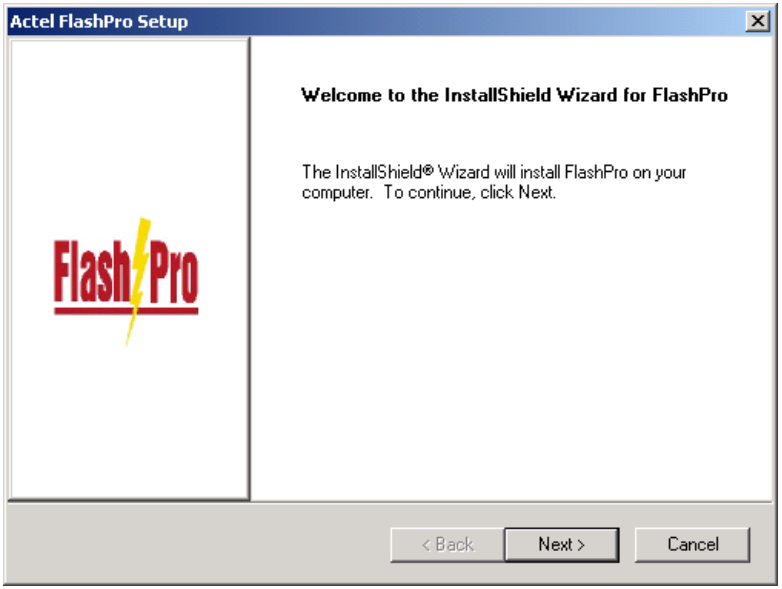

Figure 1-1. FlashPro Installation Wizard

2. Click *Next* to see the license agreement.
3. Click *Yes*, then *Next* to accept the license agreement, as shown in Figure 1-2.

Figure 1-2. License Agreement

4. Click *Next* to install FlashPro to the default destination folder, as shown in Figure 1-3. To install to a different folder, click Browse and select another folder.

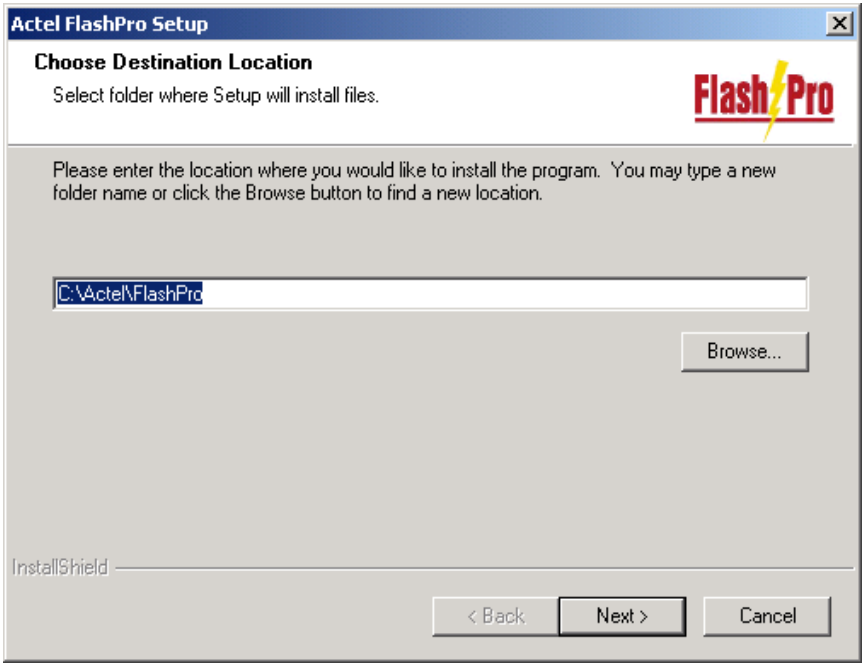

Figure 1-3. FlashPro Destination Location

5. Click *Next* to complete your installation. The FlashPro software installs.
6. Answer the question, "Will you use FlashPro3 or USB FlashPro?" (see Figure 1-4).

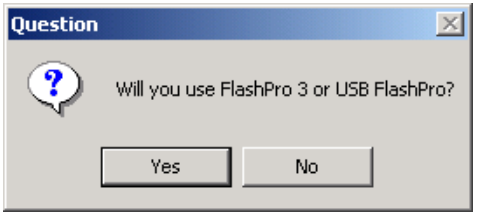

Figure 1-4. Selecting FlashPro3 or USB FlashPro

7. Click Yes if you are using either FlashPro3 or FlashPro via a USB port.

8. If you clicked Yes, follow the steps in the Information box **to ensure that FlashPro3 or USB FlashPro is installed properly,** and click OK as shown in Figure 1-5.

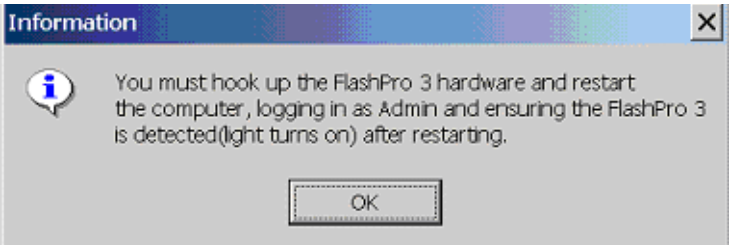

Figure 1-5. Information Box

9. If you clicked No in the Question box, follow the steps below to complete installation.
10. Click *Finish* to restart your computer as shown in Figure 1-5. You will restart your computer before starting FlashPro.

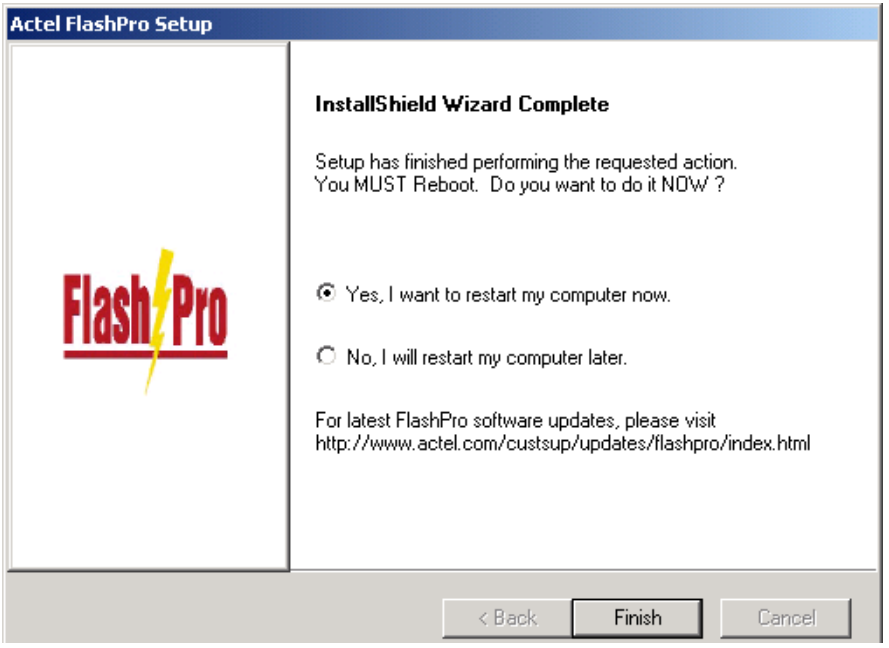

Figure 1-6. Installation Complete

11. **After rebooting, log in with your administrative privileges to load the driver. If you are asked, check the Load at Startup checkbox**

Software Update

For the latest software update available, visit the Actel website at

http:// www.actel.com/custsup/updates/flashpro/index.html or by selecting Software Update from the Help drop down menu in the FlashPro software(see Figure 1-6).

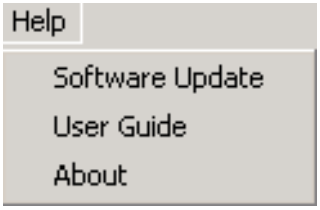

Figure 1-7. Software Update Help Drop Down Menu

Powering Down the Programmer

Before you power down the programmer, make sure of the following:

- The programming sequence is complete
- You are not executing other actions such as VERIFY, ERASE, etc.

Hardware Update

After you install or update the FlashPro software, a Version Mismatch dialog box may appear so you can download an update to your FlashPro hardware.

To update your hardware:

1. **From the Hardware Update dialog box, click *OK*.**
2. **After reading the message in the Hardware Update dialog box, click *OK*.**

   The Updating Hardware status window displays while your hardware updates.

Self-Test

Before you program any devices, please run the self-diagnostic test.

To run the self-diagnostic test:

1. **Connect the loopback test board to the FlashPro programmer.**
2. **Con**
3. **nect the FlashPro via your PC's parallel port or USB port.**
4. **Turn on the FlashPro programmer.**
5. **Start the FlashPro Diagnostic software. From the Start menu, point to Programs, FlashPro V3.3, and click Diagnostic.**
6. **Connect to the FlashPro programmer by entering**

```
openport lpt<port number>
```

Note: If your FlashPro programmer is attached using USB instead of a parallel port, you must enter

```
openport usb
```

The port number represents the parallel port you used to connect to the FlashPro programmer. If the FlashPro is connected to port 1, you would enter:

```
openport lpt1
```

If this fails, check your licensing dongles and make sure the FlashPro's power is turned on.

7. **Enter**

```
test
```

The unit enters the self-test mode, which lasts less than one minute. Do not interrupt the unit until the self-test mode is completed. If the self-test fails, you may see the following error messages:

- Failed self-test. VDDP setting: Expected 2300...27000. Actual 750 (see page 57).
- Loopback failure TDI->TDO. Expected 1, Actual 0 (see page 57).
- Parallel port device does not support IEEE-1284 negotiation protocol (see page 57).

Please refer to "Error Messages & Troubleshooting Tips" for help with error messages. If you are not successful, please contact technical support at tech@actel.com for assistance.

8. Close port.
9. Exit

Starting FlashPro

To start FlashPro, from the Start menu select Programs, FlashPro V3.3, and click FlashPro V3.3.

FlashPro Software Graphical User Interface

The FlashPro software, as shown in Figure 1-7, consists of a menu bar, toolbar, log window, and areas to specify your STAPL file, device, and action.

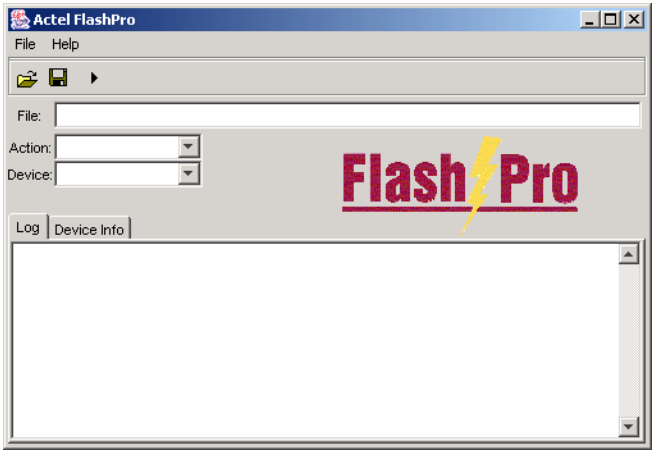

Figure 1-8. FlashPro Software Graphical User Interface

Menu Bar

Use the menu bar to set up your programmer connection, specify the device, and to save your log file. From the File menu, you can set up the programmer connection, specify the device, and save or clear the programming log file, which appears in the log window.

Toolbar

The toolbar buttons in the toolbar, as shown in Figure 1-8, allow you to open a programming file (*.stp) and execute the action you selected from the Action window.

Figure 1-9. FlashPro Toolbar

Action

Use the Action list menu to specify the action you want performed on the device. Options are available when a STAPL file is loaded. Options appear in Table 1-1.

Table 1-1. Action Options

Options	Actions
QUERY_SECURITY	Checks the security status of the device. If the device is programmed with the security key, then this command returns with Read inhibit:1 Write inhibit:1. If the security key is not present, the values are Read inhibit:0 Write inhibit 0.
ERASE	Erases the device.
READ_IDCODE	Reads the device ID code. Does not display IDCODE.
VERIFY	Verifies whether the device was programmed with the loaded STAPL file. If the wrong STAPL file is loaded, Exit 11 appears in the log window. A successful operation results in Exit 0.
PROGRAM	Programs the device.
DEVICE_INFO	Displays the serial number of the device, the Design Name that is programmed into the device, and the checksum that is programmed into the device.
ERASE_FROM (FlashPro3 only)	Erases FlashROM only.

Table 1-1. Action Options

Options	Actions
PROGRAM_FROM (FlashPro3 only)	Programs FlashROM only.
VERIFY_FROM (FlashPro3 only)	Verifys FlashROM only.
PROGRAM_ARRAY (FlashPro3 only)	Programs the FPGA Array only.
ERASE_ARRAY (FlashPro3 only)	Erases the FPGA Array only.
VERIFY_ARRAY (FlashPro3 only)	Verifys the FPGA Array only.
PROGRAM (FlashPro3 only)	Programs FPGA Array, FlashROM and/or security settings of the device.
ERASE_ALL (FlashPro3 only)	Erases FPGA Array, FlashROM and/or security settings of the device.
ACTION_VERIFY (FlashPro3 only)	Verifys FPGA Array, FlashROM and/or security settings of the device.
READ_IDCODE (FlashPro3 only)	Reads the device ID code.
ENC_DATA_AUTHENTICATION (FlashPro3 only)	Autenticates the encrypted data against the security settings you previously programmed into the device. This is a preventative measure that stops the program from corrupting data into the device.
PROGRAM_SECURITY	Programs security settings into the device.
DEVICE_INFO (FlashPro3 only)	Displays the Device IDCODE, security settings, design name, checksum and FlashROM content that is programmed into the device.

Device

Options in the Device list specify the device within a chain. The selected action in the Action list is applied to this device with the exception of ChainBuilder STAPL files. ChainBuilder STAPL files perform actions on all devices specified by the STAPL file, and if you select a device from the Action list, it has no effect.

The Device list only appears after selecting Analyze Chain from the File menu.

Log Window

The Log window displays results of the action and any error messages.

2
Using FlashPro

This chapter describes how to use the FlashPro programmer to program Actel ProASIC and ProASIC^{PLUS} devices. All screen shots shown refer to ProASIC^{PLUS} devices only and the options may vary for ProASIC and ProASIC3 devices.

This chapter also contains information on how to program a chain using a ChainBuilder generated STAPL file.

Hardware Installation

For FlashPro Lite hardware installation procedures, please refer to the "Hardware Installation" on page 41 section for FlashPro Lite. For FlashPro3 hardware installation procedures, please refer to the "Hardware Installation" on page 57 section for FlashPro3.

To connect the FlashPro to your PC:

1. **Connect the programmer to a parallel printer port on your PC.** Connect one end of the IEEE-1284 cable to the programmer's connector. Plug the other end of the cable into your parallel printer port and tighten the screws. You should not have any licensing dongles connected between the parallel port and cable.

   Your port settings should be EPP or bidirectional. Actel also supports the ECP mode with the FlashPro version 2.1 software and newer versions.

2. **Verify that you are 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. **Verify that the FlashPro power switch is in the 0 position.**

4. **Power up the programmer. Plug the DC adapter into a power socket.** Plug the other end of the AC power supply to the DC-IN input at the back of the FlashPro.

5. **Turn on the programmer.** Turn the FlashPro power switch to the 1 position. The POWER LED on the front of the programmer lights up. If it does not, contact Actel technical support at (888) 99-ACTEL.

To connect a single FlashPro to your PC using a USB port:

1. **Connect the programmer to a USB port on your PC.** Connect one end of the USB cable to the programmer's USB connector. Plug the other end of the cable into your USB port.

2. **From the "To connect the FlashPro to your PC:" instructions above, follow steps three through five.**

Note: USB programming is slightly slower than programming through the parallel port for a single device. By using a hub, multiple devices can be programmed at once, which saves time.

To connect multiple FlashPros using a USB hub:

1. **Connect the programmer to a USB hub.** Connect one end of the USB cable to the programmer's USB connector. Plug the other end of the cable into a free port on the USB hub.
2. **Connect the USB hub to the PC. If the hub is not already connected, then follow the instructions for the hub setup and connect the cable from the hub to the PC.**
3. **From the "To connect the FlashPro to your PC:" on page 19 instructions in this section, follow steps three through five.**

It is possible to connect more than one FlashPro programmer to a hub. If there is only a single programmer attached, follow the normal flow, choosing "USB" as the port when connecting to the programmer. If there is more than one programmer connected to the hub, a new instance of FlashPro software must be launched for every programmer (therefore, three connected FlashPros require launching three FlashPro software windows). Each instance must connect to a different programmer using the USB port. When connecting to a programmer, you must enter the serial number of the FlashPro into the serial number field.

Note: USB is hot-swappable, which means you do not have to power down the PC when plugging/unplugging the FlashPro programmer. Do not unplug the programmer while the programmer is active and performing a programming sequence.

Initial Setup

Before any action can be performed with the FlashPro programmer, it must be set up. Please connect the FlashPro ribbon cable with the programming header and turn on the switch.

It is possible to connect more than one FlashPro programmer to a hub. If there is only a single programmer attached, follow the normal flow, choosing USB as the port when connecting to the programmer. If there is more than one programmer connected to the hub, a new instance of FlashPro software must be launched for every programmer (so three connected FlashPros require launching three FlashPro software windows). Each instance must connect to a different programmer using the USB port. When connecting to the programmer, you must enter the serial number of the FlashPro you are connecting to in the serial number field.

Note: USB programming is slightly slower than programming through the parallel port for a single device. By using a hub, multiple devices can be programmed at once, which saves time.

Actel recommends running the self test before you program any devices; see "Self-Test" on page 13.

To set up FlashPro:

1. **From the *File* menu, click *Connect*.** The FlashPro Connect to Programmer dialog box displays, as shown in Figure 2-1.

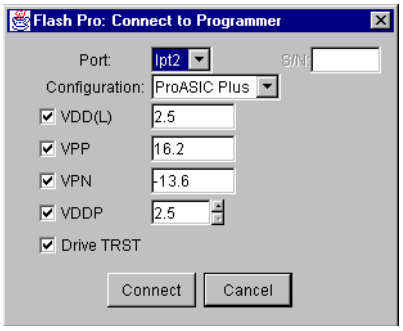

Figure 2-1. FlashPro: Connect to Programmer Dialog Box

2. **In the Port list, select the port the FlashPro programmer is connected to.**
3. **In the Configuration list, select the device family (ProASIC , ProASIC PLUS, ProASIC3).**
4. **(Optional) Disable voltages from the programmer if they are available on the board.** When you select the ProASIC configuration, the Drive TRST voltage turns grey and becomes unavailable, (see Figure 2-2).

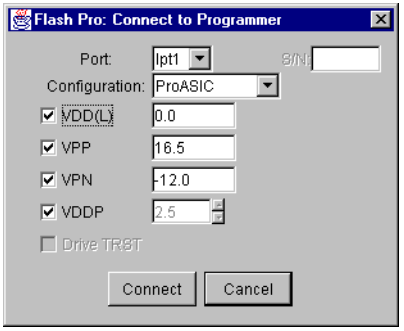

Figure 2-2. Connect to Programmer Dialog Box for ProASIC Devices

Note: If you want to power-up the device from the board power supply, please deselect VDDL and VDDP. VPP and VPN are required during programming only and are supplied by the FlashPro programmer. Programming of ProASIC devices requires that VDDL be at 0 volts during programming. The board power supply design

must allow for this if it is used to power-up the device during programming. ProASIC^{PLUS} devices do not have this requirement.

5. **Click *Connect*.** A successful connect or any errors appears in the Log window, as shown in Figure 2-3. If you encounter failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

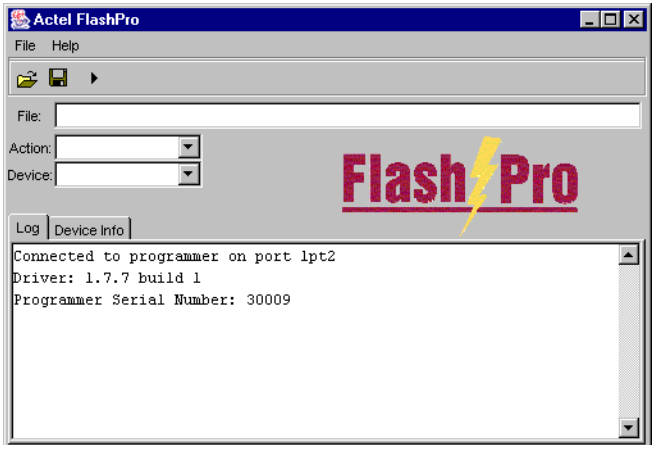

Figure 2-3. FlashPro: Successful Connection

Analyze Chain and Device Selection

To analyze the chain and select the device:

1. **From the *File* menu, click *Analyze Chain*.** Chain details appear in the Log window, as shown in Figure 2-4. The software should detect a minimum of eight instruction bits (the IR length of a ProASIC or ProASIC^{PLUS} device). If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

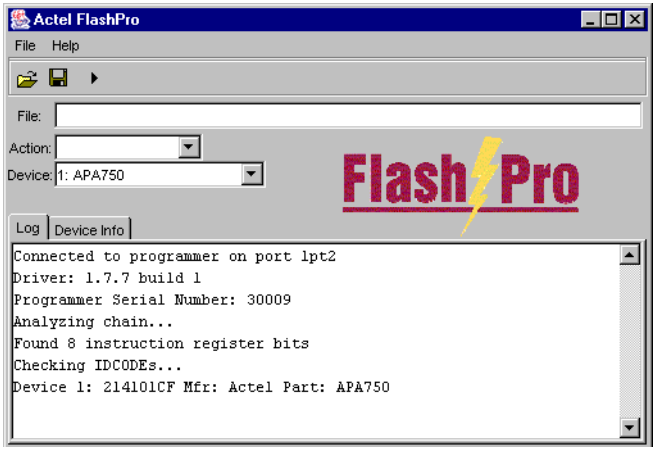

Figure 2-4. FlashPro: Analyzing Chain

2. **Select your devices.** In the Device list, select your device before you perform any action. If you have only one device in the chain, performing Analyze Chain selects that device automatically from the Device list. If you have multiple devices in the chain, you must select a device as shown in Figure 2-5.

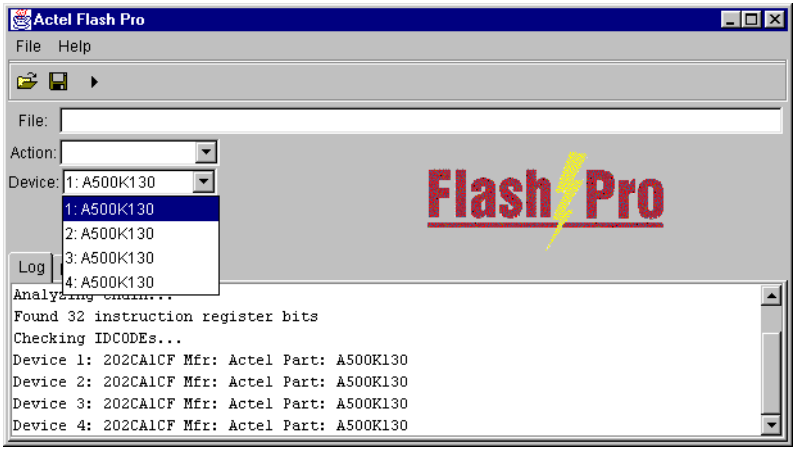

Figure 2-5. FlashPro: Device Selection

Note: The first device, selected in Figure 2-5, is the device that is nearest to TDO of the programming header.

Loading the STAPL File

The FlashPro programmer uses a STAPL (*.stp) file to program the device. Export the STAPL file from Designer. For more information, please refer to the Designer Online Help.

Note: The STAPL file must be generated from Designer R1-2003SP1 or later. Actel strongly recommends that you use the latest version of Designer software or Libero IDE with the most recent service pack installed. Software service packs can be found at http://www.actel.com/custsup/updates/index.html.

To load the STAPL file:

1. **Click the *Open File* button in the toolbar, as shown in Figure 2-6.**

Figure 2-6. Open File Toolbar Button

The Open dialog box appears, as shown in Figure 2-7.

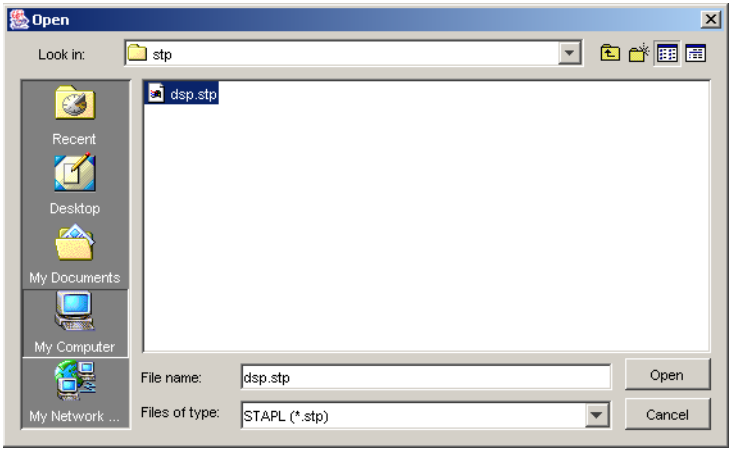

Figure 2-7. Open Dialog Box

2. **Select your STAPL file and click *Open*.** The FlashPro software loads the file.

Selecting an Action

After loading the STAPL file, select an action from the Action list. See Table 2-1 for a definition of each action.

Table 2-1. Action Options

Option	Action
QUERY_SECURITY	Checks the security status of the device. If the device is programmed with the security key, then this command returns with Read inhibit:1 Write inhibit:1. If the security key is not present, the values are Read inhibit:0 Write inhibit 0.
ERASE	Erases the device.
READ_IDCODE	Reads the device ID code. Does not display IDCODE.

Table 2-1. Action Options

Option	Action
VERIFY	Verifies whether the device was programmed with the loaded STPL file. If the wrong STPL file is loaded, Exit 11 appears in the log window. A successful operation results in Exit 0.
PROGRAM	Programs the device.
DEVICE_INFO	Displays the serial number of the device, the Design Name that is programmed into the device, and the checksum that is programmed into the device.

Programming a Device

Follow the steps below to program a device.

To program a device:

1. **In the Action list, select *PROGRAM*.**
2. **In the Device list, select the device.**
3. **Click the *Execute* button in the toolbar, as shown in Figure 2-8.**

Figure 2-8. Execute Toolbar Button

The Execute Action dialog box appears, as shown in Figure 2-9.

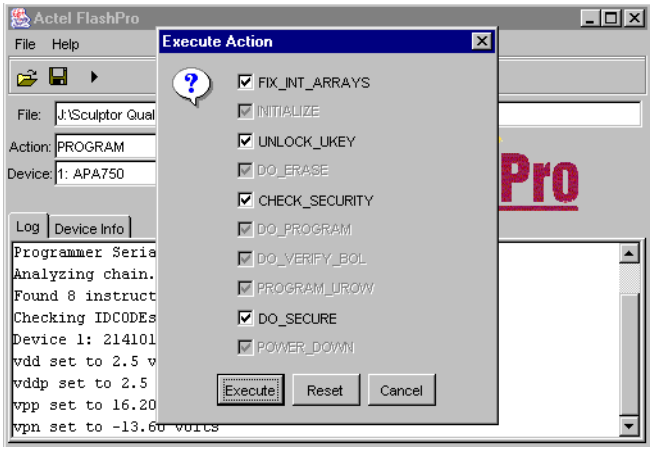

Figure 2-9. Execute Action Dialog Box

All the steps of the programming sequence are listed. Optional steps appear in bold. Grayed out options are required for programming and cannot be changed.

4. **Make your selections and click *Execute* to start programming.** The progress of the programming action displays in the Log window.

The message 'Exit 0' indicates that the device has been successfully programed, as shown in Figure 2-10.

Note: Do not interrupt the programming sequence. It may damage the device or programmer.

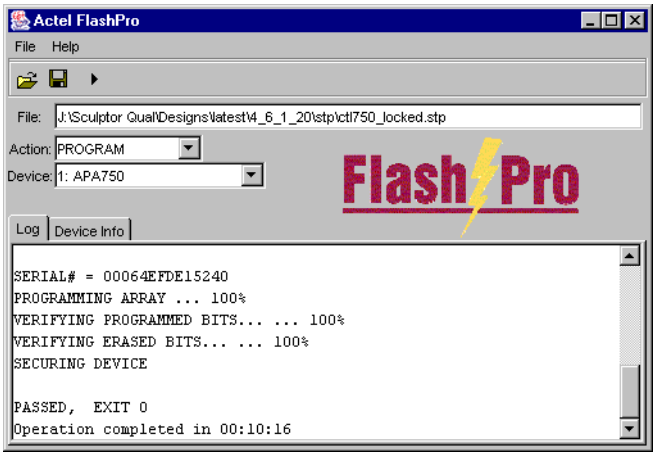

Figure 2-10. Successfully Programmed Device

If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

Verifying the Correct Programming

Follow the steps below to verify that you programmed the device with the correct STAPL file.

To verify the device is programmed with the correct STAPL file:

1. **Load the STAPL file.**
2. **In the Action list, click *VERIFY*.**
3. **Click the *Execute* button in the toolbar, as shown in Figure 2-11.**

Figure 2-11. Execute Toolbar Button

The Execute Action dialog box appears, as shown in Figure 2-12.

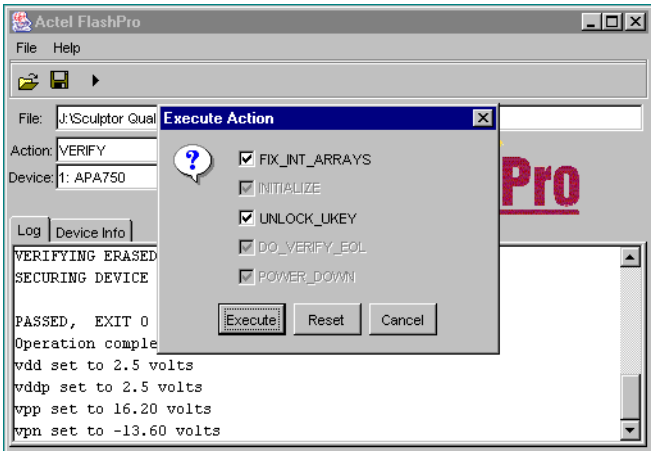

Figure 2-12. Execute Action Dialog Box

The default settings appear in the Execute Action dialog box.

4. **Click *Execute* to start the verification process.** A successful verification will result in Exit 0, as shown in Figure 2-13. If the STPL file is different from the file used for programming, Exit 11 appears in the Log window (see "Error Messages & Troubleshooting Tips" on page 89, "Exit 11" on page 92 for more details).

Note: Do not interrupt the verifying sequence, it may damage the device.

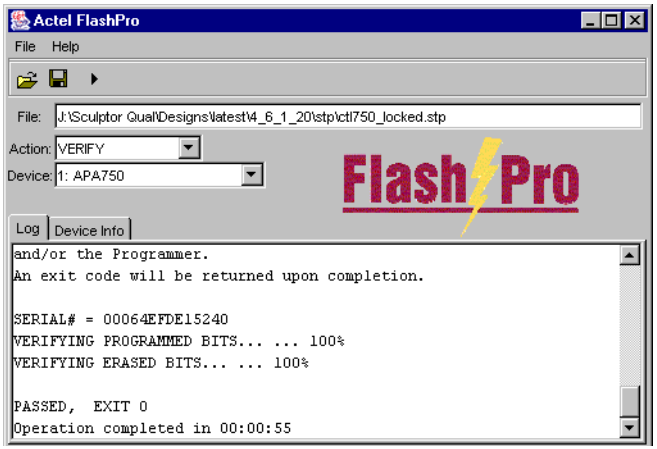

Figure 2-13. Successful Verification

ChainBuilder Programming

This section describes how to program a chain using a ChainBuilder generated STAPL file.

Hardware Setup

Before you begin, it is important to set up your hardware. See "Initial Setup" on page 20 for more information.

Analyze Chain

Follow the instructions below to analyze the chain and select the device.

To analyze the chain and select the device:

1. **From the *File* menu, click *Analyze Chain*.** Chain details appear in the Log window, as shown in Figure 2-14. If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

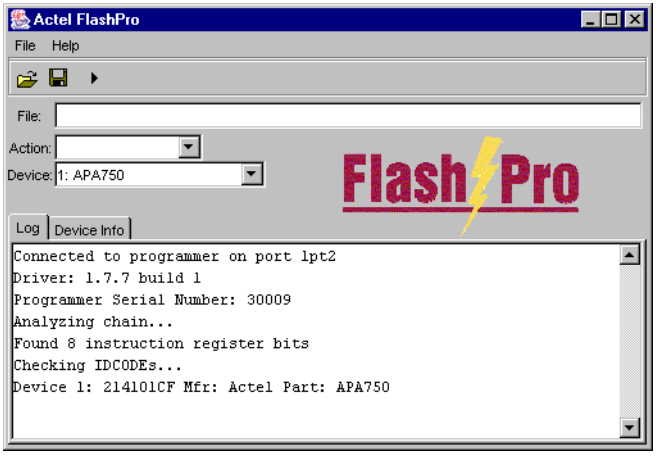

Figure 2-14. FlashPro: Analyzing Chain

Note: When you program a chain using a ChainBuilder STAPL file, you cannot select a device to target.

Loading the ChainBuilder STAPL File

The steps below show you how to load the ChainBuilder STAPL file.

To load the ChainBuilder STAPL file:

1. **Click the *Open File* button in the toolbar, as shown in Figure 2-15.**

Figure 2-15. Open File Button

The Open dialog box appears, as shown in Figure 2-16.

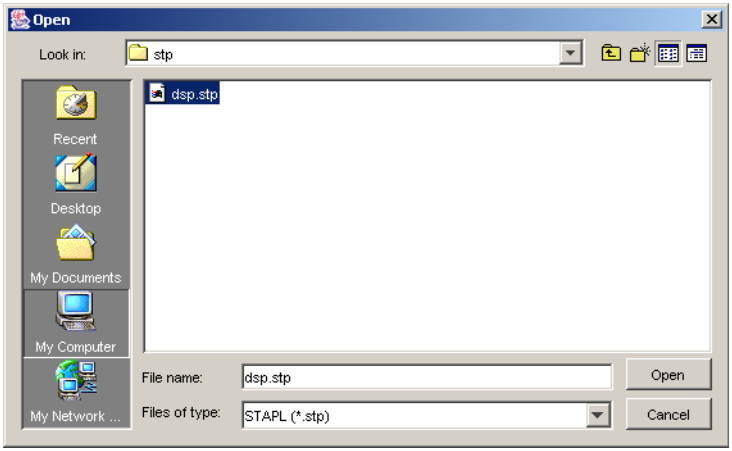

Figure 2-16. Open Dialog Box

2. **Select your STAPL file and click *Open*. The FlashPro software loads the file.**

After you analyze the chain and load the ChainBuilder STAPL file, you are ready to program the chain.

Programming a Chain using a ChainBuilder STAPL File

To program a chain using a ChainBuilder generated STAPL file, select **Program** in the Action list, and click the **Execute** button.

The progress of the programming action displays in the Log window. The message 'Exit 0' indicates that the device has been successfully programmed.

Note: The "CheckChain Command" runs before any other command to verify that your physical chain configuration matches your ChainBuilder STAPL file.

CheckChain Command

The CheckChain command is a pass/fail check for the chain you are programming and the ChainBuilder STAPL file. If the chain you are programming matches the chain expected by the ChainBuilder STAPL file, the check chain passes.

Devices are listed in the device list box. However, if a device has an unknown ID or no ID, the chain is listed as "0:Chain" as shown in Figure 2-17.

Figure 2-17. Device with Unknown ID

Note: In Figure 2-18, the part name of the device is listed because it is an unknown device with a known device ID.

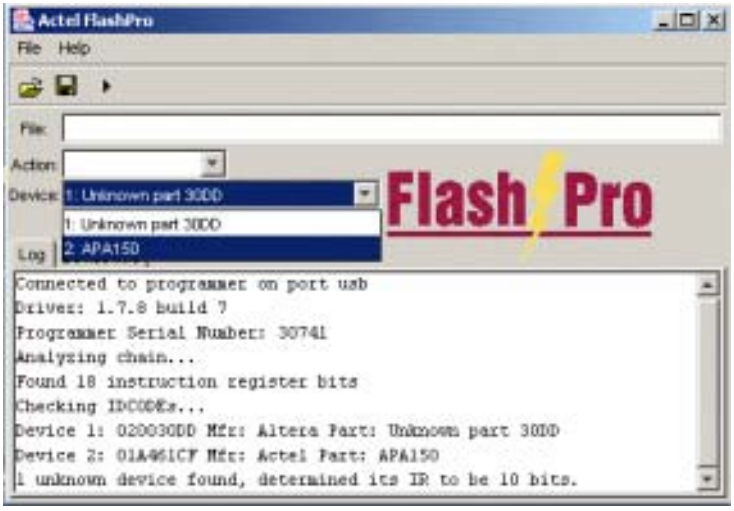

Figure 2-18. Unknown Device with Known ID

Permanently Lock the Device

The FlashPro software includes a new feature which enables you to permanently lock your device. The permanent lock feature permanently locks your device and prevents you from reprogramming. This provides the highest level of security to the ProASIC^{PLUS} device family.

Loading the Permanent Lock STAPL File:

Export the permanent lock STAPL file from Designer. See the note from "Loading the STAPL File" on page 24 in this chapter.

To load the permanent lock STAPL file:

1. **Click the *Open File* button in the toolbar.** The Open dialog box appears.

2. **Select your permanent STAPL file and click *Open*.** The Permanent Lock About dialog box displays, as shown in Figure 2-19.

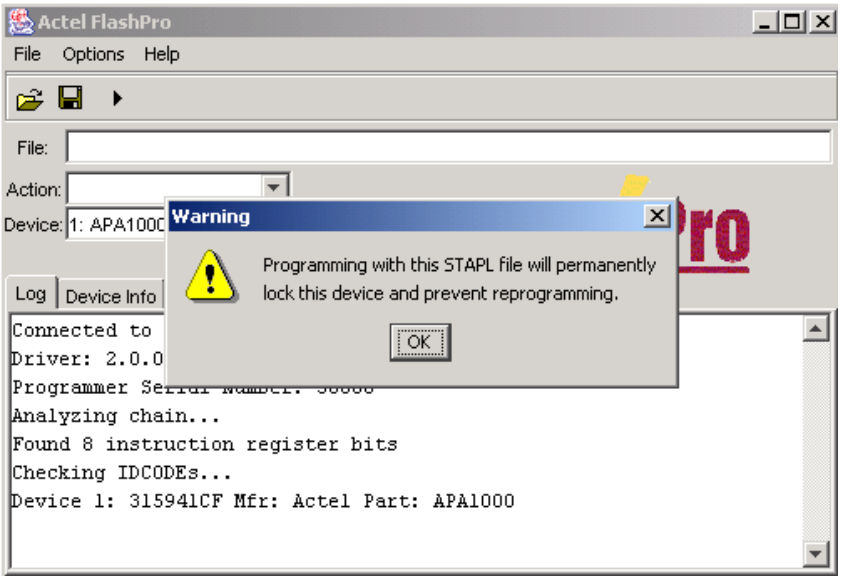

Figure 2-19. Permanent Lock About Dialog Box

3. **Read the message and click *OK* to load the permanent STAPL file.** The FlashPro software loads the file.

Programming a Device Using Permanent Lock

Follow the steps below to program a device using permanent lock.

To program a device using Permanent Lock:

1. **In the Action list, select *PROGRAM*.**
2. **In the Device list, select the device.**
3. **Click the *Execute* button in the toolbar.**

The Execute Action dialog box appears, as shown in Figure 2-20.

Figure 2-20. Execute Action Dialog Box

Note: The Do_Secure_Permanent checkbox is checked automatically. You have the option of unchecking this box. However, if you do, you will not permanently lock your device.

All the steps in the programming sequence are listed. Optional steps appear in bold. Grayed out options are required for programming and cannot be changed.

4. **Make your selections and click *Execute* to start programming.** The progress of the programming action is displayed in the Log window. The message 'Exit 0' indicates that the device has successfully been programmed as shown in Figure 2-21.

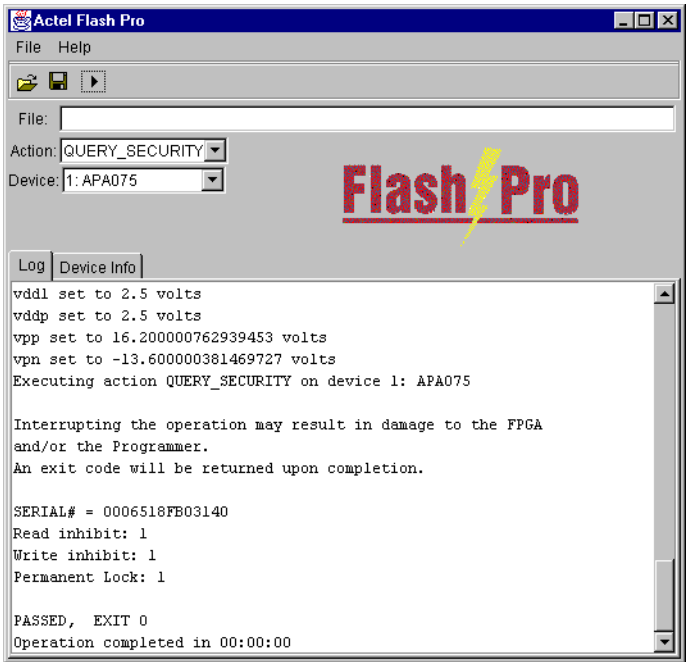

Figure 2-21. Query Results for the Permanently Locked Device

Note: Do not interrupt the programming sequence, it may damage the device or programmer.

If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

Reprogram a Securely Locked Device

After you program a part using the security feature, you cannot erase, verify, or reprogram it without your original security key in the STAPL file. If you use the permanent lock feature, you cannot (under any circumstances) reprogram or erase the device.

You can reprogram a securely locked device using the original STAPL file by following the usual programming procedures. The UNLOCK_UKEY box is checked by default, and the software automatically unlocks the device before programming (see Figure 2-23).

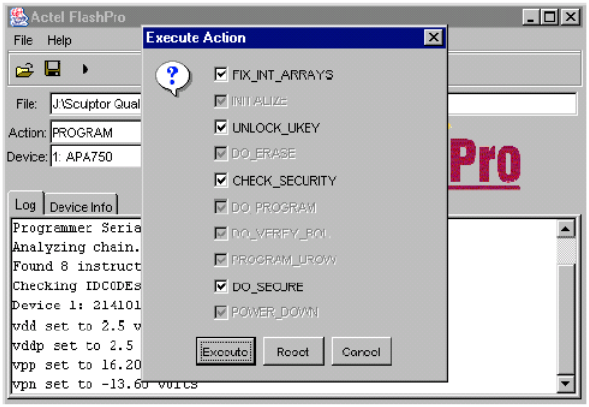

Figure 2-22. UNLOCK_UKEY Default

You can also reprogram a device using a different STAPL file.

To reprogram a device using a different STAPL file:

1. **Connect the programmer.**
2. **Analyze the chain.**
3. **Load the original STAPL file you used to program and secure the device.**
4. **Perform the Erase action.** The Erase action unlocks the device and erases the device contents.
5. **Load another STAPL file to program.**

   If your security key does not match the security key programmed on the device, the software will generate an "Exit 17" error message.

Saving Your Log File

All FlashPro results are displayed in the Log window. You can save these results into a file.

To save your log file:

1. **From the *File* menu, click *Save Log*.** The Save dialog box appears, as shown in Figure 2-23.

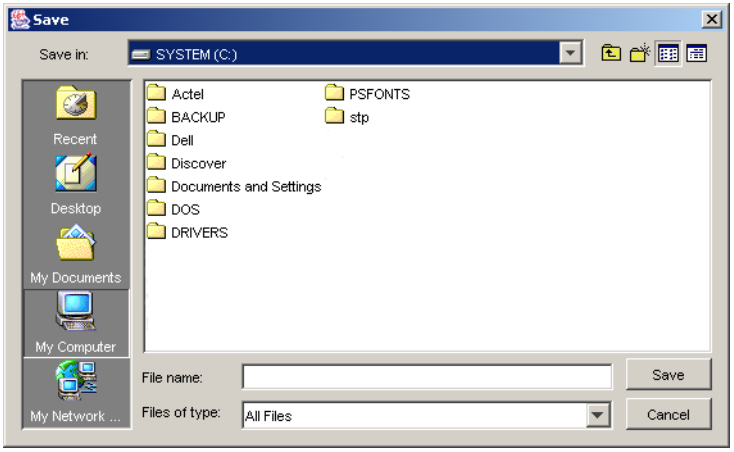

Figure 2-23. Save Dialog Box

2. **Select a directory, type in the file name, and click *Save*.** The FlashPro software saves the file.

Batch Mode

The batch mode is useful for scripts (automation) or for independent software that tries to access the FlashPro hardware without going through the FlashPro software's user interface.

You can run the batch mode command from the C:/Actel/FlashPro v3.3/FlashPro v3.3 directory if you installed it in the default location. Otherwise, run the batch mode command from an equivalent location depending on your installation directory.

Batch Mode Syntax

The batch mode has the following syntax (for FlashProv3.3 installed in default location):

"C:\Actel\FlashPro\FlashPro_v33\jre\bin\java.exe" -Xmx128m -classpath flashpro.jar com.actel.jtag.FS2 -port <port> [-fam <APA|A5K>] [-disable <vddp>] [-disable <vddl> -action <action> <file>

You must specify the <action>, <port> and <file> arguments in the command. See Table 2-2 for a list of definitions for these arguments. A sample command is shown below:

"C:\Actel\FlashPro\FlashPro_v33\jre\bin\java.exe" -Xmx128m -classpath flashpro.jar com.actel.jtag.FS2 -port lpt1 -action PROGRAM C:\designs\STAPL\apa300.stp

Note: The return value is a “0” (if there are no errors) or an error number.

Table 2-2. Argument Description

Arguments	Description
-action <action>	The STAPL action that is performed. The exact actions contained in a STAPL file may vary, but the "ERASE", "PROGRAM", "VERIFY", "QUERY_SECURITY", "DEVICE_INFO", and "READ_IDCODE" commands should be present (note that the command is case sensitive).
<file>	Should be the full path name of the STAPL file that is being used.
-fam <fam>	The family of the device connected to the programmer (APA and A500K use different voltages- they cannot be mixed). APA is the default family if none is specified.
-port <port>	The port that connects to the FlashPro programmer (usually lpt1 or USB).
-disable <vddl>	Disable VDDL from the FlashPro. Use this option if you are providing VDDL through your own board.
-disable <vddp>	Disable VDDP from the FlashPro. Use this option if you are providing VDDP through your own board.

3

Using FlashPro Lite

This chapter describes how to set up and use the FlashPro Lite to program Actel ProASIC^{PLUS} devices. FlashPro Lite does not support ProASIC (A500K) or ProASIC3/E (A3P/E) devices. All screen shots refer to ProASIC^{PLUS} devices only.

Hardware Installation

To connect the FlashPro Lite to your PC:

1. **Connect the programmer to a parallel printer port on your PC.** Connect one end of the IEEE-1284 cable to the programmer's connector. Plug the other end of the cable into your parallel printer port and tighten the screws. You should not have any licensing dongles connected between the parallel port and cable.

   Your port settings must be EPP or bidirectional. Actel also supports the ECP mode with the FlashPro v2.1 software and newer.

2. **Verify that you are 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. **Connect the FlashPro ribbon cable with the programming header and turn the target board on.**

Initial Setup

Before any action can be performed with the FlashPro Lite programmer, it must be properly setup. See "Powering Down the Programmer" on page 12.

The FlashPro Lite's Live and Status LEDs must be on. This indicates that the FlashPro Lite is getting power from the target board and is ready to use.

To setup FlashPro Lite:

1. **From the *File* menu, click *Connect*.** The FlashPro Connect to Programmer dialog box displays, as shown in Figure 3-1.

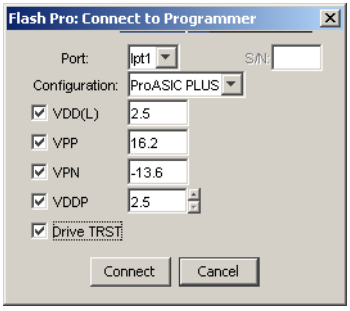

Figure 3-1. FlashPro: Connect to Programmer Dialog Box

2. **In the Port list, select the Line Printer (lpt) port the FlashPro programmer is connected to.**
3. **In the Configuration list, select the ProASIC PLUS device.** FlashPro Lite only supports ProASIC PLUS devices. Use FlashPro to program ProASIC devices.
4. **Click *Connect*.** A successful connect or any errors appears in the Log window, as shown in Figure 3-2. If you encounter failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

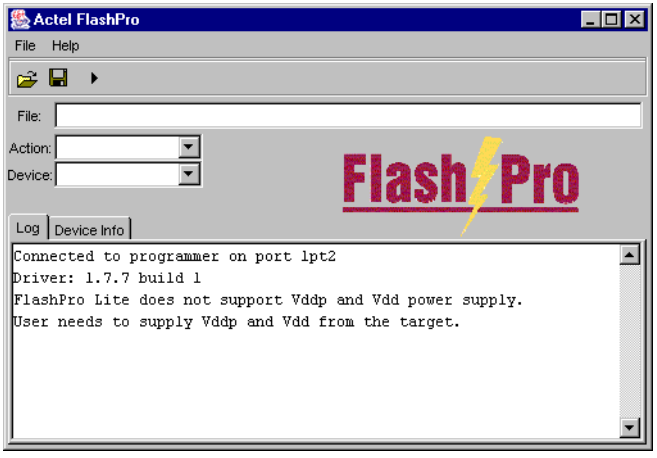

Figure 3-2. FlashPro: Successful Connection

Analyze Chain and Device Selection

Follow the steps below to analyze the chain and select the device.

To analyze the chain and select the device:

1. **From the *File* menu, click *Analyze Chain*.** Chain details appear in the Log window, as shown in Figure 3-3. If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

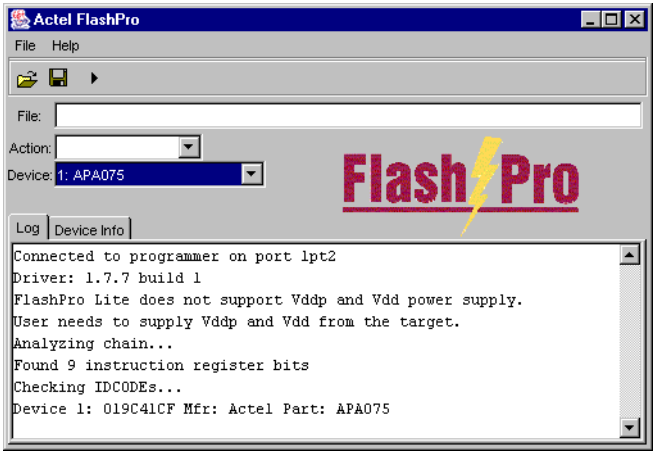

Figure 3-3. FlashPro: Analyzing Chain

2. **Select your devices.** In the Device list, select your device before you perform any action. If you have only one device in the chain, performing Analyze Chain selects that device automatically from the Device list. However, if you have multiple devices in the chain, click the down arrow next to the Device text box, and select your device from the Device list menu.

   Note: The first device, shown in the Device text box is the device nearest to TDO of the programming header.

Loading the STAPL File

The FlashPro Lite programmer uses a STAPL (*.stp) file to program the device. Export the STAPL file from Designer. For more information, please refer to the Designer Online Help.

Note: The STAPL file must be generated from Designer R1-03SP1 or later. Actel strongly recommends using the latest version of Designer software or Libero IDE with the most recent service pack installed. Software service packs can be found at http://www.actel.com/custsup/updates/index.html.

To load the STAPL file:

1. **You can click the *Open File* button in the toolbar, or from the *File* menu, you can click *Open*.**

   The Open dialog box appears, as shown in Figure 3-4.

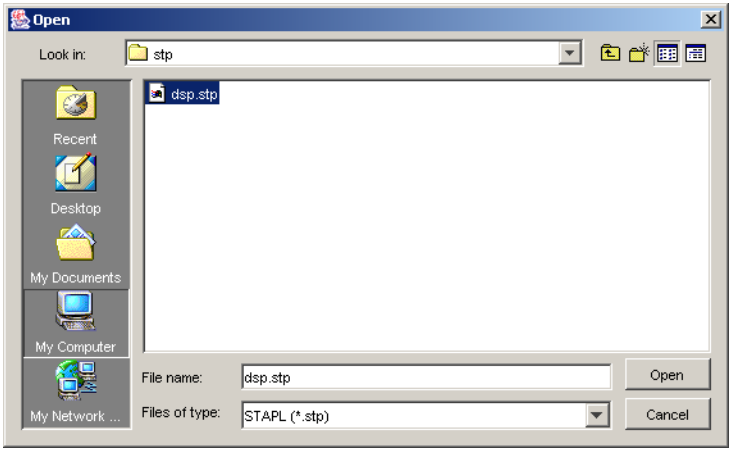

Figure 3-4. Open Dialog Box

2. **Select your STAPL file and click *Open*.** The FlashPro software loads the file. The FlashPro Log window displays a message indicating that the software has successfully loaded the software. See Figure 3-5.

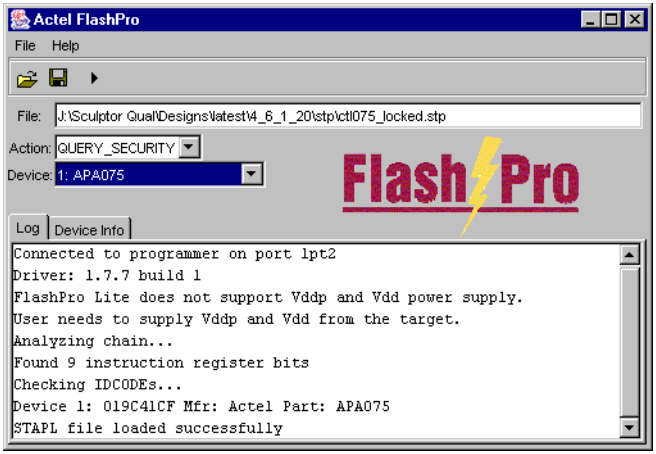

Figure 3-5. STAPL File Loaded Successfully

Selecting an Action

After loading the STAPL file, select an action from the Action list. See Table 3-1 for a definition of each action.

Table 3-1. Action Options

Option	Action
QUERY_SECURITY	Checks the security status of the device. If the device is programmed with the security key, then this command returns with Read inhibit:1 Write inhibit:1. If the security key is not present, the values are Read inhibit:0 Write inhibit 0.
ERASE	Erases the device.
READ_IDCODE	Reads the device ID code.

Table 3-1. Action Options

Option	Action
VERIFY	Verifies whether the device was programmed with the loaded STPL file. If the wrong STPL file is loaded, Exit 11 appears in the log window. A successful operation results in Exit 0.
PROGRAM	Programs the device.
DEVICE_INFO	Displays the serial number of the device, the Design Name that is programmed into the device, and the checksum that is programmed into the device.

Programming a Device

Follow these steps to program a device.

To program a device:

1. **In the Action list, select *PROGRAM*.**
2. **In the Device list, select the device.**
3. **Click the *Execute* button in the toolbar.**

The Execute Action dialog box appears, as shown in Figure 3-6.

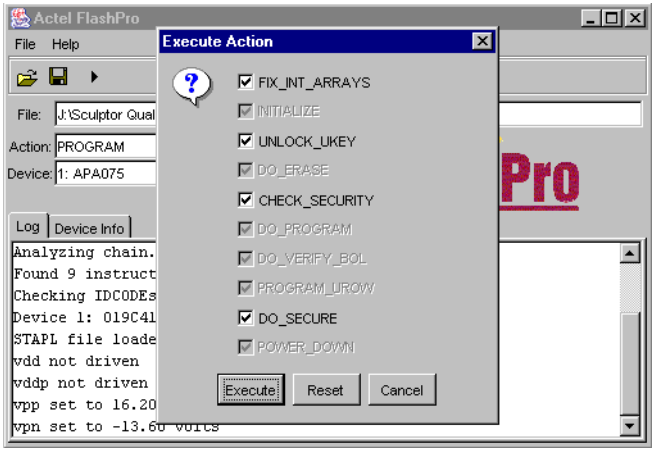

Figure 3-6. Execute Action Dialog Box

All the steps of the programming sequence are listed. Optional steps appear in bold. Grayed out options are required for programming and cannot be changed.

4. **Make your selections and click *Execute* to start programming.** The progress of the programming action appears in the Log window.

Note: Do not interrupt the programming sequence, it may damage the device or programmer.

The message 'Exit 0' indicates that the device has been successfully programed, as shown in Figure 3-7.

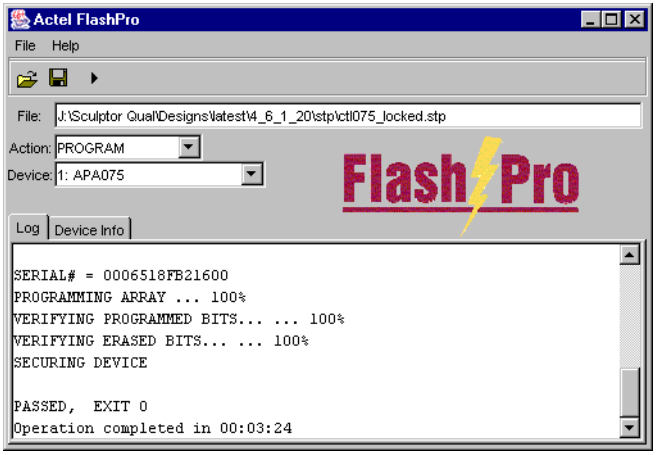

Figure 3-7. Successfully Programmed Device

If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

Verifying the Correct Programming

Follow the steps below to verify that the device is programmed with the correct STAPL file.

To verify the device is programmed with the correct STAPL file:

1. **Load the STAPL file.**
2. **In the Action list, click *VERIFY*.**
3. **Click the *Execute* button in the toolbar, as shown in.**

The Execute Action dialog box appears, as shown in Figure 3-8.

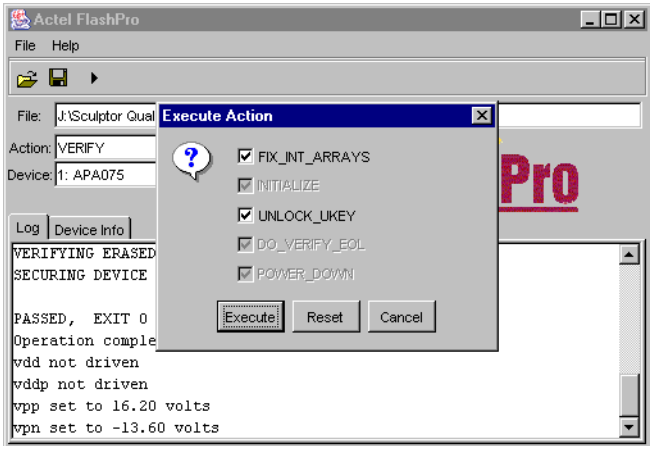

Figure 3-8. Execute Action Dialog Box

The default settings appear in the Execute Action dialog box.

4. **Click *Execute* to start the verification process.** A successful verification will result in Exit 0, as shown in Figure 3-9. If the STPL file is different from the file used for programming, Exit 11 appears in the Log window (see "Error Messages & Troubleshooting Tips" on page 89, "Exit 11" on page 92 for more details).

Note: Do not interrupt the verifying sequence, it may damage the device.

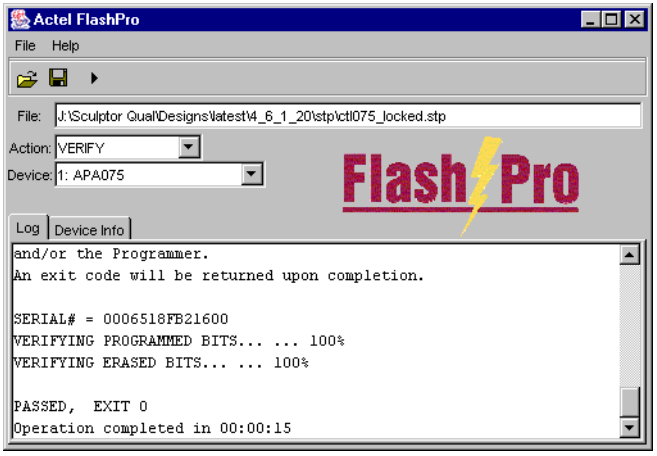

Figure 3-9. Successful Verification

Permanently Lock the Device

ProASIC^{PLUS} devices have a new feature which enables you to permanently lock your device. The permanent lock feature permanently locks your device and prevents you from reprogramming. This provides the highest level of security to the ProASIC^{PLUS} device family.

Loading the Permanent Lock STAPL File:

Export the permanent lock STAPL file from Designer. See the note from "Loading the STAPL File" on page 43 in this chapter.

To load the permanent lock STAPL file:

1. **Click the *Open File* button in the toolbar.** The Open dialog box appears.
2. **Select your permanent STAPL file and click *Open*.** The Permanent Lock About dialog box displays, as shown in Figure 3-10.

Figure 3-10. Permanent Lock About Dialog Box

3. **Read the message and click *OK* to load the permanent STAPL file.** The FlashPro software loads the file.

Programming a Device Using Permanent Lock

Follow these steps to program a device using permanent lock.

To program a device using Permanent Lock:

1. **In the Action list, select *PROGRAM*.**
2. **In the Device list, select the device.**
3. **Click the *Execute* button in the toolbar, as shown in**

   The Execute Action dialog box appears, as shown in Figure 3-11.

Figure 3-11. Execute Action Dialog Box

Note: The Do_Secure_Permanent checkbox is checked automatically. You have the option of unchecking this box. However, if you do, you will not permanently lock your device.

All the steps in the programming sequence are listed. Optional steps appear in bold. Grayed out options are required for programming and cannot be changed.

4. **Make your selections and click *Execute* to start programming.** The progress of the programming action is displayed in the Log window. The message 'Exit 0' indicates that the device has successfully been programmed as shown in Figure 3-12.

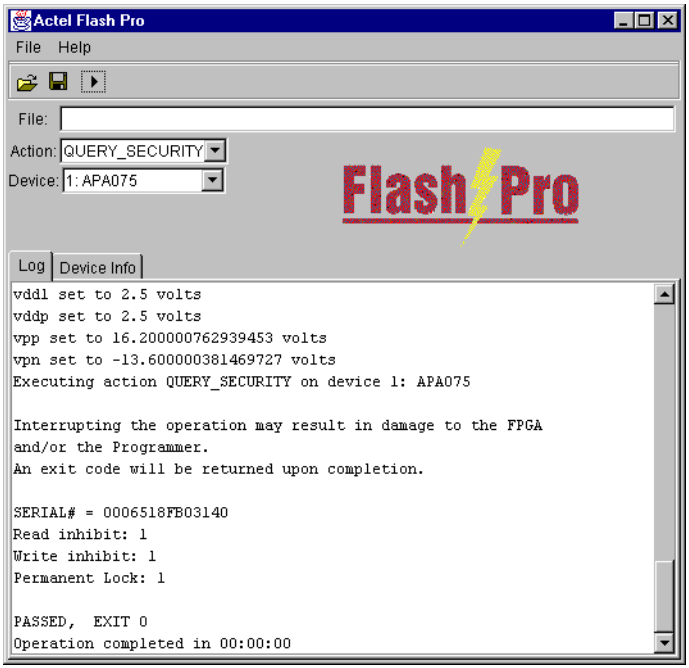

Figure 3-12. Query Results for the Permanently Locked Device

Note: Do not interrupt the programming sequence, it may damage the device or programmer.

If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

Reprogram a Key Locked Device

After you program a part using the key lock feature, you cannot erase, verify, or reprogram it without your original security key in the STAPL file.

You can reprogram a key locked device using the original STAPL file by following the usual programming procedures. UNLOCK_UKEY box is checked by default, and the software automatically unlocks the device before programming. See Figure 3-13.

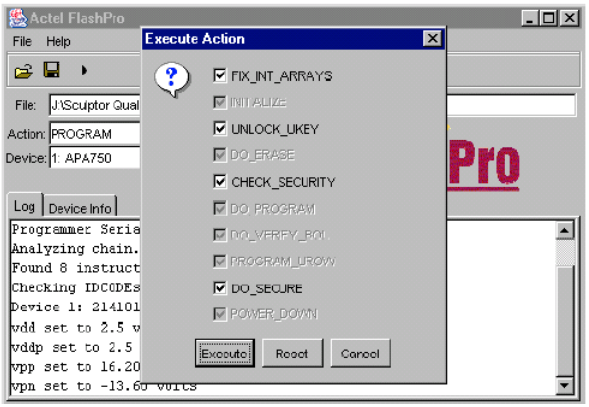

Figure 3-13. UNLOCK KEY Default

Reprogramming a Device Using a Different STAPL File

You can also reprogram a device using a different STAPL file.

To reprogram a device using a different STAPL file:

1. **Connect the programmer.**
2. **Analyze the chain.**
3. **Load the original STAPL file you used to program and secure the device.**
4. **Perform the Erase action.** The Erase action unlocks the device and erases the device contents.
5. **Load another STAPL file to program.**

If the user security key does not match the security key programmed on the device, the software generates an error message, Exit 17.

Reprogramming a Permanently Locked Device

If you use the permanent lock feature, you cannot, under any circumstances reprogram or erase the device.

Saving Your Log File

All FlashPro results are displayed in the Log window. You can save these results into a file.

To save your log file:

1. **From the *File* menu, click *Save Log*.** The Save dialog box appears, as shown in Figure 3-14.

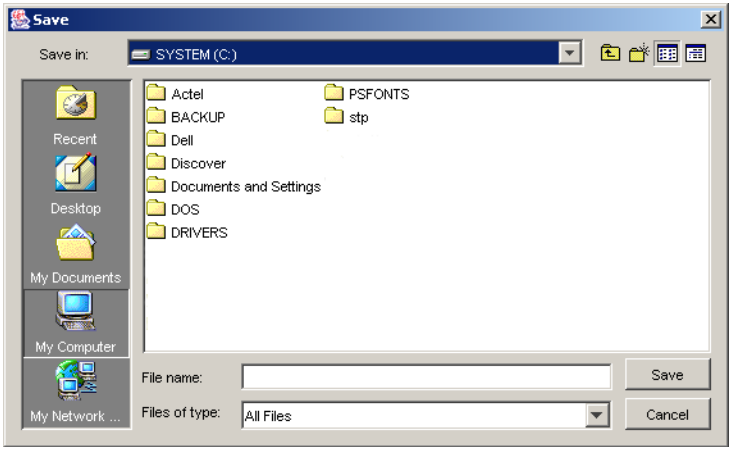

Figure 3-14. Save Dialog Box

2. **Select a directory, type in the file name, and click *Save*.** The FlashPro software saves the file.

Batch Mode

The batch mode is useful for scripts (automation) or other software that tries to access the FlashPro hardware without going through the FlashPro software's user interface.

You can run the batch mode command from the C:/Actel/FlashPro/FlashPro_v33 directory if you installed it in the default location. Otherwise, run the batch mode command from an equivalent location depending on your installation directory.

Batch Mode Syntax

The batch mode has the following syntax (for FlashProv3.3 installed in default location):

"C:\Actel\FlashPro v3.3\FlashPro v3.2\jre\bin\java.exe" -Xmx128m -classpath flashpro.jar com.actel.jtag.FS2 -port <port> [-fam <APA|A5K>] -action <action> <file>

You must specify the <action>, <port> and <file> arguments in the command. See Table 3-3 for a list of definitions for the arguments you give when running the commands.

A sample command is shown below:

"C:\Actel\FlashPro\FlashPro_v33\jre\bin\java.exe" -Xmx128m -classpath flashpro.jar com.actel.jtag.FS2 -port lpt1 -action PROGRAM C:\designs\STAPL\apa300.stp

Note: The return value is a “0” (if there are no errors) or an error number.

Table 3-2. Argument Description

Arguments	Description
-action <action>	The STAPL action that is performed. The exact actions contained in a STAPL file may vary, but the "ERASE", "PROGRAM", "VERIFY", "QUERY_SECURITY", "DEVICE_INFO", and "READ_IDCODE" commands should be present (note that the command is case sensitive).
<file>	Should be the full path name of the STAPL file that is being used.
- fam <fam>	The family of the device connected to the programmer (APA and A500K use different voltages- they cannot be mixed). APA is the default family if none is specified.
- port <port>	The port that connects to the FlashPro programmer (usually lpt1 or USB).
-disable <vddl>	Disable VDDL from the FlashPro. Use this option if you are providing VDDL through your own board.
-disable <vddp>	Disable VDDP from the FlashPro. Use this option if you are providing VDDP through your own board.

4 Using FlashPro3

This chapter describes how to set up and use the FlashPro3 to program Actel ProASIC3/E devices.

Hardware Installation

This section describes hardware installation for single and multiple FlashPro3 programmers.

To connect a single FlashPro3 to your PC using a USB port:

1. **Connect the programmer to a USB port on your PC.** Connect one end of the USB cable to the programmer's USB connector. Plug the other end of the cable into your USB port.

   You will observe the amber LEDs initially flashing and then the amber Power LED will remain illuminated indicating a connection to a powered USB port.

Note: USB 1.1 programming is slightly slower than programming through the parallel port for a single device, but by using high-speed USB 2.0 programming is faster than a parallel port. By using a hub, multiple devices can be programmed at once, which saves time (see next section).

To connect multiple FlashPros using a powered USB hub:

1. **Make sure your hub is a powered USB hub. Only powered USB hubs can be used.**
2. **Connect the USB hub to the PC. If the powered USB hub is not already connected, then follow the instructions for the hub setup and connect the cable from the hub to the PC.**
3. **Connect the programmers to a powered USB hub.** Connect one end of the USB cable to the programmer's USB connector. Plug the other end of the cable into a free port on the USB hub.

   You will observe the amber LEDs initially flashing and then the amber Power LED will remain illuminated indicating a connection to a powered USB port.
4. **Repeat Step 2 above for each programmers you wish to add.**

It is possible to connect more than one FlashPro3 programmer to a powered USB hub. If there is only a single programmer attached, follow the normal flow, choosing "USB" as the port when connecting to the programmer. If there is more than one programmer connected to the hub, a new instance of FlashPro software must be launched for every programmer (therefore, three connected FlashPro3s require launching three FlashPro software windows). Each instance must connect to a different programmer using the USB port. When connecting to a programmer, you must enter the serial number of the FlashPro3 into the serial number field.

Note: USB is hot-swappable, which means you do not have to power down the PC when plugging/unplugging the FlashPro3 programmer. Do not unplug the programmer while

the programmer is active and performing a programming sequence(when the amber USB Activity light is flashing).

Initial Setup

Before any action can be performed with the FlashPro3 programmer, it must be set up properly. Please connect the FlashPro3 to the computer using the USB port. Make sure the orange Power LED is lit. Connect the ribbon cable with the programming header.

Actel recommends running the self test before programming any devices, see "Self-Test" on page 13.

To setup FlashPro3:

1. **From the *File* menu, click *Connect*.** The **FlashPro Connect to Programmer** dialog box displays, as shown in Figure 4-1.

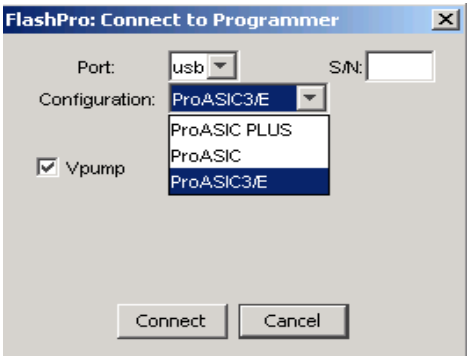

Figure 4-1. FlashPro: Connect to Programmer Dialog Box

2. **In the Port list, select the port the FlashPro3 programmer is connected to.**
3. **In the Configuration list, select the device family (ProASIC3/E).**
4. **(Optional) Disable Vpump from the programmer if the voltage is on the board.** To disable Vpump, deselect the checkbox for Vpump.

5. **Click *Connect*.** A successful connect or any errors appears in the **Log** window, as shown in Figure 4-2. If you encounter failures, please refer to "Error Messages & Troubleshooting Tips" on page 89 for more information.

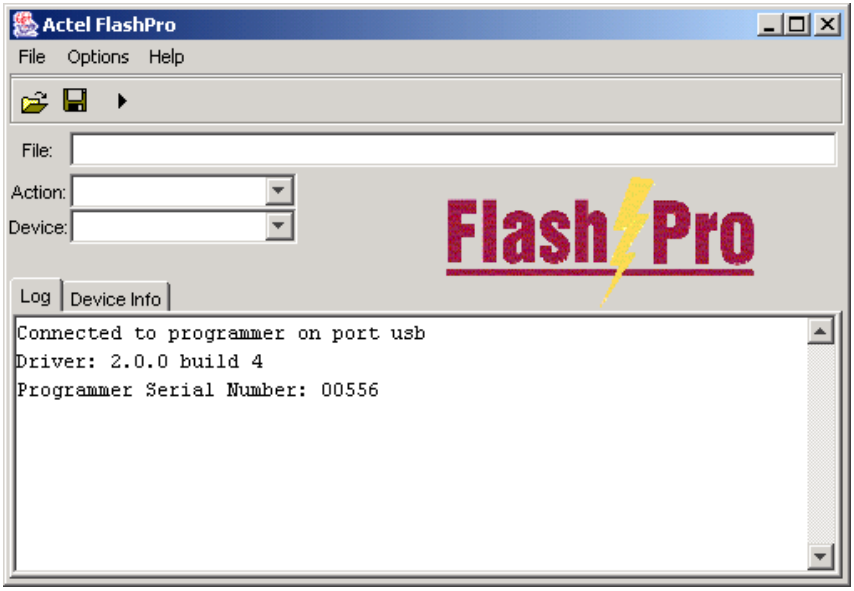

Figure 4-2. FlashPro: Successful Connection

Analyze Chain and Device Selection

To analyze the chain and select the device:

1. **From the *File* menu, click *Analyze Chain*.** Chain details appear in the **Log** window, as shown in Figure 4-3. If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" for more information.

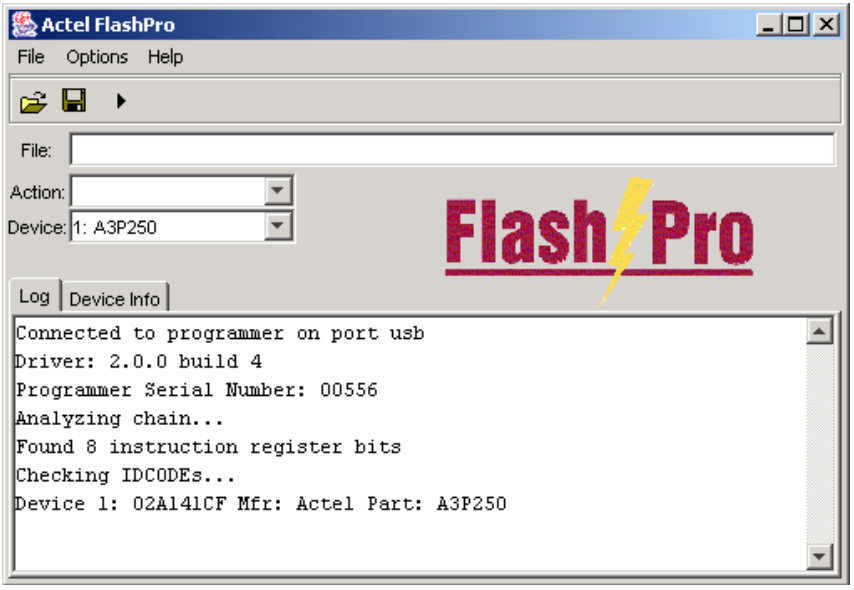

Figure 4-3. FlashPro: Analyzing Chain

2. **Select your devices.** In the **Device** list, select your device before you perform any action. If you have only one device in the chain, performing **Analyze Chain** selects that device automatically

from the Device list. If you have multiple devices in the chain, you must select a device as shown in Figure 4-4.

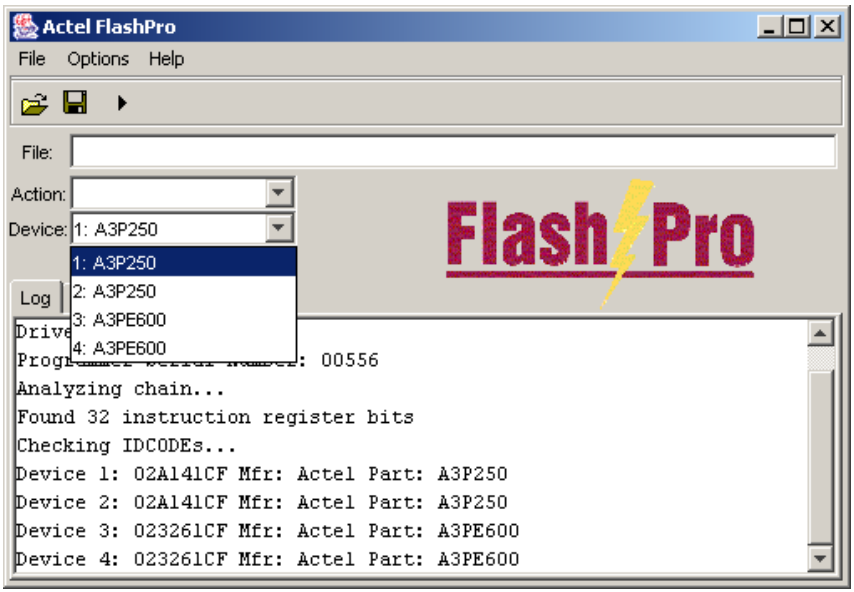

Figure 4-4. FlashPro: Device Selection

Note: The first device, selected in Figure 4-4, is the device that is nearest to TDO of the programming header.

Loading the STAPL File

The FlashPro3 programmer uses a STAPL (*.stp) file to program the device. Export the STAPL file from Designer. For more information, please refer to the *Designer Online Help*.

Note: The STAPL file must be generated from Designer R1-2003SP1 or later. Actel strongly recommends using the latest version of Designer software or Libero IDE with the most recent service pack installed. Software service packs can be found at http://www.actel.com/custsup/updates/index.html.

To load the STAPL file:

1. Click the *Open File* button in the toolbar, as shown in Figure 4-5.

Figure 4-5. Open File Toolbar Button

The **Open** dialog box appears, as shown in Figure 4-6.

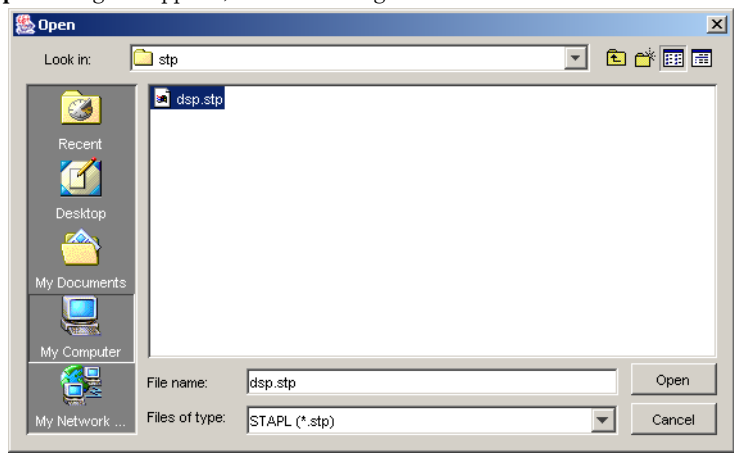

Figure 4-6. Open Dialog Box

2. Select your STAPL file and click *Open*. The FlashPro software loads the file.

Selecting an Action

After loading the STAPL file, select an action from the Action list. See Table 4-1 for a definition of each action.

Table 4-1. Action Options

Option	Action
QUERY_SECURITY	Checks the security status of the device. If the device is programmed with the security key, then this command returns with Read inhibit:1 Write inhibit:1. If the security key is not present, the values are Read inhibit:0 Write inhibit 0.
ERASE	Erases the device.
READ_IDCODE	Reads the device ID code.
VERIFY	Verifies if the device is programmed with the loaded STPL file. If the wrong STPL file is loaded, Exit 11 appears in the log window. A successful operation results in Exit 0.
PROGRAM	Programs the device.
DEVICE_INFO	Displays the serial number of the device, the Design Name that is programmed into the device, and the checksum that is programmed into the device.
ERASE_FlashROM	Erases FlashROM only.
PROGRAM_FlashROM	Programs FlashROM only.
VERIFY_FlashROM	Verifys FlashROM only.
PROGRAM_ARRAY	Programs the FPGA Array only.
ERASE_ARRAY	Erases the FPGA Array only.
VERIFY_ARRAY	Verifys the FPGA Array only.

Table 4-1. Action Options

Option	Action
PROGRAM	Programs FPGA Array, FlashROM and/or security settings of the device.
ERASE_ALL	Erases FPGA Array, FlashROM and/or security settings of the device.
ACTION_VERIFY	Verifys FPGA Array, FlashROM and/or security settings of the device.
READ_IDCODE	Reads the device ID code.
ENC_DATA_AUTHENTICATION	Autenticates the encrypted data against the security settings you previously programmed into the device. This is a preventative measure that stops the program from corrupting data into the device.
PROGRAM_SECURITY	Programs security settings into the device.
DEVICE_INFO	Displays the Device IDCODE, security settings, design name, checksum and FlashROM content that is programmed into the device.

Note: If FlashROM and FPGA Array are read/verify protected, the passkey must be provided in the STAPL file to enable read back and verification of the FPGA Array and FlashROM. If the device is permanently locked and the FPGA Array and FlashROM is read/verify protected, the content can not be verified or read back after you program the security setting.

Programming a Device

To program a device:

1. **In the Action list, select *PROGRAM*.**
2. **In the Device list, select the device.**

3. **Click the *Execute* button in the toolbar, as shown in Figure 4-7.**

Figure 4-7. Execute Toolbar Button

The **Execute Action** dialog box appears, as shown in Figure 4-8.

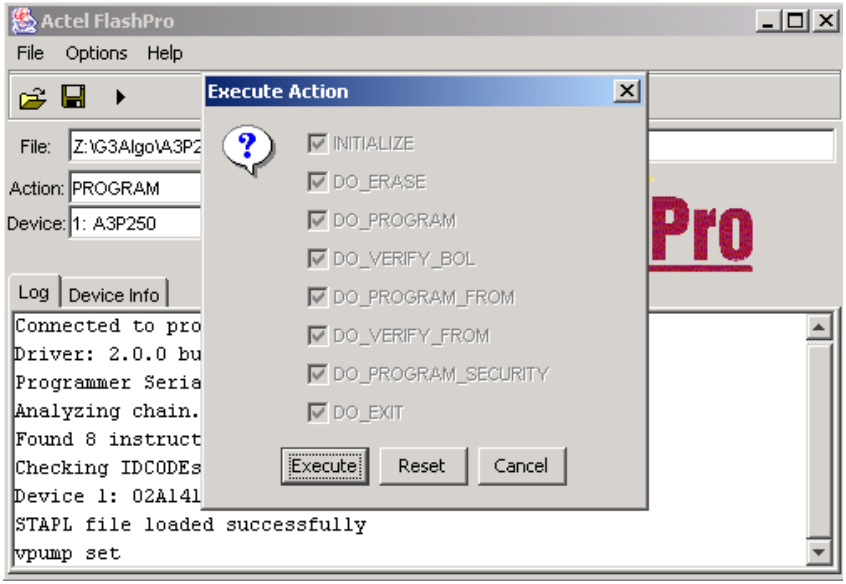

Figure 4-8. Execute Action Dialog Box

All the steps of the programming sequence are listed. Notice that all of the steps are grayed out because they are required for programming and cannot be changed.

4. **Click *Execute* to start programming.** The progress of the programming action displays in the Log window.

The message 'Exit 0' indicates that the device has been successfully programmed, as shown in Figure 4-9.

Note: Do not interrupt the programming sequence. It may damage the device or programmer.

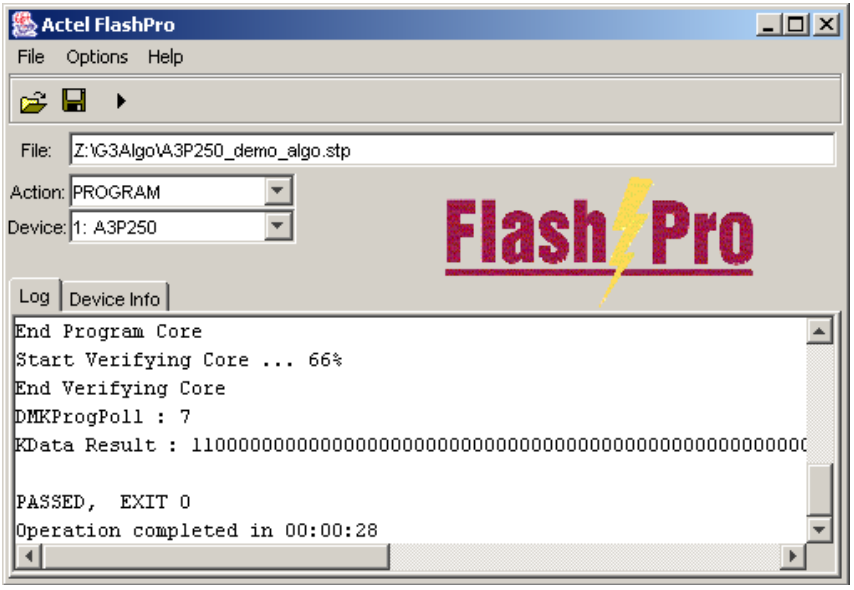

Figure 4-9. Successfully Programmed Device

If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" for more information.

Verifying the Correct Programming

To verify the device is programmed with the correct STAPL file:

1. Load the STAPL file.
2. In the Action list, click *VERIFY*.
3. Click the *Execute* button in the toolbar, as shown in Figure 4-10.

Figure 4-10. Execute Toolbar Button

The **Execute Action** dialog box appears, as shown in Figure 4-11.

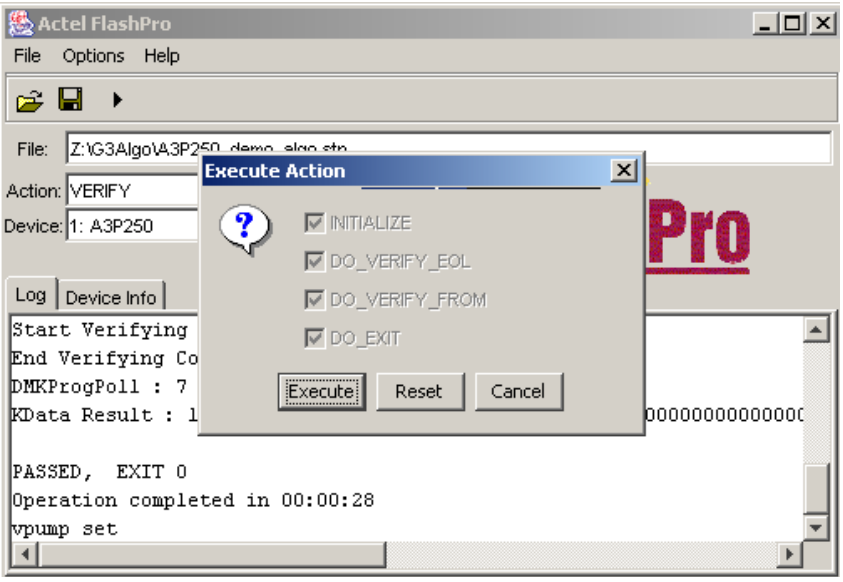

Figure 4-11. Execute Action Dialog Box

The default settings appear in the Execute Action dialog box.

4. **Click *Execute* to start the verification process.** A successful verification will result in Exit 0, as shown in Figure 4-12. If the STAPL file is different from the file used for programming, Exit 11 appears in the Log window (see "Error Messages & Troubleshooting Tips", "Exit 11" for more details).

Note: Do not interrupt the verifying sequence, it may damage the device.

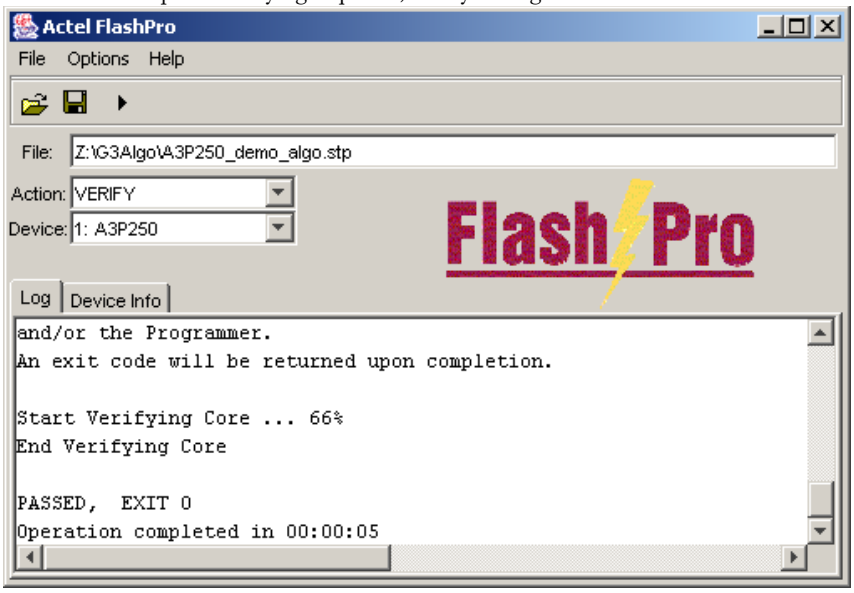

Figure 4-12. Successful Verification

ChainBuilder Programming

This section describes how to program a chain using a ChainBuilder generated STAPL file.

Hardware Setup

Before you begin, it is important to setup your hardware. See "Initial Setup" for more information.

Analyze Chain

To analyze the chain and select the device:

1. **From the *File* menu, click *Analyze Chain*.** Chain details appear in the Log window, as shown in Figure 4-13. If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" for more information.

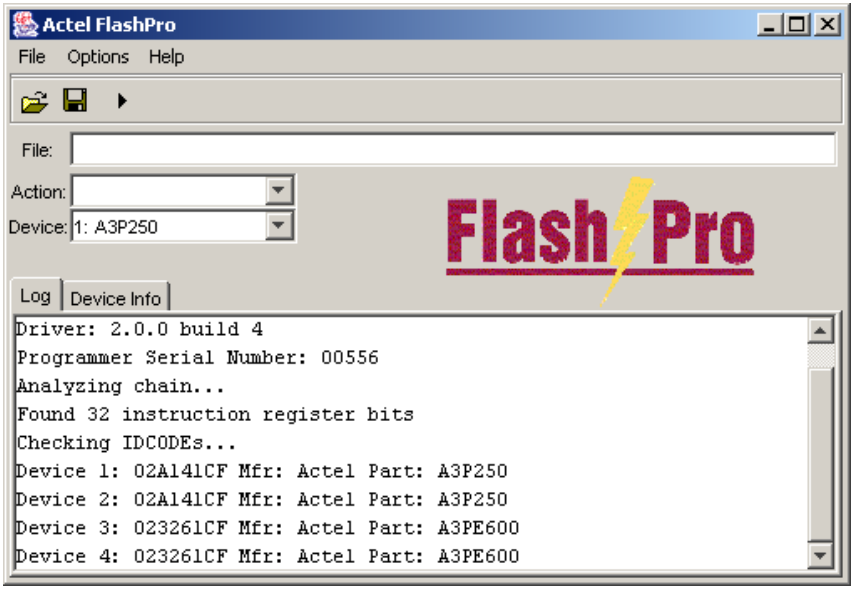

Figure 4-13. FlashPro: Analyzing Chain

Note: When you program a chain using a ChainBuilder STAPL file, you cannot select a device to target.

Loading the ChainBuilder STAPL File

To load the ChainBuilder STAPL file:

1. **Click the *Open File* button in the toolbar, as shown in Figure 4-14.**

Figure 4-14. Open File Button

The **Open** dialog box appears, as shown in Figure 4-15.

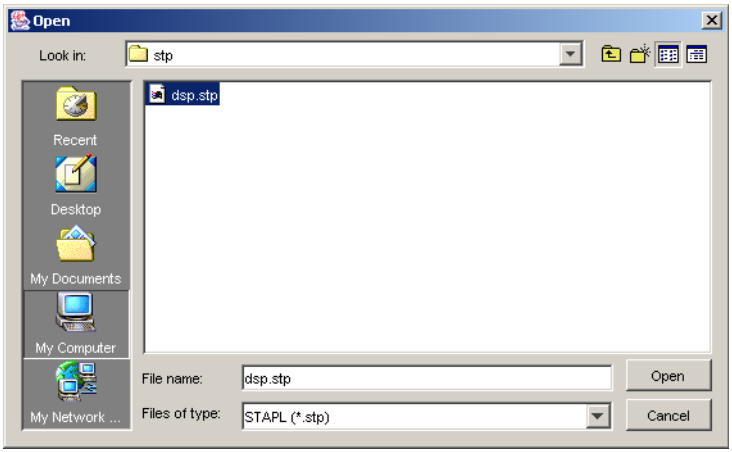

Figure 4-15. Open Dialog Box

Select your STAPL file and click *Open*. The FlashPro software loads the file.

After you analyze the chain and load the ChainBuilder STAPL file, you are ready to program the chain.

Programming a Chain using a ChainBuilder STAPL File

To program a chain using a ChainBuilder generated STAPL file:

1. **In the Action list, select *PROGRAM*.**
2. **Click the *Execute* button.** The progress of the programming action displays in the Log window. The message 'Exit 0' indicates that the device has been successfully programmed.

   Note: The "CheckChain Command" runs before any other command to verify that your physical chain configuration matches your ChainBuilder STAPL file.

CheckChain Command

The CheckChain command is a pass/fail check for the chain you are programming and the ChainBuilder STAPL file. If the chain you are programming matches the chain expected by the ChainBuilder STAPL file, the check chain passes.

Devices are listed in the device list box. However, if a device has an unknown ID or no ID, the chain is listed as "0:Chain" as shown in Figure 4-16.

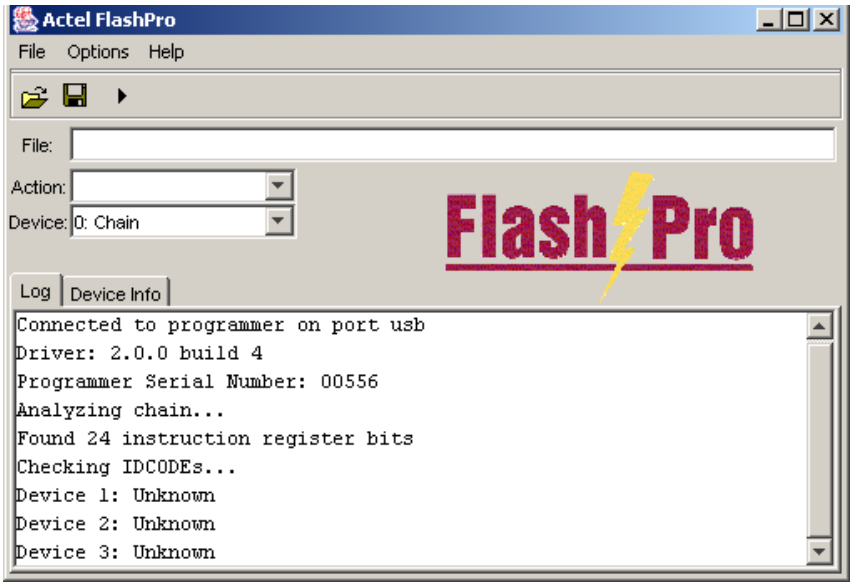

Figure 4-16. Device with Unknown ID

Note: In Figure Figure 4-17, the part name of the device is listed because it is an unknown device with a known device ID.

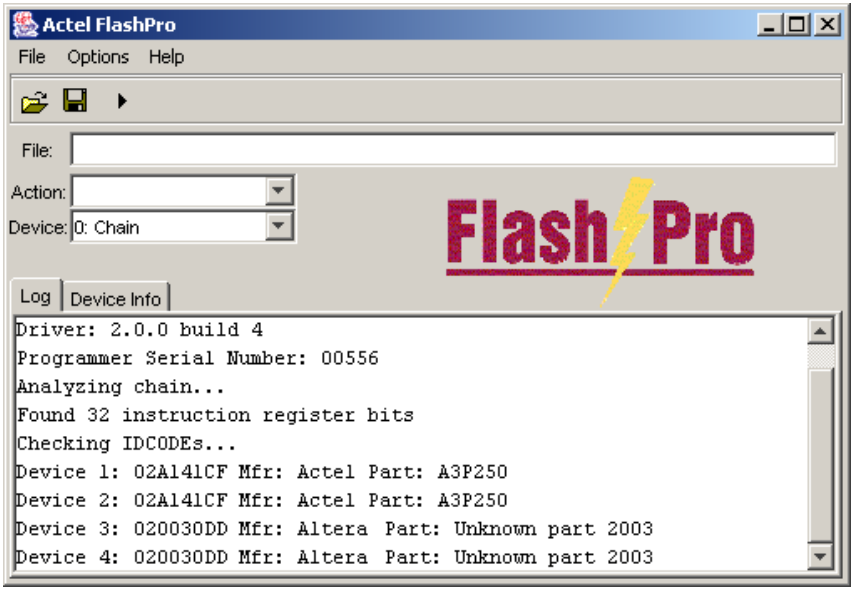

Figure 4-17. Unknown Device with Known ID

Permanently Lock the Security Setting

The FlashPro software includes a new ProASIC3/E feature which enables you to permanently lock the security setting of your device. The permanent lock feature permanently locks the security setting of your device and prevents you from modifying the security setting of the device.

Loading the Permanent Lock STAPL File:

Export the permanent lock STAPL file from Designer. See the note from "Loading the STAPL File" in this chapter.

To load the permanent lock STAPL file:

1. **Click the *Open File* button in the toolbar.** The Open dialog box appears.
2. **Select your permanent STAPL file and click *Open*.** The Permanent Lock About dialog box displays, as shown in Figure 4-18.

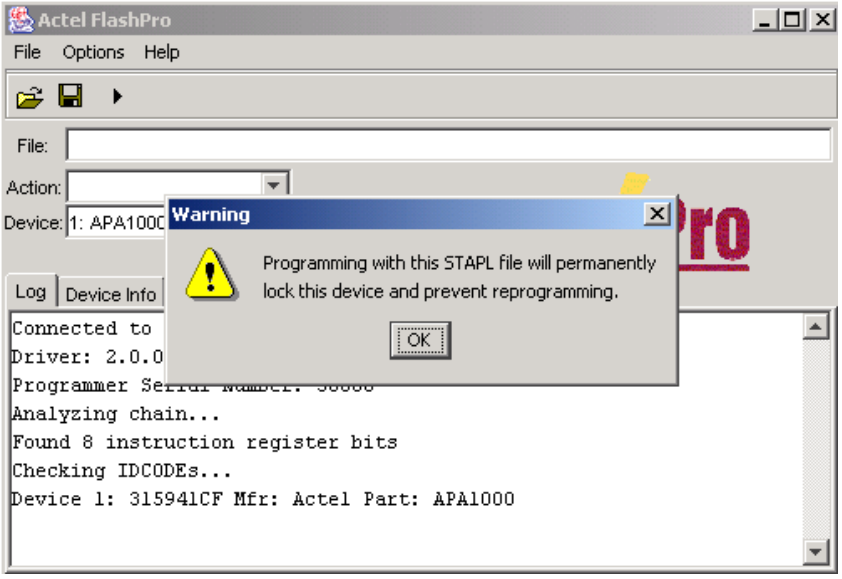

Figure 4-18. Permanent Lock About Dialog Box

3. **Read the message and click *OK* to load the permanent STAPL file.** The FlashPro software loads the file.

Programming a Device Using Permanent Lock

To program a device using Permanent Lock:

1. In the Action list, select *PROGRAM*.
2. In the Device list, select the device.
3. Click the *Execute* button in the toolbar, as shown in Figure 4-19.

Figure 4-19. Execute Toolbar Button

The **Execute Action** dialog box appears, as shown in Figure 4-20.

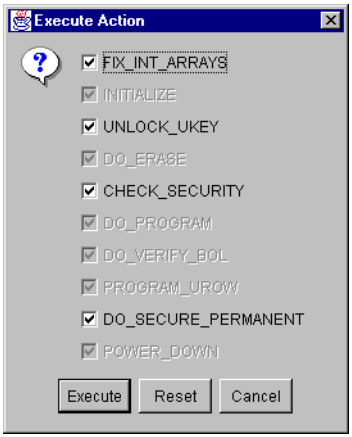

Figure 4-20. Execute Action Dialog Box

Note: The Do_Secure_Permanent checkbox is checked automatically. You have the option of unchecking this box. However, if you do, you will not permanently lock your device.

All the steps in the programming sequence are listed. Optional steps appear in bold. Grayed out options are required for programming and cannot be changed.

4. **Make your selections and click *Execute* to start programming.** The progress of the programming action is displayed in the Log window. The message 'Exit 0' indicates that the device has successfully been programmed as shown in Figure 4-21.

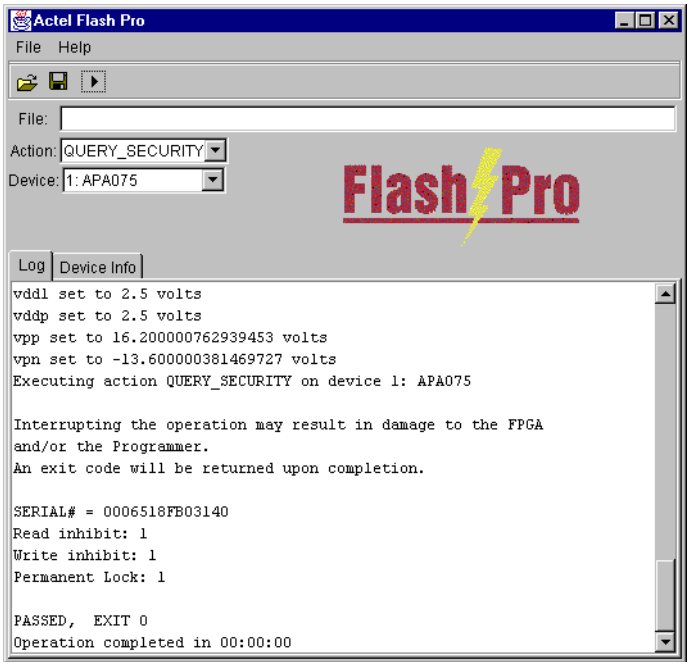

Figure 4-21. Query Results for the Permanently Locked Device

Note: Do not interrupt the programming sequence, it may damage the device or programmer.

If you encounter any failures, please refer to "Error Messages & Troubleshooting Tips" for more information.

Reprogram a Securely Locked Device

After you program a part using the security feature, you cannot erase, verify, or reprogram it without your original security key in the STAPL file. If you use the permanent lock feature, you cannot (under any circumstances) reprogram or erase the device.

You can reprogram a securely locked device using the original STAPL file by following the usual programming procedures.

You can also reprogram a device using a different STAPL file.

To reprogram a device using a different STAPL file:

1. **Connect the programmer.**
2. **Analyze the chain.**
3. **Load the original STAPL file you used to program and secure the device.**
4. **Perform the Erase action.** The Erase action unlocks the device and erases the device contents.
5. **Load another STAPL file to program.**

   If your security key does not match the security key programmed on the device, the software will generate an "Exit 17" error message.

Saving Your Log File

All FlashPro results are displayed in the Log window. You can save these results into a file.

To save your log file:

1. **From the *File* menu, click *Save Log*.** The Save dialog box appears, as shown in Figure 4-22.

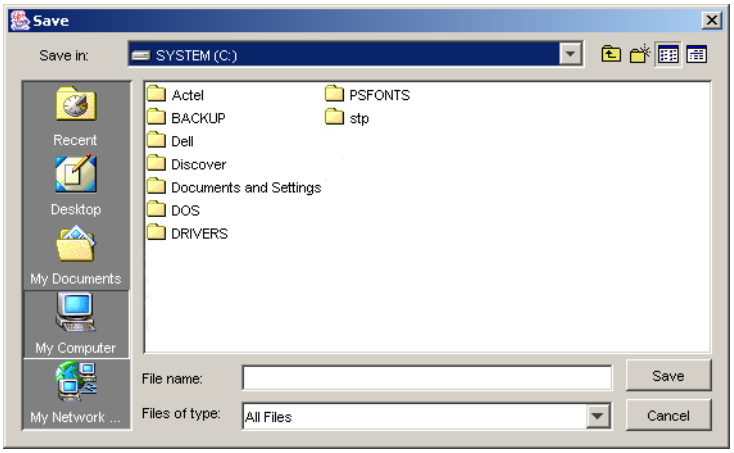

Figure 4-22. Save Dialog Box

2. **Select a directory, type in the file name, and click *Save*.** The FlashPro software saves the file.

Batch Mode

The batch mode is useful for scripts (automation) or for independent software that tries to access the FlashPro hardware without going through the FlashPro software's user interface.

You can run the batch mode command from the C:/Actel/FlashPro v3.3/FlashPro v3.3 directory if you installed it in the default location. Otherwise, run the batch mode command from an equivalent location depending on your installation directory.

Batch Mode Syntax

The batch mode has the following syntax (for FlashProv3.3 installed in default location):

"C:\Actel\FlashPro\FlashPro_v33\jre\bin\java.exe" -Xmx128m -classpath flashpro.jar com.actel.jtag.FS2 -port usb[-fam <A3P>] [-disable <vpump>] <action> <file>

You must specify the <action>, <port>, <fam>, and <file> arguments in the command. See Table 4-2 for a list of definitions for these arguments. A sample command is shown below:

"C:\Actel\FlashPro\FlashPro_v33\jre\bin\java.exe" -Xmx128m -classpath flashpro.jar com.actel.jtag.FS2 -port usb -fam A3P -action PROGRAM C:\designs\STAPL\a3p600.stp

Note: The return value is a “0” (if there are no errors) or an error number.

Table 4-2. Argument Description

Arguments	Description
-action <action>	The STAPL action that is performed. The exact actions contained in a STAPL file may vary, but the "ERASE", "PROGRAM", "VERIFY", "QUERY_SECURITY", "DEVICE_INFO", and "READ_IDCODE" commands should be present (note that the command is case sensitive).
<file>	Should be the full path name of the STAPL file that is being used.
-fam <fam>	The family of the device connected to the programmer (APA and A500K use different voltages- they cannot be mixed). APA is the default family if none is specified.

Table 4-2. Argument Description

Arguments	Description
-port <port>	FlashPro3 programmer can only connect using USB.
-disable <vpump>	Disable VPUMP from the FlashPro3. Use this option if you are providing VPUMP through your own board.

Serial Programming

Serial Programming enables you to program a sequence of ProASIC3/E devices in serial with an identical FPGA Array and with different serial data. Serial data could be a serial of different FlashROM content and/or AES key values. There are two different STAPL formats that support serial programming:

- Multiple actions to multiple serial data- This format supports a generic STAPL player because the STAPL player does not provide a mechanism for serial programming. One programming action is created to target different serial data.

  For example:

  - PROGRAM_ALL_1 programs the FPGA Array and the first serial data.

  - PROGRAM_ALL_2 programs the FPGA Array and the send serial data.

- Single action to multiple FROM- This format is created when the target programmer is FlashPro3, Sculptor II, or BP auto programmer, where new Actel innovated serial programming mechanism is supported. One programming action will program multiple serial data in serial.

Multiple Actions To Multiple FlashROM

By executing the action sequence in the STAPL file (created with different Core-FlashROM pairs), you can serial program multiple actions to multiple FlashROM.

Before you begin serial programming, make sure you have completed "Initial Setup" and "Analyze Chain and Device Selection".

To start serial programming:

1. **Load a serialized STAPL file into the software. (See "Loading the STAPL File" for more information).**

A serialized STAPL file has Multiple FlashROM data. Depending on the model you use when generating the STAPL file, each FlashROM data could include a matching AES key.

Note: The Action Combo box contains all of the actions in the STAPL file. See Figure 4-23.

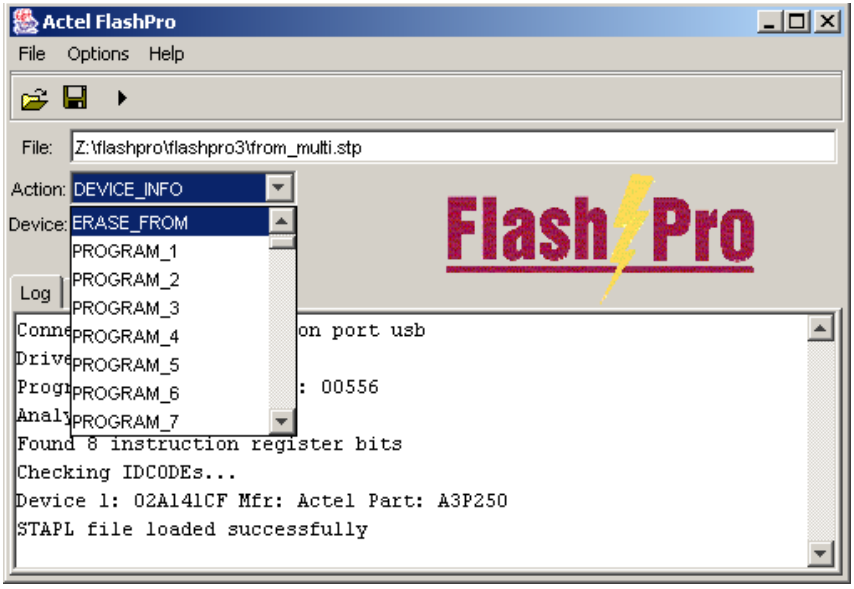

Figure 4-23. Action Combo Box

2. **Select Serial Programming from the Options menu.**

   The Serial Programming window appears as shown in Figure 4-24.

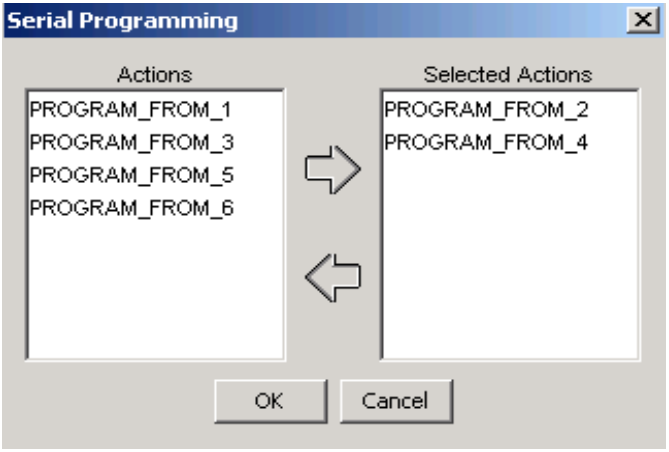

Figure 4-24. Serial Programming Action Window

3. **Select the actions you want to execute by using the arrows to move from the Actions box to the Selected Actions box.**

4. **Click OK.**

   The Action Combo box will be grayed out and Serial Mode displays next to the Action Combo box as shown in Figure 4-25.

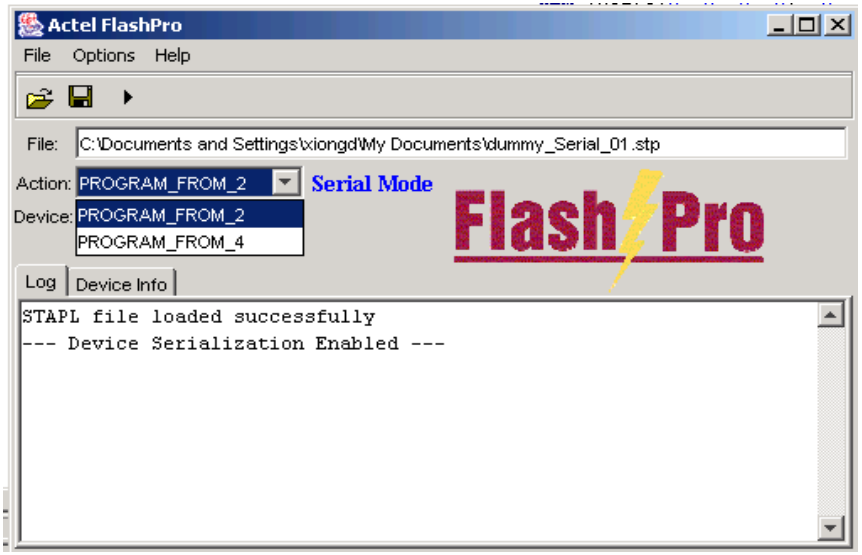

Figure 4-25. Updated Action Combo Box

5. **Click the Execute button in the toolbar.**

   The **Execute Action** dialog box appears as shown in Figure 4-26.

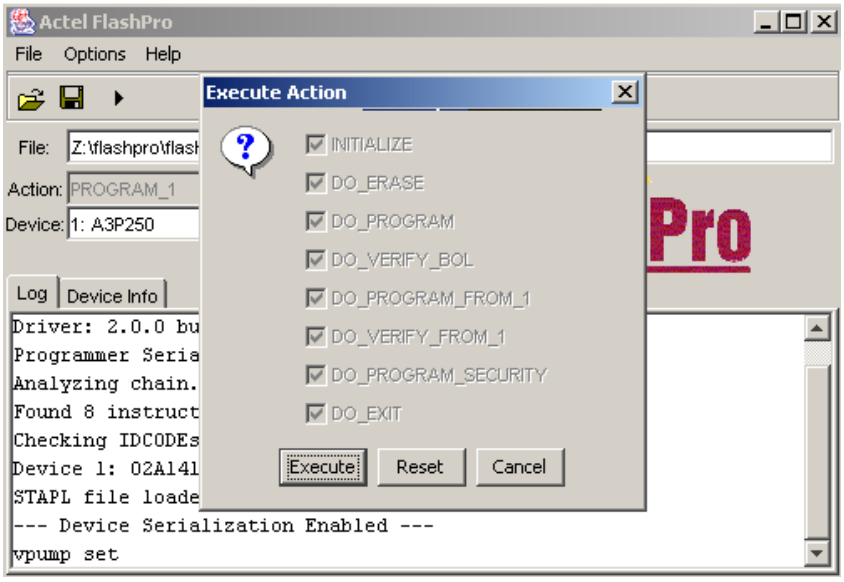

Figure 4-26. Execute Action Dialog Box

6. **Click Execute.**

   The Log window displays a passed or failed result.

7. **If it passed, the software automatically goes to the next action. Repeat steps 6 and 7.**

8. **If it failed, it may skip or repeat the action until it passes depending upon which option you selected. See "Serialization Options" for more information.**

   Continue this process until you have finished executing all actions.

   Note: The Log window displays a "completed serial programming message" when you have completed serial programming.

9. **When finished, turn Serial Programming off by selecting *Serial Programming* from the *Options* menu.**

   An execution summary displays in the Log window.

Serialization Options

If your device fails to program, and you have selected the **Reuse Serial Data** option, the software automatically reuses the current serial data when you program the next device. If your device fails to

program, and you have selected the **Skip Serial Data** option, the software automatically uses the next serial data when you program the next device.

To set serialization options:

1. **From the Options menu, select Serialization Option.**
2. **Select either Reuse Serial Data or Skip Serial Data. See Figure 4-27.**

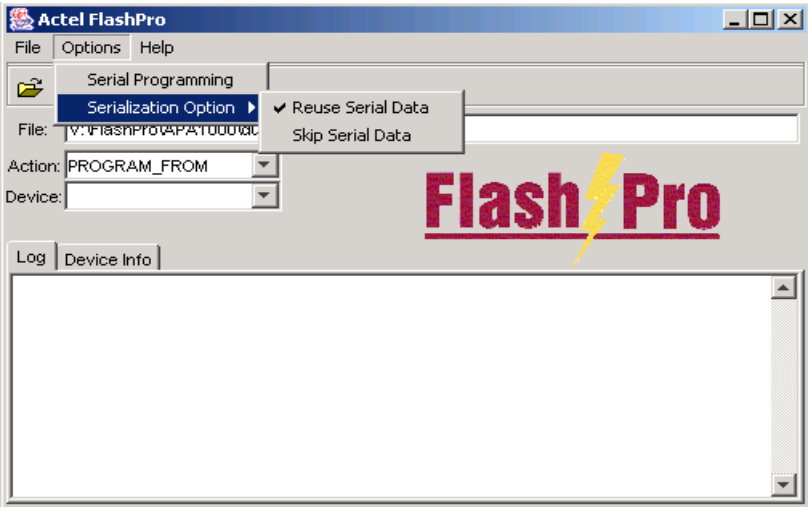

Figure 4-27. Serialization Option

Your options are set.

Single Actions to Multiple FlashROM

Before you begin serial programming, make sure you have completed the "Initial Setup" and "Analyze Chain and Device Selection".

Follow the steps below to program single actions to multiple FlashROM.

To start serial programming:

1. **Load the STAPL file into the software. (See "Loading the STAPL File" for more information).**

Note: The Action Combo box contains all of the actions in the STAPL file. See Figure 4-28.

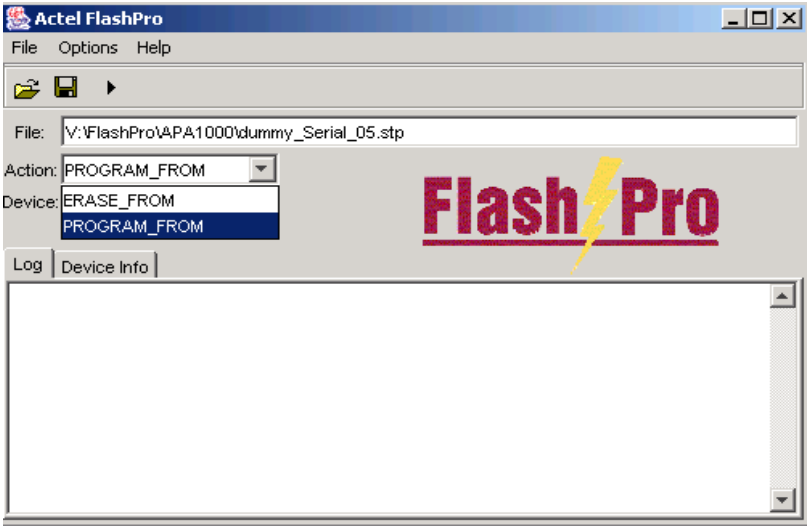

Figure 4-28. Updated Action Combo Box

2. **Select Serial Programming from the Options menu.**

   The Serial Programming Index window appears as shown in Figure 4-29.

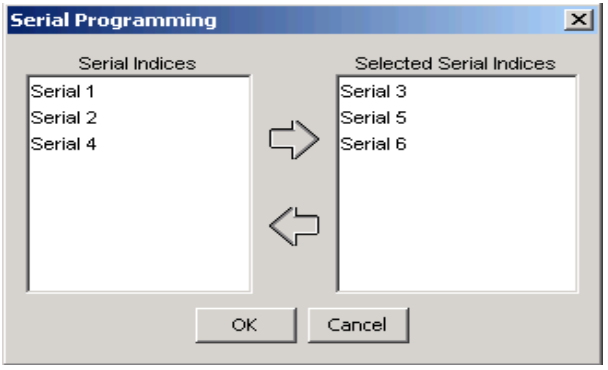

Figure 4-29. Serial Programming Index Window

3. Select the actions you want to execute by using the arrows to move from the *Serial Indices* box to the *Selected Serial Indices* box.
4. Click OK.

   The **Serial Index** box updates with the actions you selected from the Serial Programming Index window as shown in Figure 4-30.

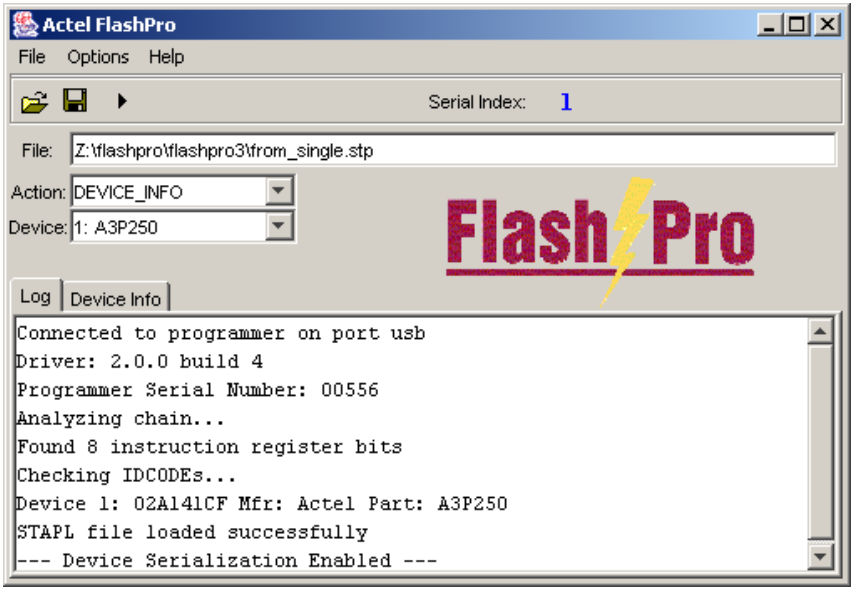

Figure 4-30. Serial Index Box

5. Select the PROGRAM action from the the Action Combo box.
6. Click the Execute button.

   The **Execute Action** dialog box appears as shown in Figure 4-31.

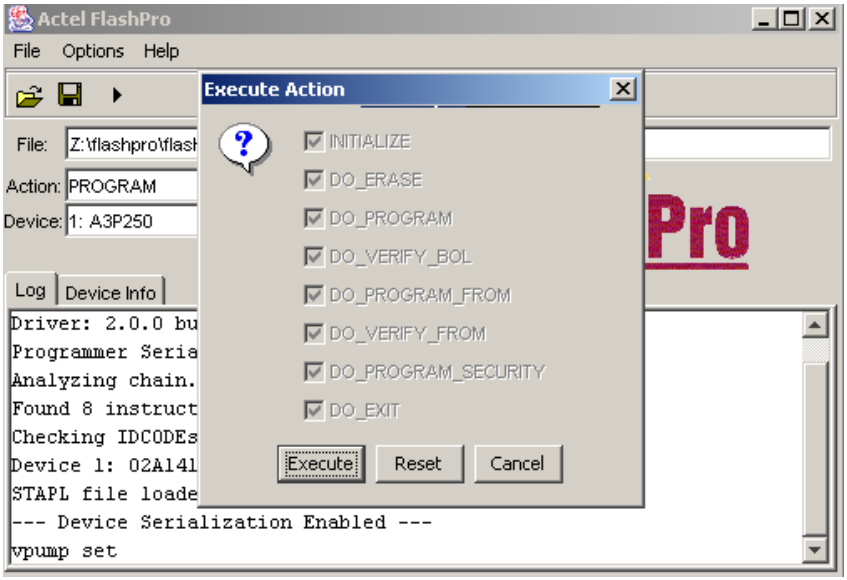

Figure 4-31. Execute Action Dialog Box

7. **Click Execute.**

   The Log window displays a passed or failed result.

8. **If it passed, the software automatically goes to the next action. Repeat steps 6 and 7.**

9. **If it failed, it may skip or repeat the action until it passes depending upon which option you selected. See "Serialization Options" for more information.**

   Continue this process until you have finished executing all actions.

   Note: The Log window displays a "completed serial programming message" when you have completed serial programming.

10. **When finished, turn Serial Programming off by selecting Serial Programming from the Options menu.**

    An execution summary displays in the **Log** window.

Serialization Options

If your device fails to program, and you have selected the reuse serial data option, the software automatically reuses the current serial data when you program the next device. If your device fails to

program, and you have selected the skip serial data option, the software automatically uses the next serial data when you program the next device.

To set serialization options:

1. From the Options menu, select Serialization Option
2. Select either *Reuse Serial Data* or *Skip Serial Data*. See Figure 4-32.

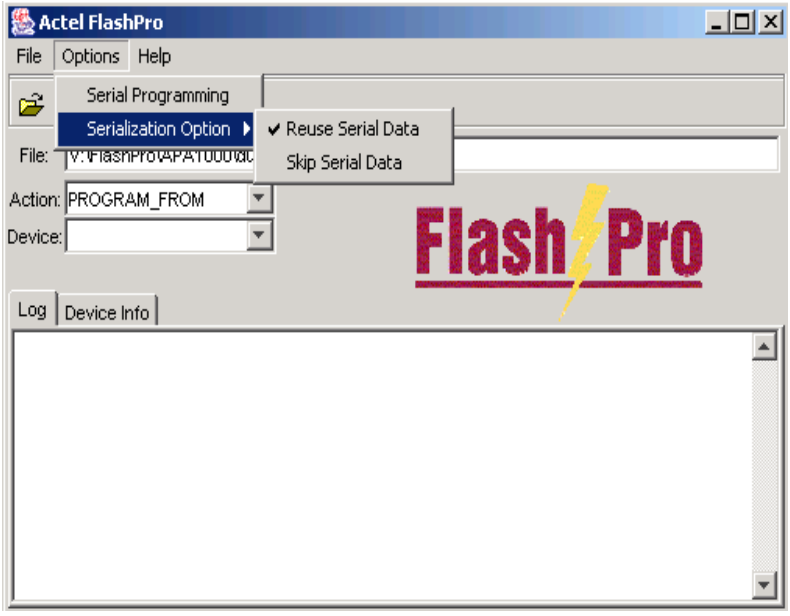

Figure 4-32. Serialization Option

Your options are set.

A

Error Messages & Troubleshooting Tips

The information in this chapter may help you solve or identify a problem with the FlashPro programmer. If you have a problem that you can not solve, please contact Actel Customer Technical Support at tech@actel.com or call our hotline 1-800-262-1060. We are dedicated to making FlashPro as trouble-free as possible. This chapter contains information on error messages for ProASIC, ProASIC^{PLUS}, and ProASIC3/E devices. For a list of error messages for ProASIC3/E devices, refer to Table A-1.

Exit Codes

The following exit codes are for ProASIC and ProASIC^{PLUS} devices:

Exit 0

This message means success. This does not indicate an error.

Exit 1

Exit 1 is defined as a Checking chain Error. This means that the physical chain does not match the expected setup from the STAPL file.

Possible Causes:

- The physical chain configuration has been altered.
- Something has become disconnected in the chain.
- The specific IR length of non-Actel devices may be incorrect.
- The order of the specified chain may be incorrect. For example, the chain order may be in the reverse order.

Exit 2

Reading device ID failure.

Possible Cause: The device either does not have a valid device ID or the data cannot be read correctly.

Possible Solution: Check the device ID.

Exit 3

This occurs when using ProASIC^{PLUS} devices.

Possible Cause: Connect was set up for a ProASIC device and the device is actually a ProASIC^{PLUS}.

Solution: Set up for a ProASIC^{PLUS} device.

Exit 5

Indicates a problem in programming setup, also known as “Entering ISP Failure.”

Possible Cause: The A500K device senses the V_{DDL} power supply as being on.

Solutions:

- Power the V_{DDL} down during programming.
- Check that the device has the correct voltages on V_{DDP}, V_{DDL}, V_{PP}, and V_{PN}.

Exit 6

JEDEC standard message. The IDCODE of the target device does not match the expected value in the STAPL file.

Possible Causes:

- User loaded an APA150 STAPL file to program an APA300.
- User selected wrong device.
- Device TRST pin is grounded.
- Noise or reflections on one or more of the JTAG pins caused by the IR Bits reading it back incorrectly.

Solutions:

- Choose the correct STAPL file and select the correct device.
- Measure JTAG pins and noise or reflection. TRST should be floating or tied high.
- Cut down the extra length of ground connection.

Exit 7

Unknown algorithm: alg=x, prev=x
Invalid data read from device

Possible Causes:

- In the factory row, the factory writes the algorithm revision the part is calibrated with. This error occurs with current STAPL files when the revision written into the factory row is not rev 2 for ProASIC devices or rev 1 for ProASIC^{PLUS} devices. The STAPL files from last year may "exit 7" with newer devices or the older revision may cause this failure if the STAPL file used is from latest version. This can occur if you are using Engineering Sample parts that

are no longer supported, such as ProASIC Engineering Sample parts. This error can also occur if the programmer has trouble reading the factory row due to signal noise, crosstalk, or reflections on the JTAG signal and clock lines.

- Programming -F ProASIC^{PLUS} device with old STAPL file.
- Connect V_{PP} and V_{PN} the wrong way around.
- No bypass Caps on V_{PP} V_{PN}, which damaged the device.

Solutions:

- Re-generate STAPL file from Libero v2.3 SP3 or Designer R1-2003SP3.
- Replace A500K ES parts with commercial parts.
- Double check V_{PP} and V_{PN} connections.
- Make sure V_{PP} and V_{PN} have correct bypass caps.
- Check the signal quality on the JTAG signal and clock lines

Exit 8

This message occurs when the FPGA failed during the Erase operation.

Possible Causes: The device is secured, and the corresponding STAPL file is not loaded. The device has been permanently secured and cannot be unlocked.

Solution: Load the correct STAPL file.

Exit 11

The message occurs when the FPGA failed verify.

Possible Causes

- The device is secured, and the corresponding STAPL file is not loaded.
- You used the Libero software v. 2.3 or earlier or the Designer R1-2003 software or earlier to generate the STAPL file.
- V_{PN} caps were soldered in the wrong polarity.

Solutions:

- Please load the correct STAPL file.
- Please use later software versions-- at least Libero v2.3 SP1 and Designer R1-2003 SP1.
- Double check the V_{PN} bypass caps polarity.

Exit 12

Occurs when security is enabled.

Possible Causes:

- The device is secured and the wrong key/STAPL file was entered.
- The device is damaged.
- The verification was interrupted and therefore fails, causing it to think the device is secure.

Exit 15

This message is a factory Calibration Data CRC Error. During program, erase, or verify, the programmer must read back Calibration Data from the FPGA. The Data contains a CRC and the programmer uses the CRC to ensure the data is not corrupted/wrong.

Possible Causes:

- The device is damaged.
- Noise on the JTAG signals causes the programmer to read back wrong data.

Exit 17

This message means that the device has been secured, write-security enabled.

Possible Causes:

- The device is secured and the wrong key/STAPL file was entered.
- The device is damaged.

Solution: Please load the correct STAPL file.

Exit 80

Error code results from STAPL files for A500K devices.

Possible Cause:

- An internal calibration (based on V_{DDP} and V_{PP}) failed.

Solutions:

- Check voltages on the device pins.

- Check voltages on the V_{DDP} and V_{PP} pins.

Exit 90

This message means that an unexpected RCK is detected. The ProASIC devices use either TCK or RCK to shape the programming pulse. The FlashPro uses TCK, it does not sense RCK directly. Rather, the device senses RCK and FlashPro reads it from the device.

Possible Causes:

- Noise on the RCK signal.
- You connected a CLK source to the RCK signal.
- The polarized bypass capacitors on VPP or VPN are reversed biased and are affecting the programmer's VPP or VPN output voltage. This is causing programming to fail.
- Several FlashPros are programming at the same time and are too close to each other.

Solutions:

- Disconnect the RCK and make sure TCK has a clean signal.
- Separate FlashPros away from each other while they are programming Internal ISP.

Exit 91

This message occurred because of a calibration data parity error. Before the FPGA is programmed, calibration data (stored in the device) are read back for programming purposes. The programmer performs a parity check on the data to ensure the proper data is read back.

Possible Cause: The device is damaged.

Solution: Please replace the device.

Exit Null

Possible Causes:

- Several FlashPros are programming at the same time and are too close to each other.
- FlashPro connects to PC parallel port through a dongle key.
- Data length mismatch when performing DRSCAN on STAPL file.

Possible Solutions:

- Separate FlashPros away from each other while they are programming.

- Connect FlashPro to PC parallel port directly.
- Regenerate STAPL file in case you mistakenly modified the file.

Cable to target is not connected properly

When the Analyze command is executed, the FlashPro will look for target devices. If the cable connection is wrong, FlashPro senses assumes that nothing is connected at all.

Possible Cause: The cable connector is not connected to the header properly or the connection from header to the device is missing something. Header pin 10 is the GND sensing pin. It senses if FlashPro is connected to the target's GND. Also, all other GND pins should be connected to the GND plane.

Solution: Please confirm the connection between header to the device. If the board supplies the power to the device, please make sure the voltage level is correct.

Chain Integrity Test Failed: XX

When the analyze chain operation is performed, the FlashPro programmer expects the first two bits of the data from the device chain to be a "01." When the programmer does not see the 01 pattern, it will return an error and report the bit values that it read. For example, if the bits it read were 11, then it would return "Chain Integrity Test Failed: 3"

Possible Causes:

- The connection between the FlashPro programmer and the Device is broken.
- The programmer cable might not be securely inserted into the header.
- The header is not connected to the JTAG pins of the FPGA correctly.
- The configuration setting (ProASIC/ProASIC^{PLUS}) does not match the target device.
- Noise or reflections on the JTAG pins has caused communication between the programmer and the device to fail.
- A dongle is plugged in between the PC parallel port and the FlashPro parallel port cable.

Solutions:

- Please secure the connections.
- Check the JTAG pins for signal activity.
- Check for broken TDO, TMS, and TCK pins.
- After checking all type of connections if the failure exists, you may need to replace the first device (the devices closest to the TDO of the programming header) in the chain.

- Remove the dongle.

Could not connect to programmer on port lpt1 or Parallel port device does not support IEEE-1284 negotiation protocol

Possible Causes: These errors can occur because the remote device does not respond to the negotiation protocol, for a variety of reasons.

Solutions:

- Make sure the port is connected
- Make sure the connected device is a FlashPro/Lite programmer
- Turn the programmer on
- Check parallel port setting in BIOS
- Make sure that there are no dongles in between the parallel port and the FlashPro connection
- Try another parallel cable, the parallel cable might be defective
- Check to see if the programmer is damaged (see step 4 in "Software Freeze" on page 115)
- Make sure the FlashPro Lite has power. The FlashPro Lite is powered from the target board through the Vdd pin of the programming header. Please make sure the Vdd pin is connected and the target board is powered up.

External Voltage Detected on <Supply>

From the CONNECT menu, the FlashPro programmer has been told to power a supply (one of Vdd, Vddp, Vpp, Vpn) of the FPGA, but it is already driven from another source. The FlashPro has sense-amps on all the power supplies to make sure that it does not drive a power supply that is already driven by the board.

Possible Cause: The voltage supply for the FPGA is driven by the another source (board, external power-supply), but the user forgot to turn off the supply in the CONNECT menu.

Solution: Set appropriate options in the CONNECT menu.

Failed self-test. V_{DDP} setting: Expected 2300...27000. Actual 750

This failure happens due to low V_{DDP}. A loose cable connector usually causes a low voltage or no voltage.

Possible Cause: The cable may have become loose if the cable was disconnected from the target by pulling up on the cable instead of lifting the connector directly.

Solution: Secure the connection between the cable connector and the programming header.

Loopback Failure TDI -> TDO. Expected 1, Actual 0

Possible Causes: An error message indicating a mismatch between expected signal values of 1 or 0 indicates a hard failure. The signals will be TCK, OUT0, or TDI.

Solution: Send the programmer back for repair.

More than one unidentified device cannot continue

In order to perform an operation to the ProASIC device, the rest of the devices in the chain must be in bypass mode. To put the devices into bypass mode, the programmer must need to know the IDCODE (hence the instruction register length) of these devices. If there is more than one device in the chain which does not support IDCODE command, then the programmer cannot put them into bypass mode, therefore cannot reach the desired ProASIC device.

Possible Causes:

- The user has chained the ProASIC device with non-Actel devices. Currently that is not supported in our software.
- One or more of the devices in the chain is damaged, and the IDCODE cannot be read back.

Solution:

Please remove all non-Actel devices from the chain. If you still experience the failure, it is likely that the device's ID CODE can not be read and you need to replace the device.

Self-test

Before you program any devices, you should run the self-diagnostic test (see "Self-Test" on page 13). The diagnostic software can be found on the Actel web site. If the test fails, please contact Actel Customer Technical Support at tech@actel.com for credit and replacement.

Note: The Self-test is only available for FlashPro, not FlashPro Lite.

V_{DDP} Disconnected

This message occurred because there is no Vddp voltage supply to the FPGA.

Possible Causes:

- You accidentally turned off the Vddp supply in the CONNECT menu.
- The Vddp supply on the board is not functioning.

Solution: Please check the Vddp supply on the board for appropriate voltages and correct the CONEECT menu.

Table A-1 lists exit codes are for ProASIC3/E devices.

Table A-1. ProASIC3/E Device Exit Codes

Exit Code	Description	Possible Cause(s)	Solution(s)
0	This message means success. This does not indicate an error.		
1	Exit 1 is defined as a checking chain error. This means that the physical chain does not match the expected setup from the STAPL file.	• The physical chain configuration has been altered. • The specific IR length of non-Actel devices may be incorrect. • The order of the specified chain may be incorrect. For example, the chain order may be in the reverse order. • Something has become disconnected in the chain.	• Check the physical chain configuration against ChainBuilder's configuration. • Check the programmer header connection. • Check the connection between the FlashPro3 programmer and the PC.

Table A-1. ProASIC3/E Device Exit Codes

Exit Code	Description	Possible Cause(s)	Solution(s)
5, -25, -26	Entering ISP failure.	Indicates there is a problem in the programming environment setup.	• Check the connection of the programmer header. • Check the connection between the FlashPro3 programmer and the PC 3. • Check that all the required voltages are provided for ISP programming.
6	The IDCODE of the target device does not match the expected value in the STAPL file.	• The STAPL file does not match the targeted device. • You selected a wrong device. • Device TRST pin is grounded. • Noise or reflections on one or more of the JTAG pins caused by the IR Bits reading it back.	• Choose the correct STAPL file and select the correct device. • Measure JTAG pins and noise or reflection. TRST should be floating or tied high. • Cut down the extra length of ground connection.
8	FPGA Array erase failure	• The device is secured, and the corresponding STAPL file with the correct security information is not loaded. The device has been permanently secured and cannot be unlocked.	Make sure you loaded the correct STAPL file.

Table A-1. ProASIC3/E Device Exit Codes

Exit Code	Description	Possible Cause(s)	Solution(s)
10	FPGA Array programming failure	• The device is secured, and the corresponding STAPL file with the correct security information is not loaded. • The device has been permanently secured and cannot be unlocked.	Make sure you loaded the correct STAPL file.
11	FPGA Array Verification Failure: Device content does not match with the STAPL file.	• Device content does not match the STAPL file. • The device is secured, and the STAPL file does not contain the correct security information. • The device was not programmed successfully.	• Make sure the correct STAPL file was loaded correctly. • Verify the correct STAPL file was loaded for the verification process. • Verify all the power supply voltages meet the datasheet specification.
14	Security status register programming failure Note: The device security setting may not be properly set due to this failure, and the device will be erased automatically.	• The device is secured, and the corresponding STAPL file with the correct security information is not loaded. • Failed to program the security setting for the device. • The device has been permanently secured and cannot be unlocked.	Make sure you loaded the correct STAPL file.

Table A-1. ProASIC3/E Device Exit Codes

Exit Code	Description	Possible Cause(s)	Solution(s)
-18	Encrypted Data Authentication Failure: Failed to authenticate the encrypted STAPL file.	• Make sure the data is encrypted with the same AES Key as the one programmed into the device.	Regenerate the STAPL file with the correct AES Key.
-19	FlashROM programming failure	• The device is secured, and the corresponding STAPL file with the correct security information is not loaded. • The device has been permanently secured and cannot be unlocked.	Make sure you loaded the correct STAPL file.
-20	FlashROM verification failure	• The FlashROM content in the device does not match the STAPL file. • The device is secured, and the corresponding STAPL file with the correct security information is not loaded. • The device has been permanently secured and cannot be unlocked. • If you are using Serialization, you may have used the wrong serial index to verify the FlashROM content. • The FlashROM was not programmed successfully.	• Make sure you loaded the correct STAPL file. • If the you are using serialization, please make sure that you have selected the correct serial index.

Table A-1. ProASIC3/E Device Exit Codes

Exit Code	Description	Possible Cause(s)	Solution(s)
-21	FlashROM erase failure	• The device is secured, and the corresponding STAPL file with the correct security information is not loaded. • The device has been permanently secured and cannot be unlocked.	• Make sure you loaded the correct STAPL file.
-22	Pass Key programming failure	• The device is secured, and the corresponding STAPL file with the correct security information is not loaded. • The device has been permanently secured and cannot be unlocked.	• Make sure you loaded the correct STAPL file.
-23, -31, -32	AES Key programming failure	• The device is secured, and the corresponding STAPL file with the correct security information is not loaded. • The device has been permanently secured and cannot be unlocked.	• Make sure you loaded the correct STAPL file.
-24	Information Programming Failure	Connection to the device may be interrupted.	• Check the programmer header connection . • Check the connection between the FlashPro3 programmer and the PC. • Verify that all the required voltages are provided for ISP programming.

B

Electrical Pin Outs

Programmer electrical parameter information for FlashPro3, FlashPro Lite, and FlashPro are located in Table 0-4 thorugh Table 0-8. Electrical pin out diagrams of FlashPro3, FlashPro Lite, and FlashPro are shown below.

Note: You should take the following precautions if you want to wire your own header arrangements:

- All the ground pins must be individually connected to ground to ensure reliable programming and to ensure that they are not connected internally in the programmer.
- Keep cable lengths short to avoid signal integrity problems.

FlashPro3

The FlashPro3 output is supplied via a connector to which a detachable 10-pin cable is fitted. The connector on the FlashPro3 unit is a 2x5, RA male Header connector, which is manufactured by AMP and has a manufacturer's part number of 103310-1. This is a standard 2x5, 0.1 pitch connector which is keyed.

The signals on the pins of the FlashPro3 10-pin connector are shown in Figure B-1 below (extracted from FlashPro3 product specification):

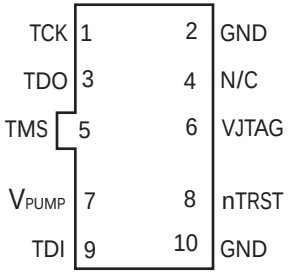

Figure B-1. 10-Pin Connector

Table B-1 shows a description of the signals..

Table B-1. FlashPro3 Signal Description

Signal	Description
V_{PUMP}	3.3V Programming voltage
GND	Signal reference
TCK	JTAG clock
TDI	JTAG data input to device
TDO	JTAG data output from device
TMS	JTAG mode select
nTRST	Programmable output pin may be set to off, toggle, low, or high level
V_{JTAG}	Reference voltage from the target board
N/C	Programmer does not connect to this pin

FlashPro Lite

For FlashPro Lite, the existing 26-pin connector is shown in Figure B-2. See Table B-2 for a description of the signals.

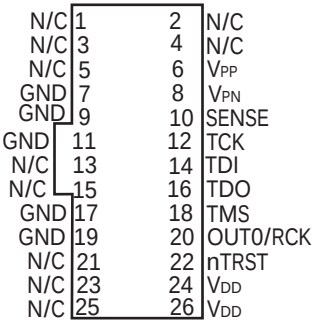

Figure B-2. 26-Pin Connector

The appropriate SAMTEC micro connnector target cable for this is:
Samtec FFSD-13-D-12.00-01-N.

The 12 inch cable is specified. This is likely to be more than enough to connect to the board and reducing the inductance will help compared with 18 inches, which is supplied by the default with FlashPro Lite.

Note: All ground pins must be connected.

Table B-2. FlashPro Lite Signal Description

Signal	Description
V_{DDP}	VDD supply for logic I/O pads
V_{DDL}	VDD supply for core
V_{PP}	Positive programming supply (+16.5V)
V_{PN}	Negative programming supply(-13.8V)
GND	Signal reference
SENSE	Input from target board to programmer to indicate connection to ground
TCK	JTAG clock
TDI	JTAG data input to device
TDO	JTAG data output from device
TMS	JTAG mode select
nTRST	Programmable output pin may be set to off, toggle, low, or high level
RCK/OUT0	Programmable output pin may be set to off, toggle, low, or high level
N/C	Programmer does not connect to this pin

FlashPro

For FlashPro, you can use the same 26-pin target cable you used for FlashPro Lite, but the connections are shown in Figure B-3.

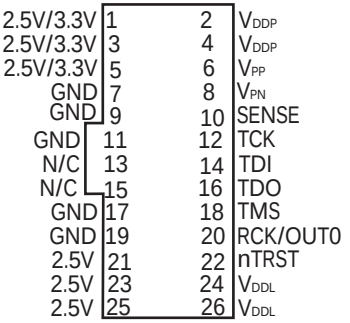

Figure B-3. FlashPro 26-Pin Connector

Table B-3 shows the signal pin descriptions for FlashPro.

Table B-3. FlashPro Signal Description

Signal	Description
V_{DDP}	VDD supply for logic I/O pads
V_{DDL}	VDD supply for core
V_{PP}	Positive programming supply (+16.5V)
V_{PN}	Negative programming supply(-13.8V)
GND	Signal reference
SENSE	Input from target board to programmer to indicate connection to ground
TCK	JTAG clock
TDI	JTAG data input to device
TDO	JTAG data output from device

Table B-3. FlashPro Signal Description

Signal	Description
TMS	JTAG mode select
nTRST	Programmable output pin may be set to off, toggle, low, or high level
RCK/OUT0	Programmable output pin may be set to off, toggle, low, or high level
2.5V, 2.5V/3.3V, N/C	Programmer does not connect to these pins

Programmer Electrical Parameters

Table B-4 shows DC characteristics for FlashPro3.

Table B-4. DC Characteristic for FlashPro3

Description	Symbol	Min	Max	Unit
Input low voltage, TDO	V_{IL}	-0.5	0.35*VJTAG	V
Input high voltage, TDO	V_{IH}	0.65*VJTAG	3.6	V
Input current, TDO	I_{IL}, I_{IH}	-20	+20	µA
Input capacitance, TDO			40	pF
Output voltage, V_{PUMP}, operating	V_{PP}	+3.0	+3.6	V
Output current, V_{PUMP}	I_{PP}		250	mA
VJTAG = 1.5V				
Output low voltage, TCK, TMS, TDI, 100µA load	V_{OL}	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 4mA load	V_{OL}	0.0	0.30*VJTAG	V

Table B-4. DC Characteristic for FlashPro3

Description	Symbol	Min	Max	Unit
Output high voltage, TCK, TMS, TDI, 100µA load	V_{OH}	VJTAG-0.2	VJTAG	V
Output high voltage, TCK, TMS, TDI, 4mA load	V_{OH}	0.70*VJTAG	VJTAG	V
Output current, TCK, TMS, TDI	I_{OL}, I_{OH}	-4	+4	mA
VJTAG = 2.5V				
Output low voltage, TCK, TMS, TDI, 100µA load	V_{OL}	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 8mA load	V_{OL}	0.0	0.6	V
Output high voltage, TCK, TMS, TDI, 100µA load	V_{OH}	VJTAG-0.2	VJTAG	V
Output high voltage, TCK, TMS, TDI, 8mA load	V_{OH}	1.8	VJTAG	V
Output current, TCK, TMS, TDI	I_{OL}, I_{OH}	-8	+8	mA
VJTAG = 3.3V				
Output low voltage, TCK, TMS, TDI, 100µA load	V_{OL}	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 8mA load	V_{OL}	0.0	0.6	V
Output high voltage, TCK, TMS, TDI, 100µA load	V_{OH}	VJTAG-0.2	VJTAG	V

Table B-4. DC Characteristic for FlashPro3

Description	Symbol	Min	Max	Unit
Output high voltage, TCK, TMS, TDI, 8mA load	V_{OH}	2.4	VJTAG	V
Output current, TCK, TMS, TDI	I_{OL}, I_{OH}	-8	+8	mA

Table B-5 shows the DC characteristics for FlashPro Lite.

Table B-5. DC Characteristics for FlashPro Lite

Description	Symbol	Min	Max	Unit
Input low voltage, TDO	V_{IL}	-0.5	0.7	V
Input high voltage, TDO	V_{IH}	1.7	5.0	V
Input current, TDO	I_{IL}, I_{IH}	-10	+10	µA
Input capacitance, TDO			40	pF
Input voltage, VDD, operating		+2.3	+3.5	V
Input voltage, VDD, power off		-1.0	+1.0	V
Input current, VDD	I_{VDD}		700	mA
Output voltage, V_{PP}, operating	V_{PP}	+15.9	+16.5	V
Output voltage, V_{PN}, operating	V_{PN}	-13.8	-13.4	V
Output current, I_{PP}	I_{PP}	0	35	mA
Output current, I_{PN}	I_{PN}	0	-15	mA

Table B-5. DC Characteristics for FlashPro Lite

Description	Symbol	Min	Max	Unit
Output low voltage, TCK, TMS, TDI, 100uA load	V_{OL}	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 1mA load	V_{OL}	0.0	0.5	V
Output low voltage, TCK, TMS, TDI, 2mA load	V_{OL}	0.0	0.8	V
Output high voltage, TCK, TMS, TDI, 100uA load	V_{OH}	2.1	2.5	V
Output high voltage, TCK, TMS, TDI, 1mA load	V_{OH}	1.9	2.5	V
Output high voltage, TCK, TMS, TDI, 2mA load	V_{OH}	1.6	2.5	V
Output current, TCK, TMS, TDI, nTRST	I_{OL}, I_{OH}	-2	+2	mA

Table B-6 shows DC characteristics for FlashPro.

Table B-6. DC Characteristic for FlashPro

Description	Symbol	Min	Max	Unit
Input low voltage, TDO	V_{IL}	-0.5	0.30 * V_{DDP}	V
Input high voltage, TDO	V_{IH}	0.70 * V_{DDP}	5.5	V

Table B-6. DC Characteristic for FlashPro

Description	Symbol	Min	Max	Unit
Input current, TDO	I_{IL}, I_{IH}	-10	+10	µA
Input voltage, V_{DDP}, V_{DDL}		0	5.25	V
Input voltage, V_{PP}		0	21.0	V
Input voltage, V_{PN}		-21.0	0	V
Input current, V_{DDP}, V_{DDL}, V_{PN}, V_{PP}	I_{VCC}		5.0	mA
Output voltage range, V_{DDP}	V_{DDP}	1.5	3.3	V
Output voltage range, V_{DDL}	V_{DDL}	1.5	3.3	V
Output voltage range, V_{PP}	V_{PP}	15.0	18.0	V
Output voltage range, V_{PN}	V_{PN}	-16.0	-12.0	V
Output voltage resolution / accuracy			100 / ±50	mV
Output current, I_{DDP}	I_{DDP}	-135 (1)	+135	mA
Output current, I_{DDL}	I_{DDL}	-135 (1)	+135	mA
Output current, I_{PP}	I_{PP}	-270 (1)	+270	mA
Output current, I_{PN}	I_{PN}	-270	+270 (1)	mA
Output low voltage, TCK, TMS, TDI, OUT0, nTRST	V_{OL}	0.0	0.4	V
Output high voltage, TCK, TMS, TDI, OUT0, nTRST	V_{OH}	0.85 * V_{DDP}	V_{DDP} + 0.3	V
Output current, TCK, TMS, TDI, OUT0, nTRST	I_{OL}, I_{OH}	-12	+12	mA

Note (1): When power supply mode is set to ABI_GROUND.

Table B-7 shows the JTAG switching characteristics for FlashPro3.

Table B-7. JTAG Switching Characteristics for FlashPro3

Description	Symbol	Min	Max	Unit
Output delay from TCK to TDI, TMS	T_{TCKTDI}	-2	2	ns
TDO setup time before TCK rising, VJTAG=3.3	T_{TDOTCK}	12		ns
TDO setup time before TCK rising, VJTAG=1.5	T_{TDOTCK}	14.5		ns
TDO hold time after TCK rising	T_{TCKTDO}	0		ns
TCK period	T_{TCK}	41.7	10667	ns

Table B-8 shows the JTAG switching characteristics for FlashPro and FlashPro Lite measured at the programmer end of the JTAG cable.

Table B-8. JTAG Switching Characteristics for FlashPro and FlashPro Lite

Description	Symbol	Min	Max	Unit
Output delay from TCK falling to TDI, TMS	T_{TCKTDI}	-2.0	2.0	ns
TDO Setup time before TCK rising	T_{TDOTCK}	5.0		ns
TDO Hold time after TCK rising	T_{TCKTDO}	0		ns
TCK period	T_{TCK}	40	10240	ns

Figure B-4 shows an illustration of the JTAG switching characteristics in Tables B-4 and B-5.

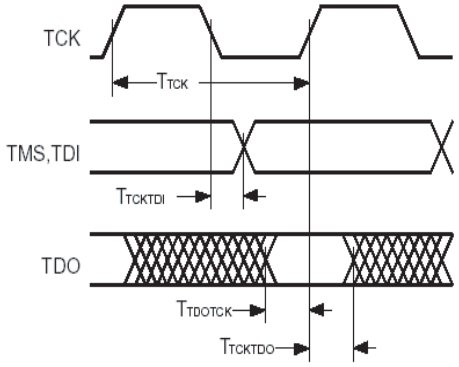

Figure B-4. JTAG Switching Characteristics Illustration

C

Software Freeze

The software may freeze if there are any unexpected events that terminate the communication between the programmer and the PC. For example, the software may freeze if you short the connection pins of the programmer to ground. This causes an excessive amount of current (drawing from the programmer), which may potentially damage the programmer and/or the device.

To restart the software after a crash:

1. **Power-down everything.**

- If Vpp and Vpn are provided on the board, power them down first, then power down Vdd and Vddp. Finally, power down the FlashPro and disconnect it from the board.
- If the FlashPro is providing all the voltages, power down the FlashPro and disconnect it from the board.

2. **Close the FlashPro software.**
3. **On the FPGA, measure resistance between all power supplies to GND. If any power supply is shorted to GND, then the device is damaged. Don't power up the board.**
4. **Power up the FlashPro, invoke the FlashPro software, and run self-test (**"Self-Test" on page 13**).**
5. **Assuming that the FPGA does not have any supply to GND short, reconnect the FlashPro and run an Analyze Chain (**"Analyze Chain and Device Selection" on page 23**).**

D

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.

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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.

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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 (650) 318-4480.
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Guru is a web-based automated technical support system accessible through the Actel home page (**http://www.actel.com/custsup/search.html**). 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.

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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.

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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:

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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.

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Index

F

G

H

L

M

P