



AN 827: Unified Tool for Generating Programming Files

Updated for Intel® Quartus® Prime Design Suite: **18.0**



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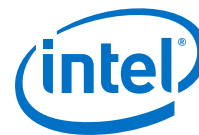
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1. AN 827: Unified Tool for Generating Programming Files

This application note presents the new Intel® Quartus® Prime Programming File Generator tool, that simplifies the generation of programming files for a target device.

The Programming File Generator's graphical interface adapts to your previous choices by only displaying options that generate valid results, and enables file generation only after the setup is complete. The Programming File Generator tool is set to replace the Convert Programming File tool. However, for Intel Quartus Prime Pro Edition 18.0, both tools are available.

To open the Programming File Generator in the Intel Quartus Prime software, click **File** ► **Programming File Generator**.

Note: This document assumes familiarity with basic project compilation in Intel Quartus Prime software.

Related Information

[Configuration Devices Overview](#)

1.1. Setup Requirements

The Programming File Generator tool is available in the Intel Quartus Prime Pro Edition software versions 18.0 and later.

1.2. Supported Devices

Table 1. Device Families that the Programming File Generator Tool Supports

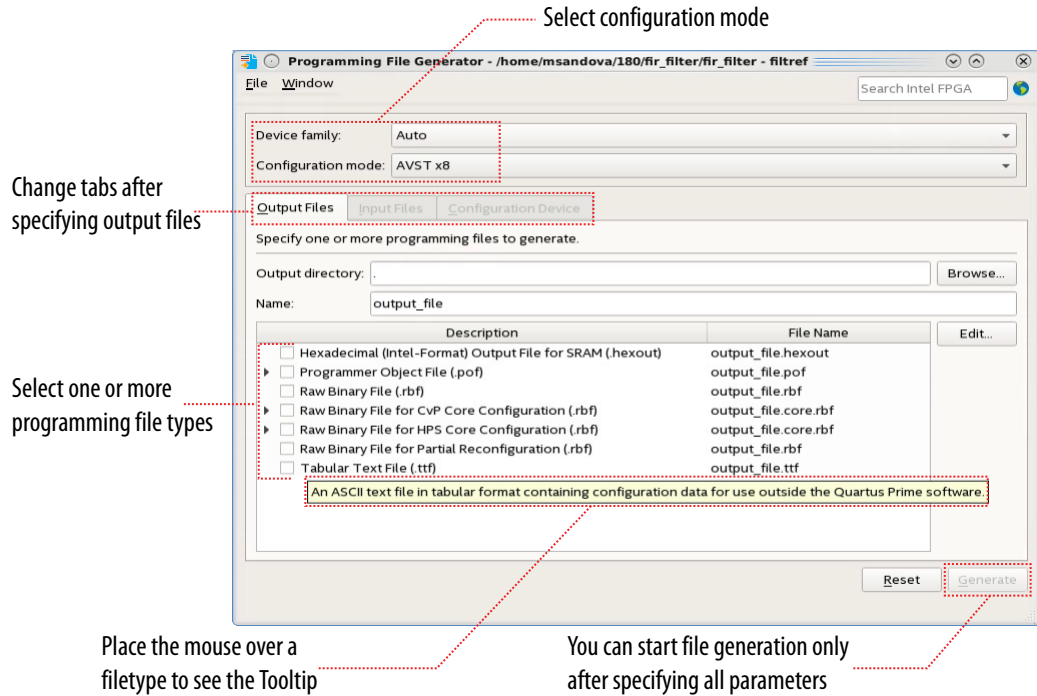
Software	Version	Supported Device Families
Intel Quartus Prime Pro Edition	18.0	<ul style="list-style-type: none"> Intel Stratix® 10 Intel MAX® 10 Intel Cyclone® 10 LP

1.3. Programming File Generator Features

The Programming File Generator separates the generation of configuration files with the generation of bitstreams that contain the design logic. This ability allows you to define flash partitions, and also generate several programming files simultaneously.

The tool also provides tips that show information about options or file types.

Figure 1. Programming File Generator Tool

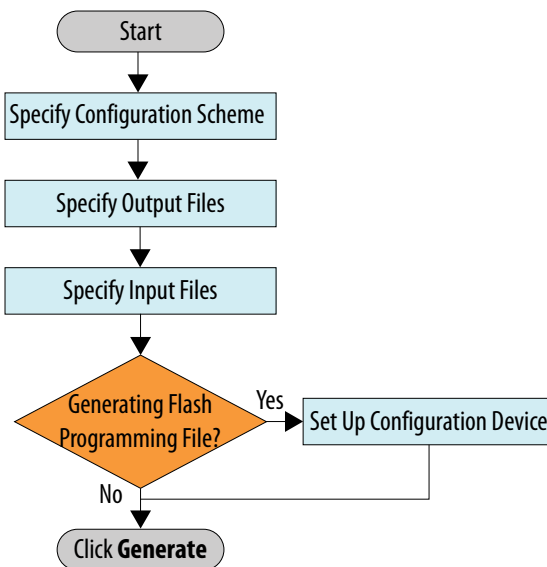


1.4. Stages of Generating Programming Files

Before creating output programming files you must perform a full compilation of the design that includes the generation of .sof files.

The following figure illustrates the stages of the file generation process.

Figure 2. Programming File Generation Flow





1.4.1. Specifying Device and Configuration Scheme

1. Select the device family that the files must target.
If you leave **Device Family** in **Auto**, the Programming File Generator displays all output file types available for the configuration mode that you select.
2. Select a configuration scheme.

Related Information

[Supported Devices](#) on page 3

1.4.2. Specifying Output Files

During this stage you specify the output files that contain the design logic.

1. Type or browse to the location where you want the output files.
The default value is the project directory.
2. Type the name of the output files.
The default value is `output_file`.
3. Select one or more output files to generate.
4. If you want to view or edit the properties of an output file, select the file and then click **Edit...**
For example, RPD files have the **Bit swap** property, which you can turn **On** or **Off**.

Related Information

[Output File Types](#) on page 7

1.4.3. Specifying Input Files

You specify input files in the **Input Files** tab. The input files that you can add depend on the output file types that you selected in the **Output** tab.

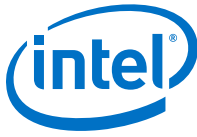
1. To add bitstream (SOF/PMSF/POF) files, click **Add Bitstream...**
The Intel Quartus Prime software allows you to add multiple SOF files.
2. To add raw data (HEX/RBF/BIN) files, click **Add Raw Data...**
3. If you want to set the properties of an input file, select the file and then click **Properties**.

1.4.4. Specifying Configuration Device

During this stage you specify the flash device that you want to use for configuration.

Note: The Programming File Generator supports specifying only one configuration device.

1. Click the **Configuration Devices** tab.
2. Click **Add Device**, and select the configuration device from the drop-down menu.



The device now appears in the list.

3. If you want to specify flash partitions, click **Add Partitions** and follow the instructions in *Specifying Flash Partitions*
4. Otherwise, click **Generate**.

Related Information

- [Intel MAX 10 User Flash Memory User Guide](#)
- [Intel Stratix 10 Configuration User Guide](#)

1.4.4.1. Specifying Flash Partitions

You define a flash partition when you want to store a bitstream or your own raw data.

Note: The Programming File Generator supports defining flash partitions only for JIC or POF programming files.

To create one or more flash partition in the **Configuration Devices** tab:

1. Select the device and click **Add Partition...**
2. In the **Add Partition** dialog box, define the following parameters, and then click **OK**:

Parameter	Description								
Name	Name that you give to the partition								
Input File	Input file to program into the flash partition								
Page	Indicates that the partition stores bitstreams for configuration. If the device has the remote system update feature enabled, Page represents the parity.								
Address Mode	The options are: <table border="1"> <thead> <tr> <th>Option</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Auto</td> <td>The tool automatically allocates a block in the flash device to store the data.</td> </tr> <tr> <td>Block</td> <td>You specify the start and end address of the flash partition.</td> </tr> <tr> <td>Start</td> <td>You only specify the start address of the partition. The tool assigns the end address of the partition based on the input data size.</td> </tr> </tbody> </table>	Option	Description	Auto	The tool automatically allocates a block in the flash device to store the data.	Block	You specify the start and end address of the flash partition.	Start	You only specify the start address of the partition. The tool assigns the end address of the partition based on the input data size.
Option	Description								
Auto	The tool automatically allocates a block in the flash device to store the data.								
Block	You specify the start and end address of the flash partition.								
Start	You only specify the start address of the partition. The tool assigns the end address of the partition based on the input data size.								
Start Address	Specifies the start address of the partition. Only enabled when Address Mode is Block or Start .								
End Address	Specifies the end address of the partition. Only enabled when Address Mode is Block .								

The partition associated to the device appear in the device list.

3. If you want to change the parameters of a partition, click the partition and then click **Edit...**
4. If you want to remove a partition, click the partition and then click **Remove**.

When all the partitions are set, click **Generate**.



1.5. quartus_pfg Command Line Tool

The Programming File Generator is also available as a command line tool, allowing use in scripted flows. You can specify conversion settings in the command line or using a PFG setting (PFG) file. This ability is useful for advanced settings, like multiple images or multiple user data files (HEX/RFB), because you can define the settings using the GUI and then export them for use in the command line.

To export PFG settings to a PFG file, click **File ► Save**. The Programming File Generator only saves settings that are consistent.

For help with the command line tool, type:

```
quartus_pfg --help
```

Differences Between GUI and Command Line Tool

The command line tool supports single image conversion only.

1.6. Output File Types

The following table describes the output file types that you can generate with the Programming File Generator tool:

Table 2. Output File Types

Programming File Type	Extension	Description
Hexadecimal (Intel-Format) Output File for SRAM	.hexout	Contains configuration data for use outside the Intel software.
Jam Byte Code File	.jbc	Stores programming data for programming, configuring, verifying, and blank-checking one or more devices in a JTAG chain, in binary format. <i>Note:</i> .jbc conversion is only available in the command line.
Jam File	.jam	Similar to .jbc files, but in ASCII format. <i>Note:</i> .jam conversion is only available in the command line.
JTAG Indirect Configuration File	.jic	<ul style="list-style-type: none"> Proprietary Intel FPGA file type. Enables serial flash programming via Intel FPGA JTAG pins. Works only for Active Serial configuration. Before programming the flash, the Programmer first configures the FPGA with the Serial Flash Helper Design.
Programmer Object File	.pof	<ul style="list-style-type: none"> Proprietary Intel FPGA file type. Allows to program into an external flash, such as programming CFI flash with the PFL IP core via JTAG header, or programming a serial flash via Active Serial header.
Raw Binary File	.rbf	You use .rbf files for passive configuration mode, such as Passive Serial (PS), Fast Passive Parallel (FPP), or Avalon®-Streaming (AvST) mode. If the design does not use the Intel PFL Intel FPGA IP, then external hosts such as a CPU or microcontroller use this file to configure Intel FPGAs.

continued...



Programming File Type	Extension	Description
Raw Programming Data File	.rpd	<ul style="list-style-type: none">Only for Active Serial configuration.You can program this file into the serial flash with any third party programmer or Intel FPGA IP, such as ASMI Parallel or Serial Flash Controller.The .rpd file content has a bit swapped if compared to the output file.
Serial Vector Format File	.svf	Stores programming data for programming, verifying, and blank-checking one or more fixed-algorithm devices in a JTAG chain in Automated Test Equipment (ATE)-type programming environments. .svf files can do FPGA configuration and flash programming. <i>Note:</i> .svf conversion is only available in the command line.
Tabular Text File	.ttf	Contains configuration data for use outside the Intel Quartus Prime software.

Related Information

- [File Types Definition](#)
In *Intel Quartus Prime Help*
- [Intel FPGA Configuration Devices Support Page](#)

1.7. Document Revision History for AN 827: Unified Tool for Generating Programming Files

Document Version	Intel Quartus Prime Version	Changes
2018.10.29	18.0.0	Minor text edits.
2018.05.07	18.0.0	Initial release.