FPGA PROGRAMMING TUTORIAL

English – v1.0

Abstract

This tutorial guides users through programming a Cyclone V FPGA with Quartus using a .pof file. It covers board preparation, hardware setup, file loading, and final configuration, ensuring a reliable workflow for flashing and testing the FPGA.

L. Durieux

Table of Contents

Introduction

This step-by-step tutorial explains how to program the Cyclone V FPGA board using the provided VHDL design file. It assumes you already have Quartus installed, the board powered and connected, and the .pof file ready.

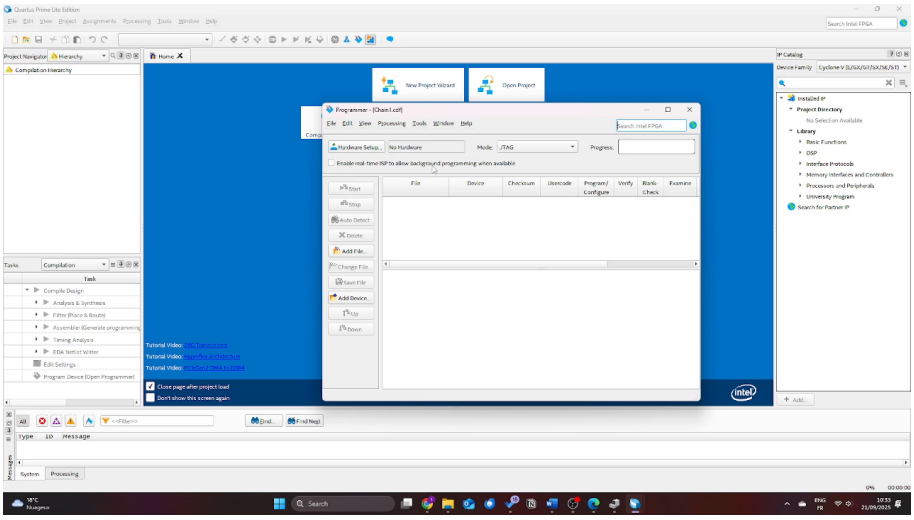
Step 1 – Prepare the FPGA board

- Plug in the FPGA power supply.
- Turn on the board using the red ON/OFF switch.
- Flip the small switch to the 'programming' position (left).
- Connect the USB-Blaster cable to the rectangular port on the top left and link it to your computer.

Step 2 – Launch Quartus

- Open Quartus (Quartus Prime Lite used here – version 21.1).
- In the top menu, go to 'Tools' > 'Programmer'.

Example interface:

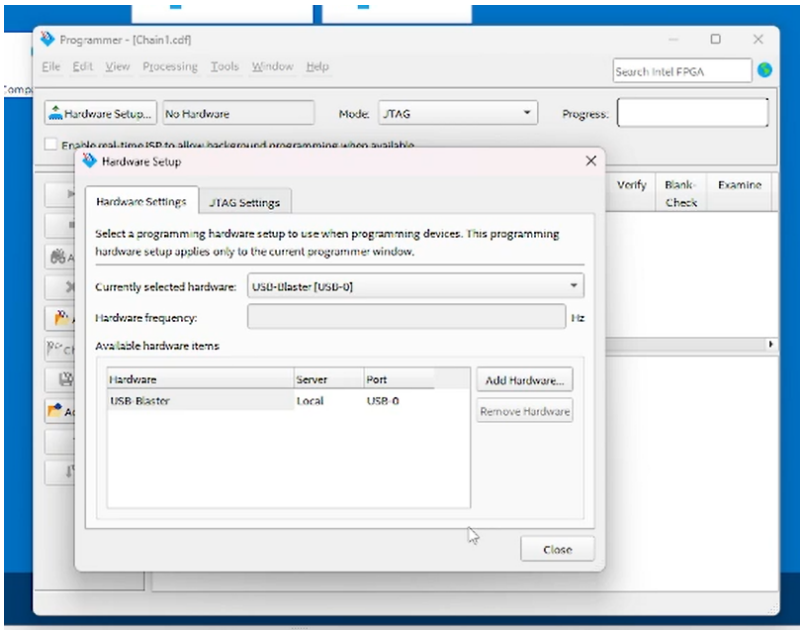


Note: If you have issues with installing Quartus Prime Lite, please, do not hesitate to contact us.

Step 3 – Set up the hardware interface

- In the Programmer window, click on 'Hardware Setup...'.
- In the 'Currently selected hardware' field, choose 'USB-Blaster'.
- Close the window once selected.

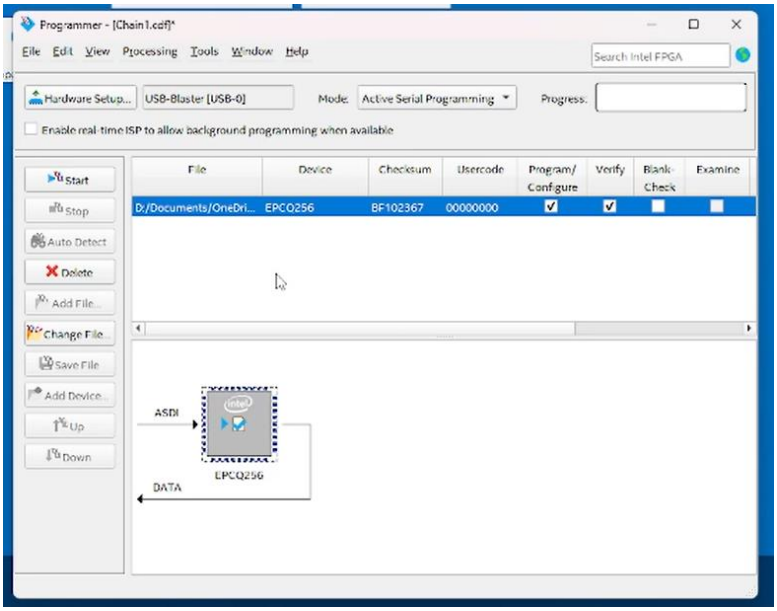
Example interface:



Step 4 – Load the .pof file

- Click on 'Add File...' in the Programmer window.
- Browse to the .pof file location (e.g., `output_files.pof`). .pof is the bitstream file and it is the one we need to upload to the FPGA.
- Make sure the “mode” is set to 'Active Serial Programming' (not JTAG).
- Check the 'Program/Configure' and optionally 'Verify' boxes.

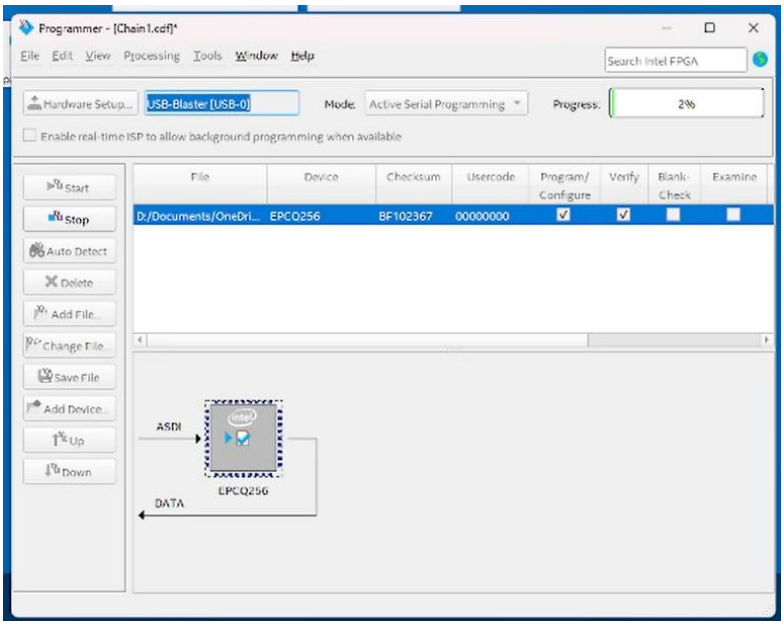
Example interface:



Step 5 – Start the programming

- Click 'Start'. The programming process begins.
- Do not disconnect the board during this phase – it may take 20–30 minutes.
- Once the progress bar is fully green, programming is complete.

Example interface:



Step 6 – Finalize setup

- Flip the switch back to 'Run'.
- You can now test the FPGA to verify the new configuration.

Additional Notes

- The .pof file will be available in the open-source repository (GitHub or Zenodo). Make sure to use the correct version matching your hardware.
- If Quartus shows an error regarding the USB-Blaster, ensure drivers are installed and Quartus has administrator rights.
- You can repeat the process to flash multiple boards, starting again from Step 4.

Versioning

AUTHORS	VERSION	DATE	COMMENT
L. DURIEUX	V1.0	23.09.25	Document first release
A. BARBELIVIEN **M. MAJCHRZAK**		01.11.25	Proofreading