FlashPoint User's Guide

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Generate a programming file

FlashPoint enables you to program security settings, FPGA Array, and FlashROM features for ProASIC3/E devices. You can program these features separately using different programming files or you can combine them into one programming file. Each feature is listed as a silicon feature in the GUI.

You can generate a programming file with one, two, or all of the silicon features from the **Generate Programming File** page.

To generate a programming file:

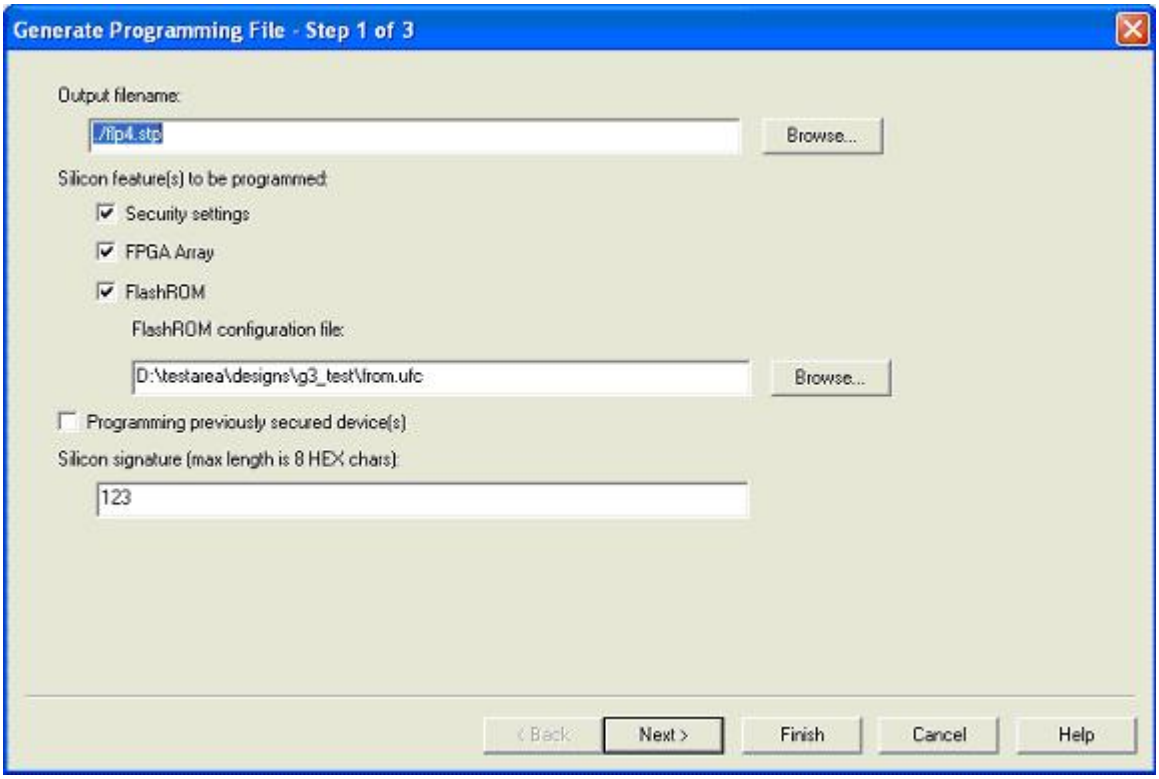
1. Enter the **Output file name**.
   Click the **Browse** button if you need to find your file or select your directory, and then enter the file name to save your output file.

2. Select the **Silicon feature(s)** you want to program.

   Security settings

   FPGA Array

   FlashROM



3. Click the **Programming previously secured device(s)** check box if you are reprogramming a device that has been secured.

   Because the ProASIC3/E family enables you to program the Security Settings separately from the FPGA Array and/or FlashROM, you must indicate if the Security Settings were previously programmed into the target device. This requirement also applies when you generate programming files for reprogramming.

4. Enter the silicon signature (0-8 HEX characters). See Silicon Signature for more information.

5. Click **Next**.

Silicon signature

With Designer tools, you can use the silicon signature to identify and track Actel designs and devices. When you generate a programming file, you can specify a unique silicon signature to program into the device. This signature is stored in the design database and in the programming file, and programmed into the device during programming.

The silicon signature is accessible through the USERCODE JTAG instruction.

NOTE: If you set the security level to high, medium, or custom, you must program the silicon signature along with the Security Setting. If you have already programmed the Security Setting into the target device, you cannot reprogram the silicon signature without reprogramming the Security Setting.

The previously programmed silicon signature will be erased if:

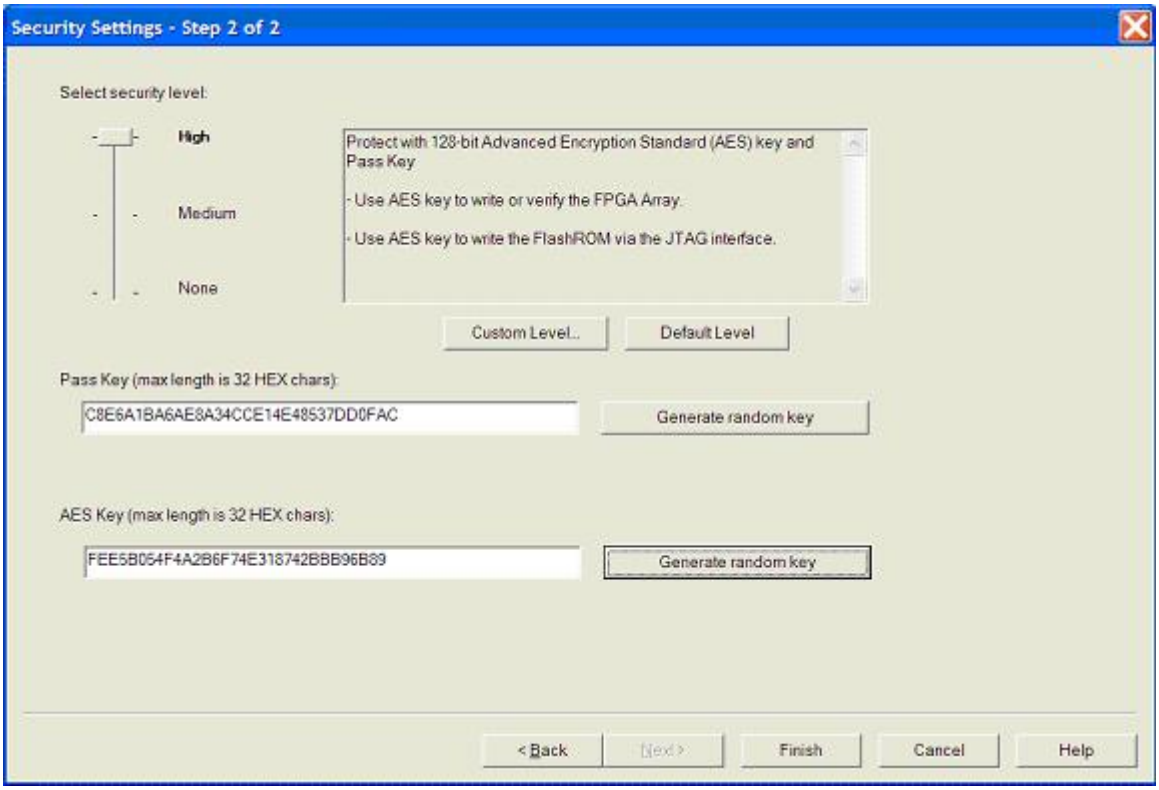
- You have already programmed the silicon signature and
- You are programming the security settings, but you do not have an entry in the silicon signature field

Programming security settings

FlashPoint allows you to set a security level of high, medium or none.

To program Security Settings on the device:

1. If you choose to program Security Settings on the device from the **Generate Programming File** page, the wizard takes you to the **Security Settings** page (see figure below).



2. Move the sliding bar to select the security level for FPGA and FlashROM (see table for a description of the security levels).

Security Level	Security Option	Description
High	Protect with a 128-bit Advanced Encryption Standard (AES) key and a Pass Key	Access to the device is protected by an AES Key and the Pass Key. The Write and Verify operations of the FPGA Array use a 128-bit AES encrypted bitstream. From the JTAG interface, the Write and Verify operations of the FlashROM use a 128-bit AES encrypted bitstream. Read back of the FlashROM content via the JTAG interface is protected by the Pass Key. Read back of the FlashROM content is allowed from the FPGA Array.
Medium	Protect with Pass Key	The Write and Verify operations of the FPGA Array require a Pass Key. From the JTAG interface, the Read and Write operations on the FlashROM content require a Pass Key.

Security Level	Security Option	Description
		You can Verify the FlashROM content via the JTAG interface without a Pass Key. Read back of the FlashROM content is allowed from the FPGA Array.
None	No security	The Write and Verify operations of the FPGA Array do not require keys. The Read, Write, and Verify operations of the FlashROM content also do not require keys.

3. Enter the **Pass Key** and/ or the **AES Key** as appropriate. You can generate a random key by clicking the **Generate random key** button.

   The **Pass Key** protects all the Security Settings for the FPGA Array and/or FlashROM.

   The **AES Key** decrypts FPGA Array and/or FlashROM programming file content. Use the AES Key if you intend to program the device at an unsecured site or if you plan to update the design at a remote site in the future.

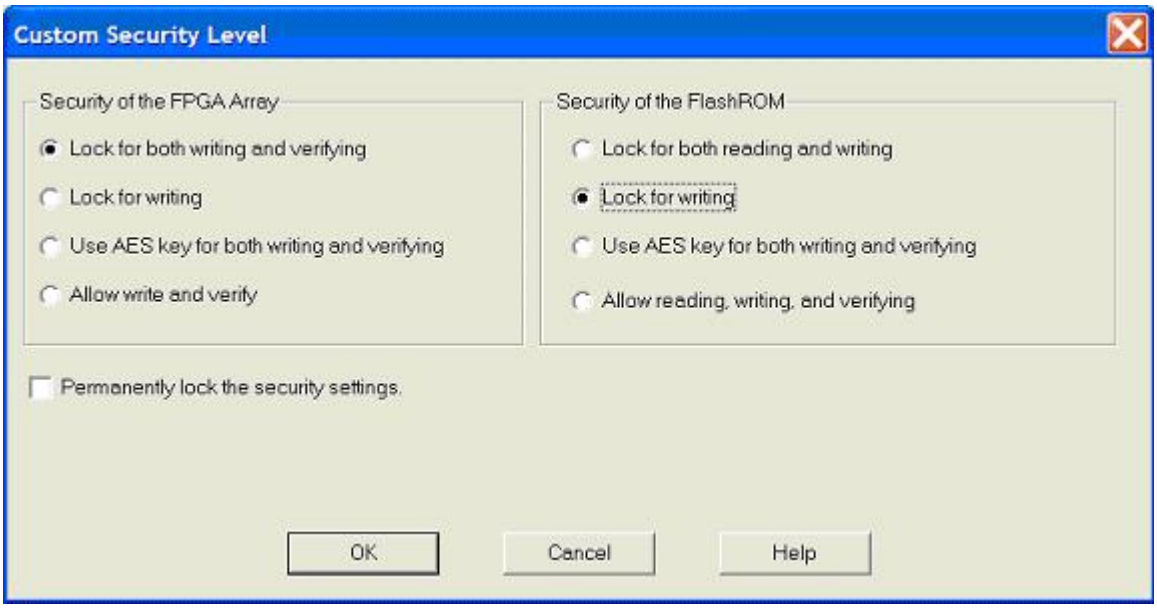
   You can also customize the security levels by clicking the **Custom Level** button. For more information, see the Custom Security Levels section.

Custom security levels

For advanced use, you can customize your security levels.

To set custom security levels:

1. Click the **Custom Level** button in the **Setup Security** page. The **Custom Security** dialog box appears (see figure below).



2. Select the **FPGA Array Security** and the **FlashROM Security** levels.

   The FPGA Array and the FlashROM can have different Security Settings. See the tables below for a description of the custom security option levels for FPGA Array and FlashROM.

FPGA Array

Security Option	Description
Lock for both writing and verifying	Allows writing/erasing and verification of the FPGA Array via the JTAG interface only with a valid Pass Key.
Lock for writing	Allows the writing/erasing of the FPGA Array only with a valid Pass Key. Verification is allowed without a valid Pass Key.
Use the AES Key for both writing and verifying	Allows the writing/erasing and verification of the FPGA Array only with a valid AES Key via the JTAG interface. This configures the device to accept an encrypted bitstream for reprogramming and verification of the FPGA Array. Use this option if you intend to complete final programming at an unsecured site or if you plan to update the design at a remote site in the future. Accessing the device security settings requires a valid Pass Key.
Allow write and verify	Allows writing/erasing and verification of the FPGA Array with plain text bitstream and without requiring a Pass Key or an AES Key. Use this option when you develop your product in-house.

Note: The ProASIC3/E family FPGA Array is always read protected regardless of the Pass Key or the AES Key protection.

FlashROM

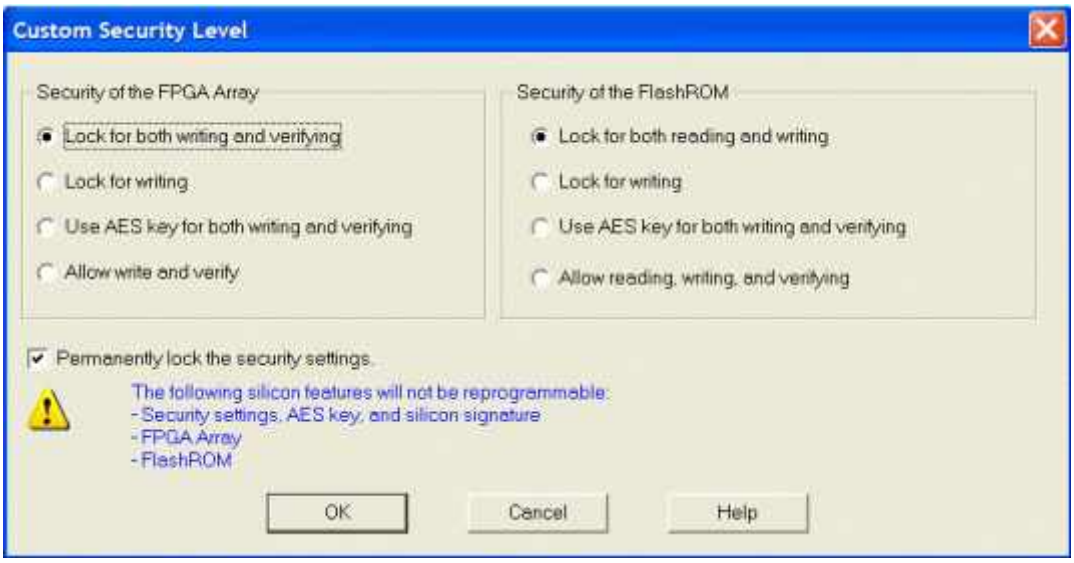
Security Option	Description
Lock for both reading and writing	Allows the writing/erasing and reading of the FlashROM via the JTAG interface only with a valid Pass Key. Verification is allowed without a valid Pass Key.
Lock for writing	Allows the writing/erasing of the FlashROM via the JTAG interface only with a valid Pass Key. Reading and verification is allowed without a valid Pass Key.
Use the AES Key for both writing and verifying	Allows the writing/erasing and verification of the FlashROM via the JTAG interface only with a valid AES Key. This configures the device to accept an encrypted bitstream for reprogramming and verification of the FlashROM. Use this option if you complete final programming at an unsecured site or if you plan to update the design at a remote site in the future. Note: The bitstream that is read back from the FlashROM is always unencrypted (plain text).
Allow writing and verifying	Allows writing/erasing, reading and verification of the FlashROM content with a plain text bitstream and without requiring a valid Pass Key or an AES Key.

Note: The FPGA Array can always read the FlashROM content regardless of these Security Settings.

3. To make the Security Settings permanent, select the **Permanently lock the security settings** check box. This option prevents any future modifications of the Security Setting of the device. A Pass Key is not required if you use this option.

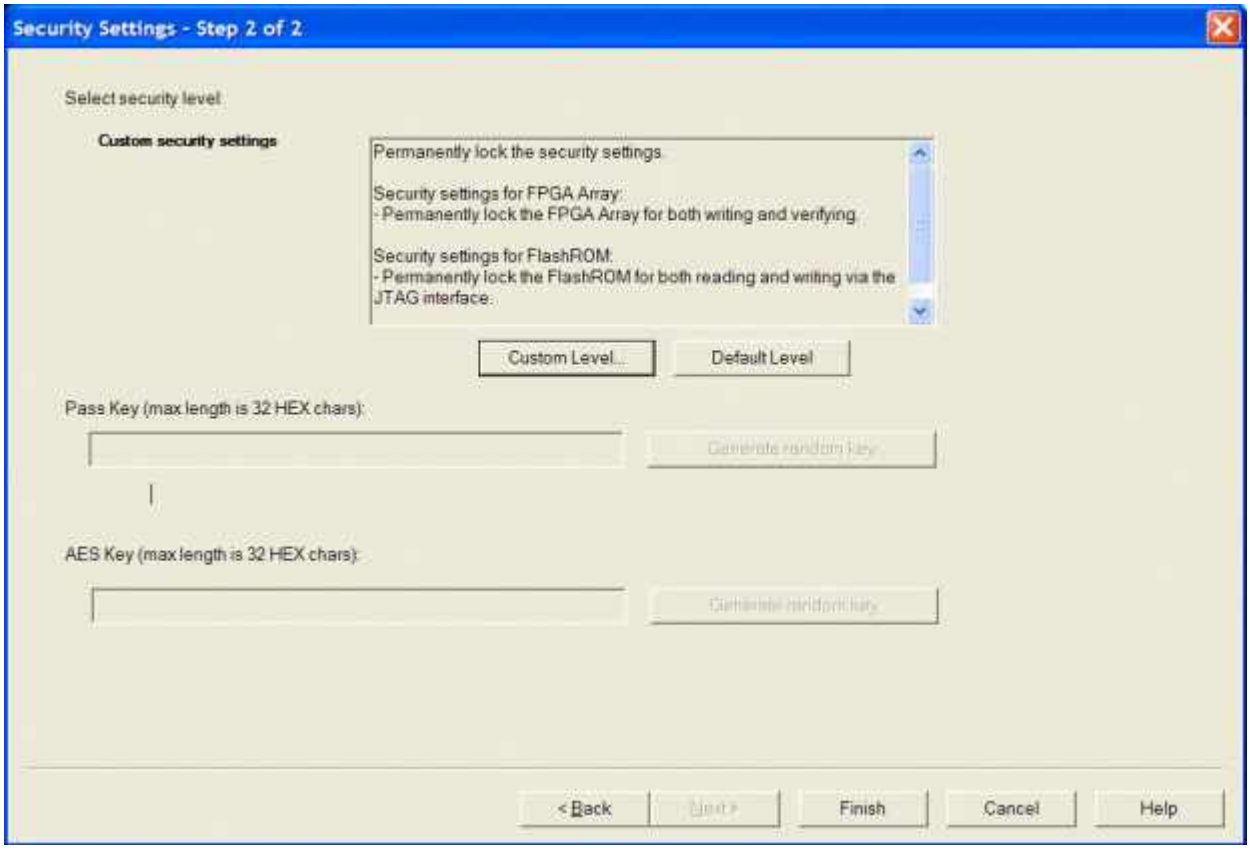
   Note: When you make the Security Settings permanent, you can never reprogram the Silicon Signature. If you Lock the write operation for the FPGA Array or the FlashROM, you can never reprogram the FPGA Array or the FlashROM, respectively. If you use an AES key, this key cannot be changed once you permanently lock the device.

   To use the Permanent FlashLock™ feature, select Disable Write and Verify for **FPGA Array** and Disable Read, Write and Verify for **FlashROM** and select the **Permanently lock the security settings** checkbox as shown in the figure below. This will make your device one-time-programmable.



4. Click the **OK** button.

   The **Security Settings** page appears with the **Custom security setting** information as shown in the figure below.

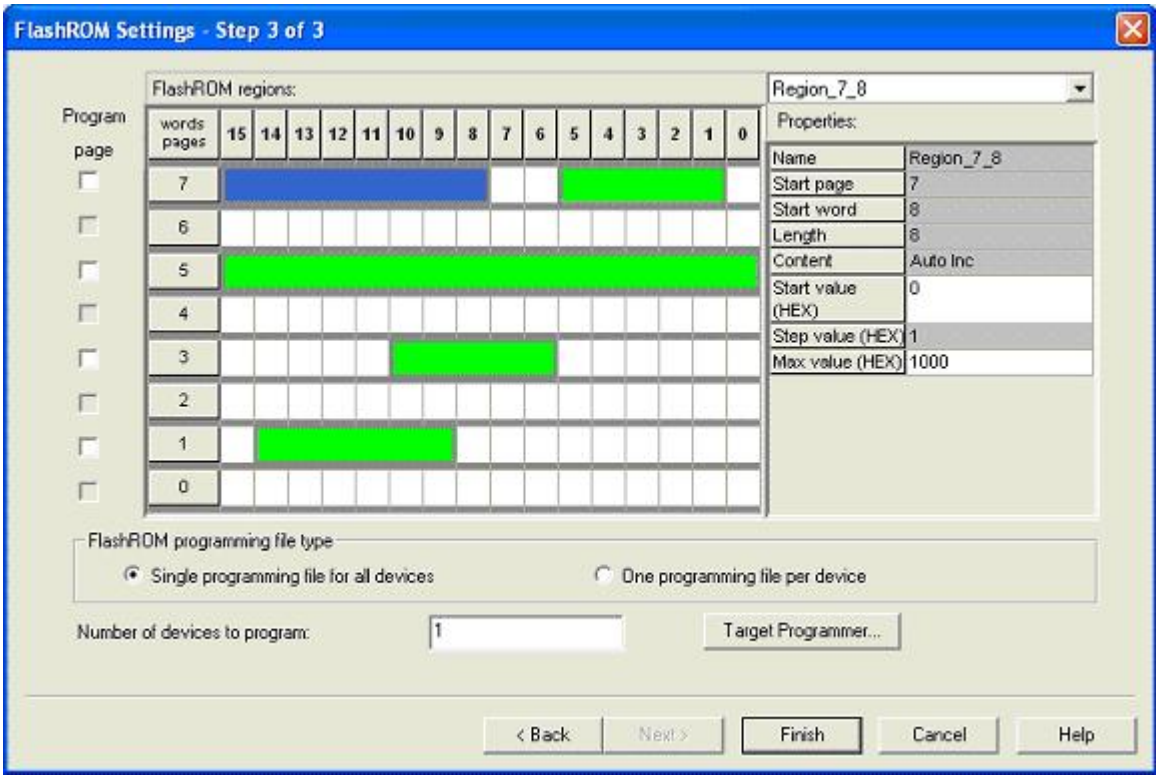


Programming the FlashROM

You can program selected memory pages and specify the region values of the FlashROM.

To program FlashROM:

1. Select **FlashROM** from the **Generate Programming File** page.
2. Enter the location of the FlashROM configuration file.
   The **FlashROM Settings** page appears (see figure below).

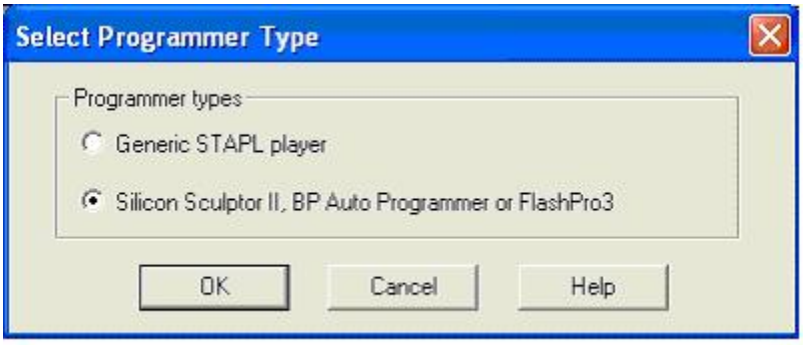


3. Select the FlashROM memory page that you want to program.
4. Enter the data value for the configured regions.
5. If you selected the region with a **Read From File**, specify the file location. See Custom Serialization Data for FlashROM Region for more information.
6. If you selected the **Auto Increment** region, specify the **Start** and **Max** values.
7. Complete steps 8 and 9 if you have a **Read from file** and/or **Auto Increment** region in the FlashROM.
8. Select the type of FlashROM programming files you want to generate from the two options below:

   - **Single programming file for all devices option**: generates one programming file with all the generated increment values or with values in the custom serialization file.

   - **One programming file per device**: generates one programming file for each generated increment value or for each value in the custom serialization file.

9. Enter the number of devices you want to program.
10. Click the **Target Programmer** button.
    The **Select Programmer Type** dialog box appears (see figure below).



11. Select your target **Programmer type**.
12. Click **OK**.
    FlashPoint generates your programming file.

Note: You cannot change the FlashROM region configuration from FlashPoint. You can only change the configuration from the ACTgen FlashROM core generator.

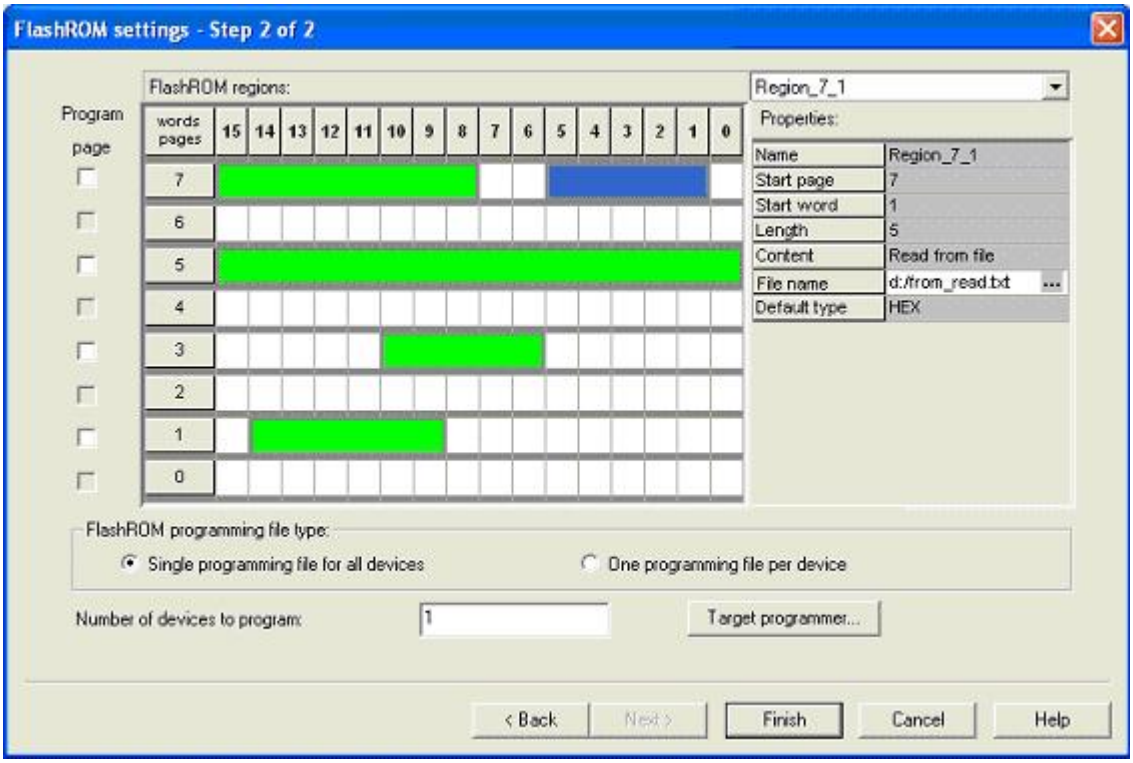
For more information, see ACTgen online help.

Custom serialization data for FlashROM region

FlashPoint enables you to specify a custom serialization file as a source to provide content for programming into a **Read from file FlashROM** region. You can use this feature for serializing the target device with a custom serialization scheme.

To specify a FlashROM region:

1. From the **Properties** section in the **FlashROM Settings** page, select the file name of the custom serialization file (see figure below). For more information on custom serialization files, see Custom Serialization Data File Format.



2. Select the FlashROM programming file type you want to generate from the two options below:

   - **Single programming file for all devices option:** generates one programming file with all the values in the custom serialization file.

   - **One programming file per device:** generates one programming file for each value in the custom serialization file.

3. Enter the number of devices you want to program.
4. Click the **Target Programmer** button.
5. Select your target **Programmer type**.
6. Click **OK**.

Custom serialization data file format

FlashPoint supports custom serialization data files that specify the data in binary, HEX, decimal, or ASCII text. The custom serialization data files may contain multiple data with the Line Feed (LF) character as the delimiter.

You can create a file by entering serialization data into any type of text editor. Depending on the serialization data format (hex, ASCII, binary, decimal), input the serialization data according to the size of the region you specified in the FlashROM

settings page.

Semantics

Each custom serialization file has only one type of data format (binary, decimal, Hex or ASCII text). For example, if a file contains two different data formats (i.e. binary and decimal) it is considered an invalid file.

The length of each data must be shorter or equal to the selected region length. If the data is shorter then the selected region length, the most significant bits shall be padded with 0's. If the specified region length is longer then the selected region length, it is considered an invalid file.

The digit / character length is as follows:

-Binary digit: 1 bit.

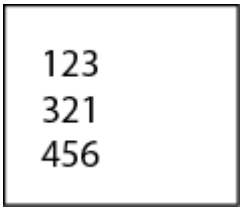
-Decimal digit: 4 bits.

-Hex digit: 4 bits.

-ASCII Character: 8 bits.

Standard Example

If you wanted to use, for example, device serialization for three devices with serialization data 123, 321, and 456, you would create file name from_read.txt. (See figure below). Each line in from_read.txt corresponds to the serialization data that will be programmed on each device. For example, the first line corresponds to the first device to be programmed, the second line corresponds to the second device to be programmed, and so on.



Hex serialization data file example

The following example is a Hex serialization data file for a 40-bit region:

```
123AEd210
AeB1
0001242E
```

Note: If you enter an invalid Hex digit such as 235SedF1, an error occurs. An error also occurs if you enter data that is out of range, i.e. 4300124EFE.

The following is an example of programming "AeB1" into Region_7_1 located on page 7, from Word 5 to Word 1 in the **FlashROM settings** page. See Custom Serialization Data for FlashROM Region for more information.

	Word 15	…	Word 6	Word 5	Word 4	Word 3	Word 2	Word 1	Word 0
Page 7	…	…	…	00	00	00	AE	B1	…

Binary serialization data file example

The following example is a binary serialization data file for a 16-bit region:

```
1100110011010001
100110011010011
11001100110101111  (This is an error: data out of range)
1001100110110111
1001100110110112  (This is an error: invalid binary digit)
```

Decimal serialization data file example

The following example is a decimal serialization data file for a 16-bit region:

```
65534
65535
65536  (This is an error: data out of range)
6553A  (This is an error: invalid decimal digit)
```

Text serialization data file example

The following example is a text serialization data file for a 32-bit region:

```
AESB
A )e
ASE3 23  (This is an error: data out of range)
65A~
1234
AEbF
```

Syntax

```
Custom serialization data file = <hex region data list> | <decimal region data list> |
         <binary region data list> | <ascii text data list>

Hex region data list = < hex data> <new line> { < hex data> <new line> }

Decimal region data list = <decimal data> <new line> {<decimal data><new line> }

Binary region data list = <binary data> <new line> { <binary data> <new line> }

ASCII text region data list = < ascii text data> <new line>
                  { < ascii text data> <new line> }

hex data = <hex digit> {<hex digit>}
```

```
decimal data = < decimal digit> {< decimal digit>}

binary data = < binary digit> {< binary digit>}

ASCII text data = <ascii character> {< ascii character >}
new line = LF

binary digit = '0'|'1'

decimal digit = '0'|'1'|'2'|'3'|'4'|'5'|'6'|'7'|'8'| '9'

hex digit = '0'|'1'|'2'|'3'|'4'|'5'|'6'|'7'|'8'|'9'|'A'|'B'|'C'|'D' | 'E'| 'F' |

'a'| 'b' | 'c'| 'd' | 'e'| 'f'

ascii character = characters from SP(0x20) to'~'(0x7E).
```

Programming the FPGA Array

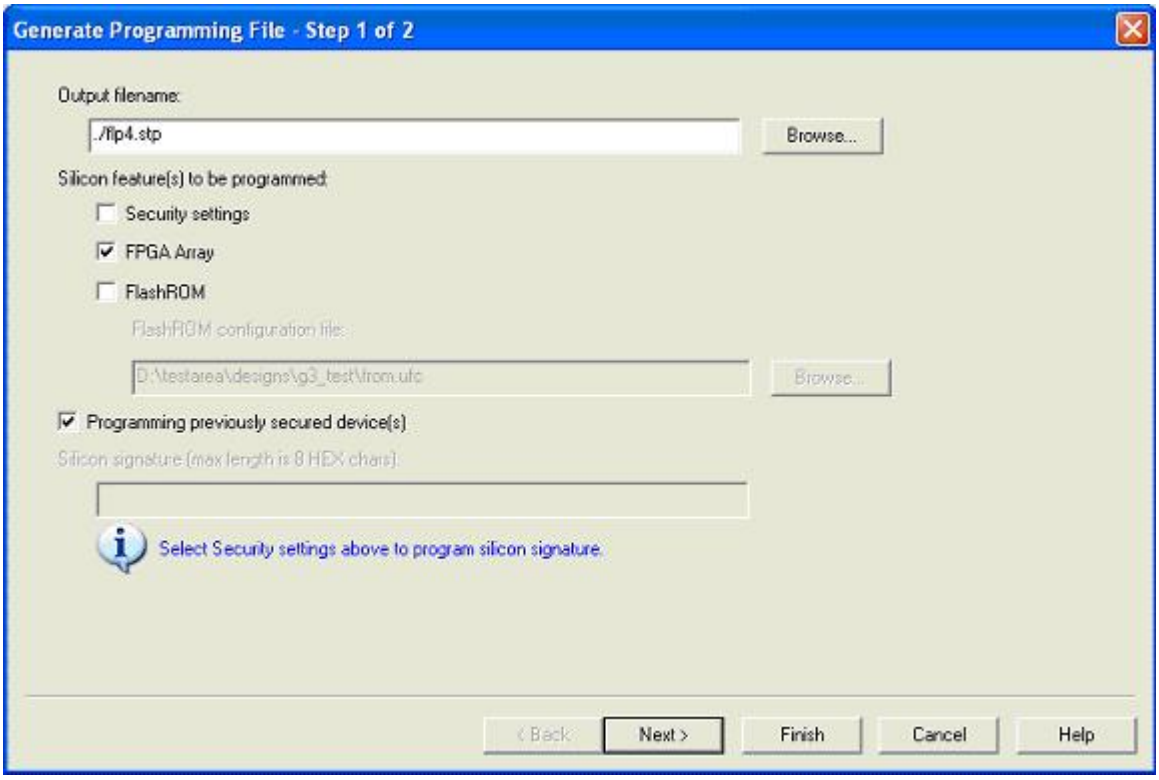
You can program the FPGA Array by selecting the silicon feature, **FPGA Array** in the **Generate Programming File** page and clicking **OK**. See Generate a Programming File for more information.

Reprogramming a secured device

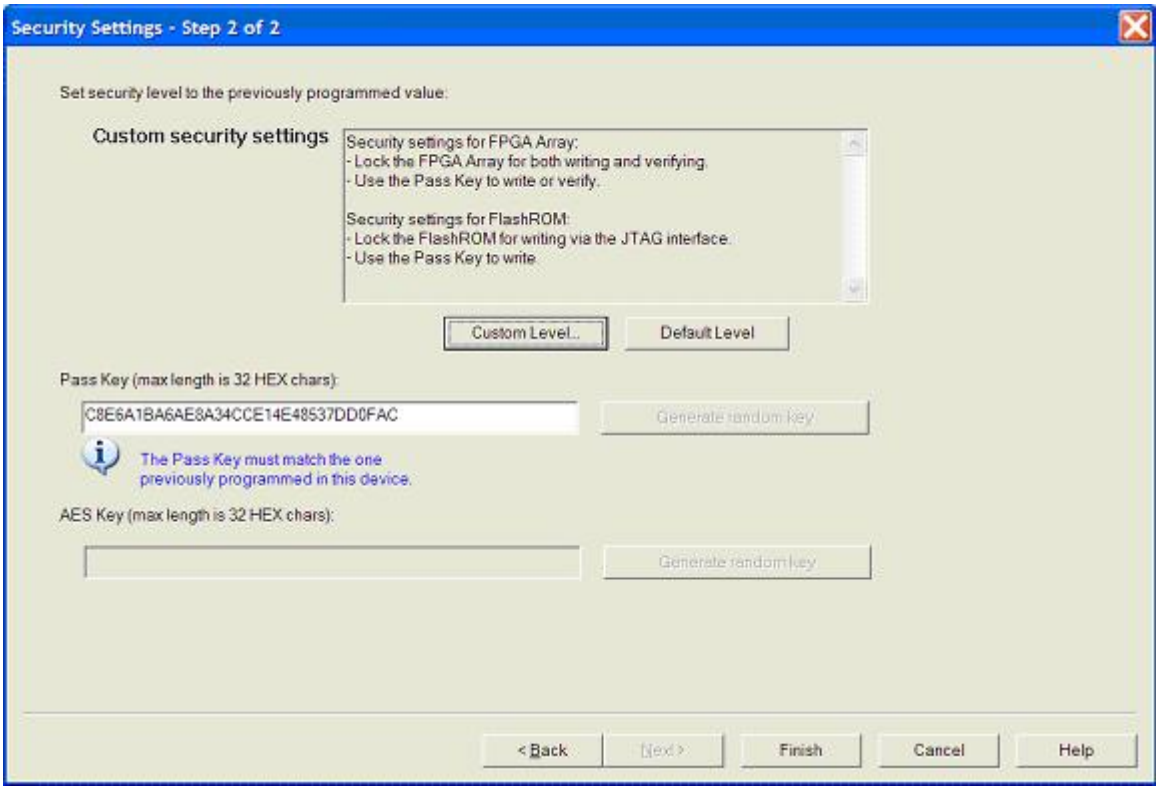
You must know the previous Security Settings of the device before you can reprogram a device with Security Settings.

To program a secured device:

1. In the **Generate Programming File** page, click the **Programming previously secured devices(s)** check box (see figure below).



2. Specify the previously programmed security setting for the FlashROM and/or the FPGA Array.
3. If you programmed the device with a custom security level, click the **Custom Level** button to open the **Custom security** dialog box, and select the **Security Settings** for the FPGA Array or the FlashROM that you programmed (see figure below).



4. Enter the previously programmed Pass Key and/or the AES Key.
5. Click **Finish**.

Note: Enter the AES Key only if you want to perform encrypted programming.