Development and Education Board

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PROGRAM

DE0 Getting Started

Development and Education Board

This document describes the scope of Altera's DE0 Development and Education Board and the supporting materials provided by the Altera Corporation. It also explains the installation process needed to use a DE0 board connected to a computer that has the Quartus II CAD system installed on it.

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Altera's DE0 Development and Education Board provide a perfect platform for creating your cutting edge design in programmable logic. It uses the state-of-the-art technology in both hardware and CAD tools to expose students to a wide range of topics covered in typical courses. The power of the board is such that it is also highly suitable for a variety of design projects as well as for the development of sophisticated digital systems.

1. Purpose of the DE0 Board

The DE0 is the next generation of development and education board, equipped with Altera Cyclone III 3C16 FPGA device, which offers 15,408 LEs. The board provides 346 user I/O pins, and is loaded with a rich set of features that makes it suitable to be used for advanced university and college courses, as well as the development of sophisticated digital systems.

2. Scope of the DE0 Board and Supporting Material

The DE0 development board is designed in a compact size that has all the essential tools for users to gain knowledge in especially areas of digital logic, computer organization and FPGAs. The DE0 combines the Altera low-power, low-cost, and high performance Cyclone III FPGA to control the various features of the DE0 board. The DE0 development board includes software, reference designs, and accessories required to ensure the user simple access in evaluating their DE0 board.

Finally, it is possible to connect other user-designed boards to the DE0 board by means of two GPIO expansion headers. Software provided with the DE0 board features the Quartus II web edition design tools. There are also several applications that demonstrate the utility of the DE0 board.

3. Installing the Altera Design Software

The Quartus II software is the primary FPGA development tool used to create the reference designs used. Some reference designs use the Nios II soft-core embedded processor, it is necessary to install the software too.

Install the following software from the accompanying DVD in the directory Altera Complete Design Suite or from the Altera web page: **www.altera.com/download**

Install ALL of the following:
   • Quartus II software version
   • Nios II EDS

4. Install the USB Blaster (Windows XP, Vista)

The DE0 board includes integrated USB Blaster circuitry for FPGA programming. However, for the host computer and development board to communicate, you must install the USB Blaster driver on the host computer.

The DE0 board is shipped in a package that includes all parts necessary for its operation. The only essential parts are 7.5V power adapter, power cable and the USB cable. Plug in the power cable which connects to power adapter to provide power to the board. Use the USB cable to connect the USB connector (the one closest to the power switch) on the DE0 board to a USB port on a computer that runs the Quartus II software. Turn on the power switch on the DE0 board.

For USB-Blaster Driver installation on Windows 2000 and Windows XP Systems perform the following steps below:

   Step 1.   Recognize the new hardware connected:
              The computer will recognize the new hardware connected to its USB
              port, but it will be unable to proceed if it does not have the required
              driver already installed. The DE0 board is programmed by using

Altera's USB-Blaster mechanism. If the USB-Blaster driver is not already installed, the New Hardware Wizard in Figure 1 will appear.

Step 2. **Specify the path for USB Blaster driver:**
Since the desired driver is not available on the Windows Update Web site, select **No**, not this time response to the question asked and click **Next**. This leads to the window in Figure 2. The driver is available within the Quartus II software. Hence, select Install from a specific location and click **Next** to get to Figure 3.

Figure 1. Found New Hardware Wizard.

Step 3. **Select appropriate driver version for USB Blaster:**
Now, choose Search for the best driver in these locations and click **Browse** to get to the pop-up box in Figure 4. Find the desired driver, which is at location \<*Quartus II system directory*>*drivers\usb-blaster*. Click **OK** (For Quartus II version 6.1 and later, select the appropriate driver version based on the 64-bit or 32-bit Quartus II version.) and then upon returning to Figure 4 click **Next**. At this point the installation will commence, but a dialog box in Figure 5 will appear indicating that the driver has not passed the Windows Logo testing. Click **Continue Anyway**.

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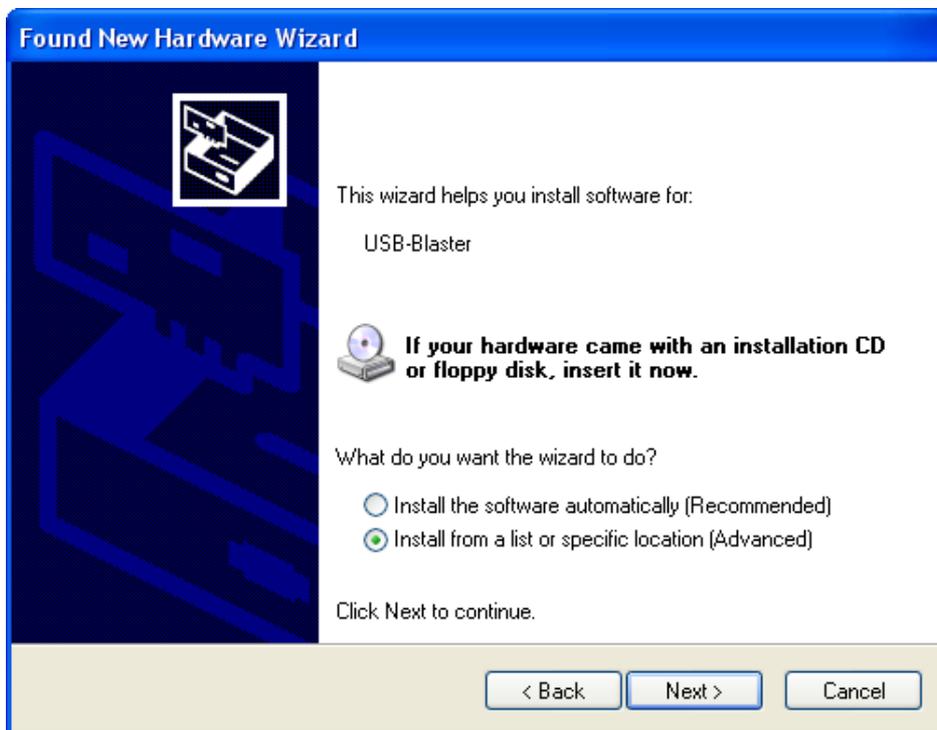
Figure 2. The driver is found in a specific location.
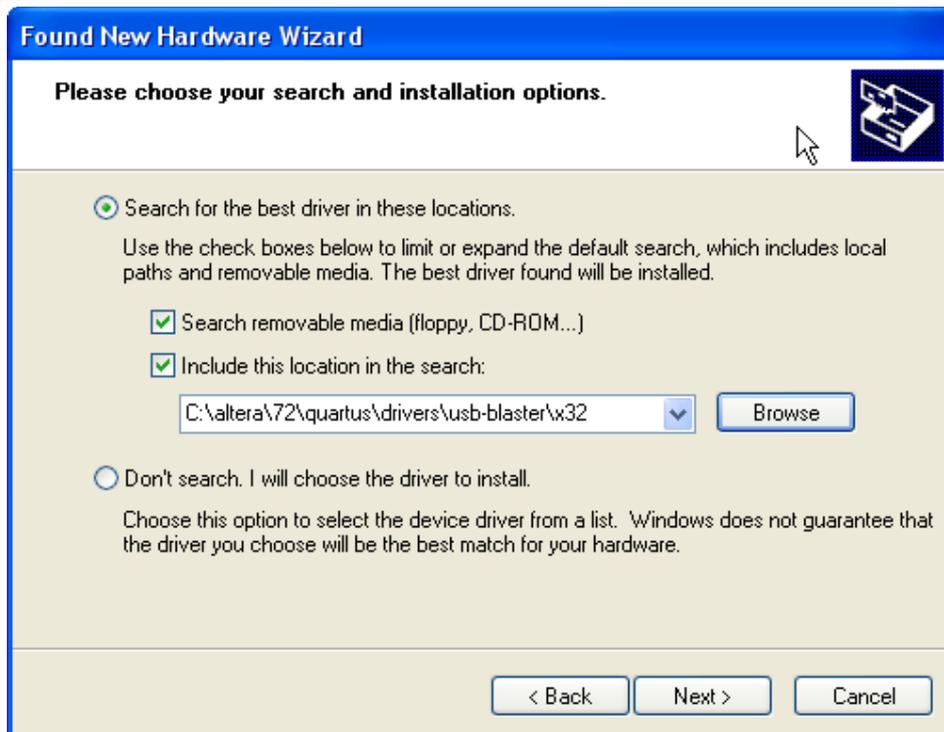
Figure 3. Specify the location of the driver.
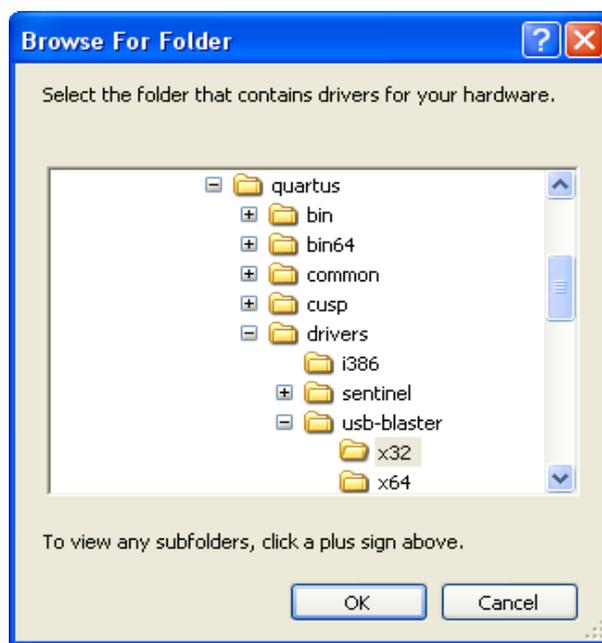
Figure 4. Browse to find the location.

Step 4. **The USB Blaster is ready for use.**

The driver will now be installed as indicated in Figure 6. Click **Finish** and you can start using the DE3 board.

Figure 5. There is no need to test the driver.

Figure 6. The driver is installed.

For USB-Blaster Driver installation on Windows Vista System perform the following steps below:

Step 1. **Recognize the new hardware connected:**
The computer will recognize the new hardware connected to its USB port, but it will be unable to proceed if it does not have the required driver already installed. The DE0 board is programmed by using Altera's USB-Blaster mechanism. If the USB-Blaster driver is not already installed, the New Hardware Wizard will appear.

Step 2. **Specify the path for USB Blaster driver:**
On the Found New Hardware Wizard window, click **Locate and install driver software** to continue. On the Found New Hardware – USB Blaster window, click **I don't have the disk Show me other options** to continue.

Step 3. **Select appropriate driver version for USB Blaster:**
Click Browse my computer for driver software to continue. Click **Browse…** and browse to the location of the driver on your system: \<Quartus II system directory>**drivers\usb-blaster.** Click **OK**.

Step 4. **Installing USB Blaster driver.**
Click **Next** to install the driver. Click **Install this driver software anyway** when the Hardware Installation warning appears. Click **Close** when the driver installation is completed Reboot your system.

5. Power up the DE0 Board

The DE0 board comes with a preloaded configuration bit stream to demonstrate some features of the board. This bit stream also allows users to see quickly if the board is working properly. To power-up the board perform the following steps:

Step 1. Connect the provided power cord from the 7.5V power adapter to the wall jack as shown in Figure 7. (Please make sure the voltage supplied is the same with the specification of power supply.).

Step 2. Connect the provided DE0 power cable from the connector of 7.5V power adapter to the power connector (J7) on the DE0 board.

Step 3. Turn on the power by pressing the ON/OFF switch (SW5) on the DE0 board.
At this point you should observe the following:
- All user LEDs (LED0~LED9) are flashing
- All 7-segment displays(HEX0 and HEX3) are cycling through the numbers 0 to F
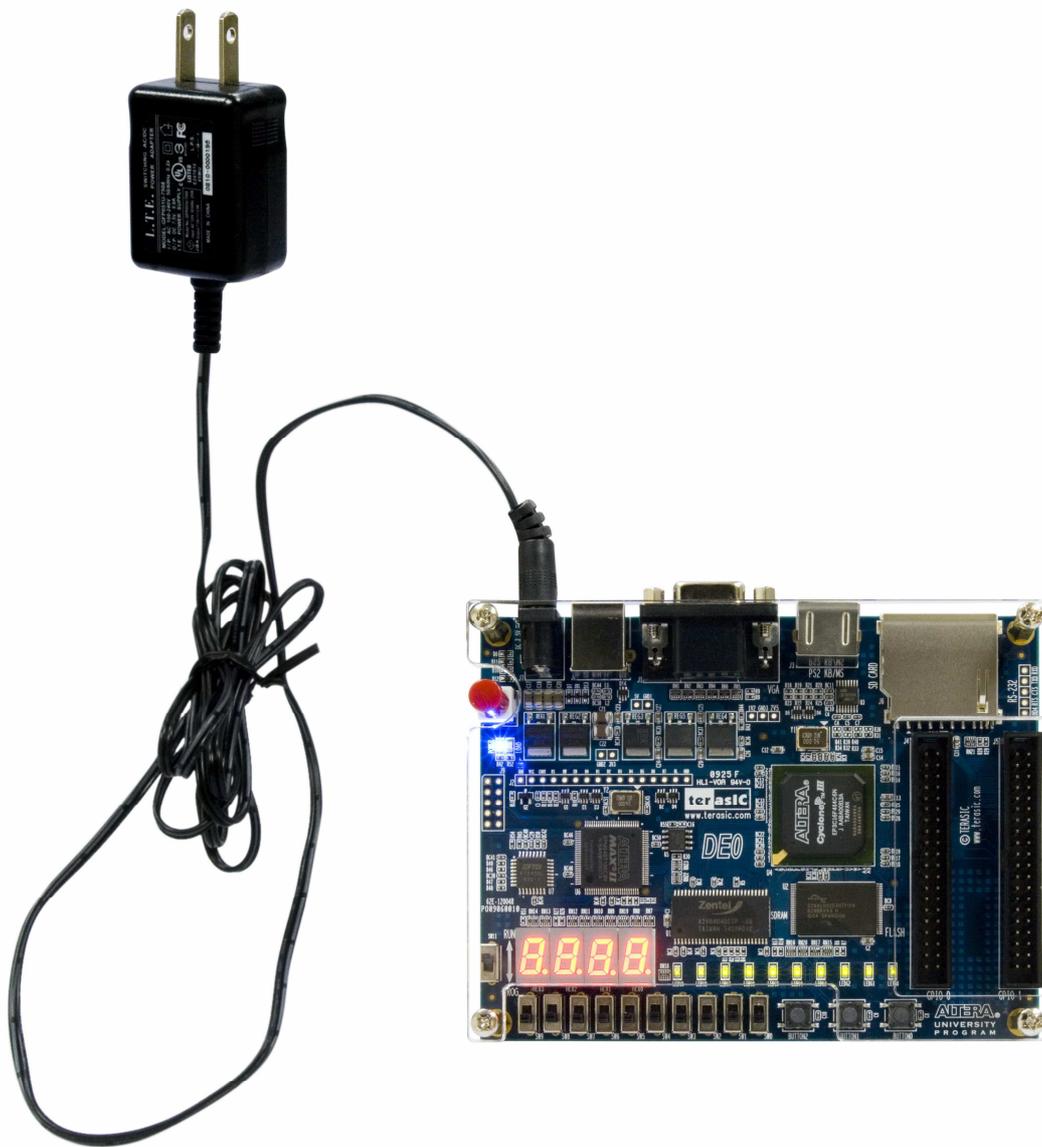
Figure 7. The connection setup for DE0 board and power supply

6. Programming the FPGA Device on the DE0 Board

If users would like to program their own SRAM Object File (.sof) into the FPGA device on the DE0 board, please perform the following steps:

Step 1. Connect the power adapter to the power connector (J7) on the DE0 board to a power outlet.

Step 2. Connect the USB cable to your host computer and the USB blaster port

(J8) on the DE0 board.

Step 3.   Turn on the power by pressing the ON/OFF switch (SW11).

Step 4.   Open Quartus II software, Choose **Tools** > **Programmer**. The Programmer window opens. See Figure 8.

Step 5.   Click Hardware Setup.

Step 6.   If it is not already turned on, turn on the USB-Blaster [USB-0] option under **Currently selected hardware**. See Figure 9.

Step 7.   Click **Close**.

Step 8.   Click **Add File** to select users' .sof file.

Step 9.   Click **Open**.

Step 10.   Turn on the **Program Configure** option that corresponds to users' SOF file.

Step 11.   Click **Start**. The file downloads to the development board as shown in Figure 10.
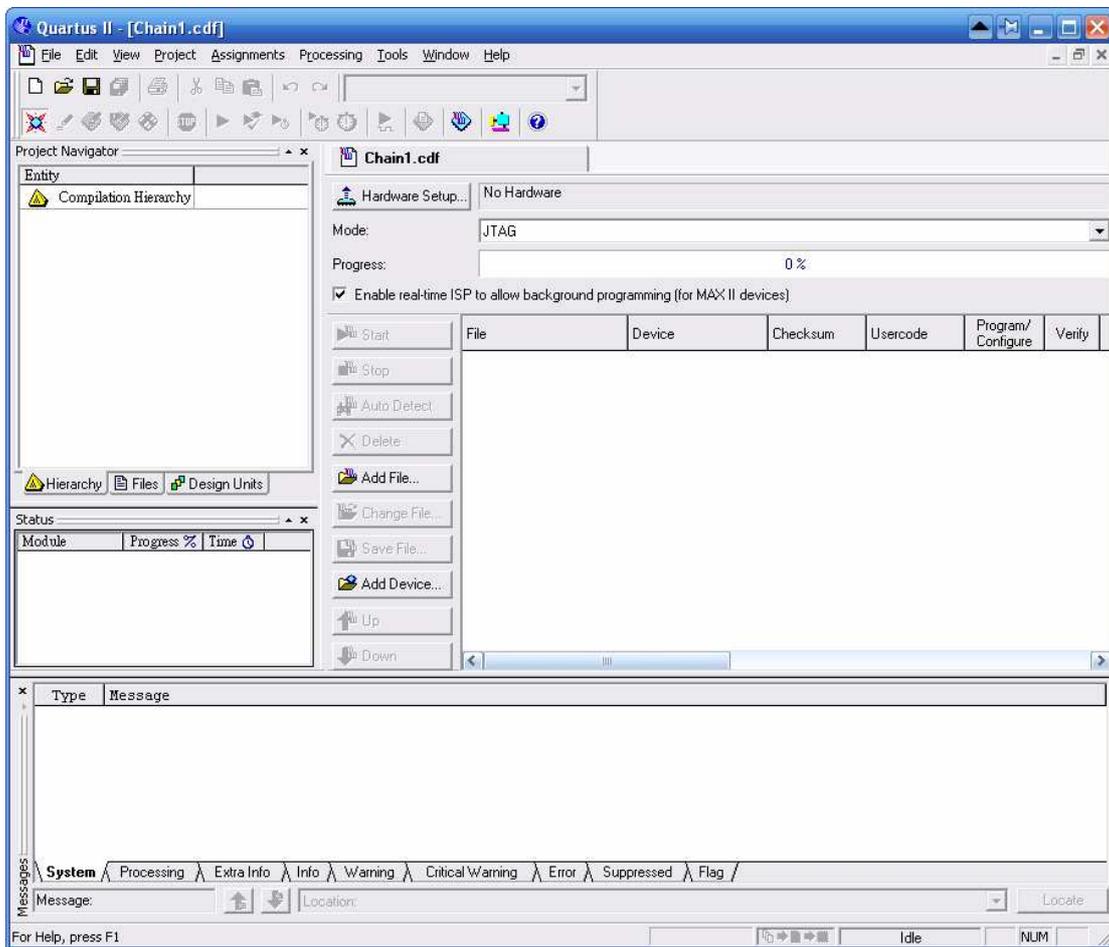
Figure 8. Programmer window
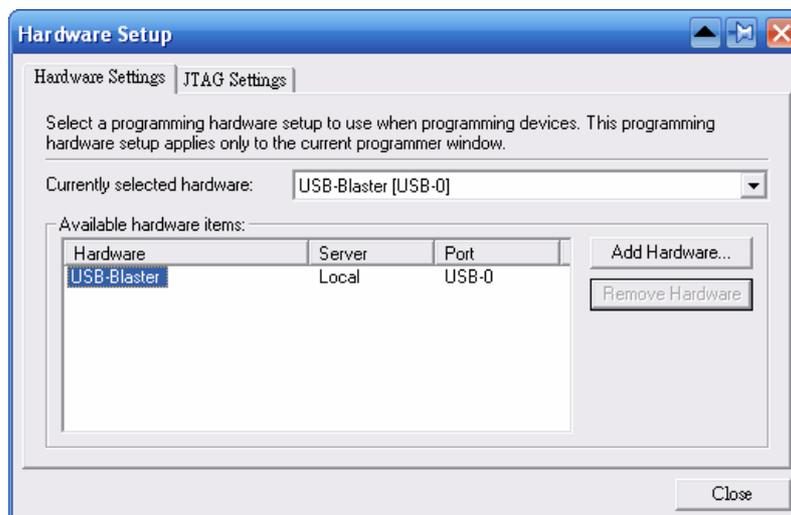
Figure 9. Hardware settings
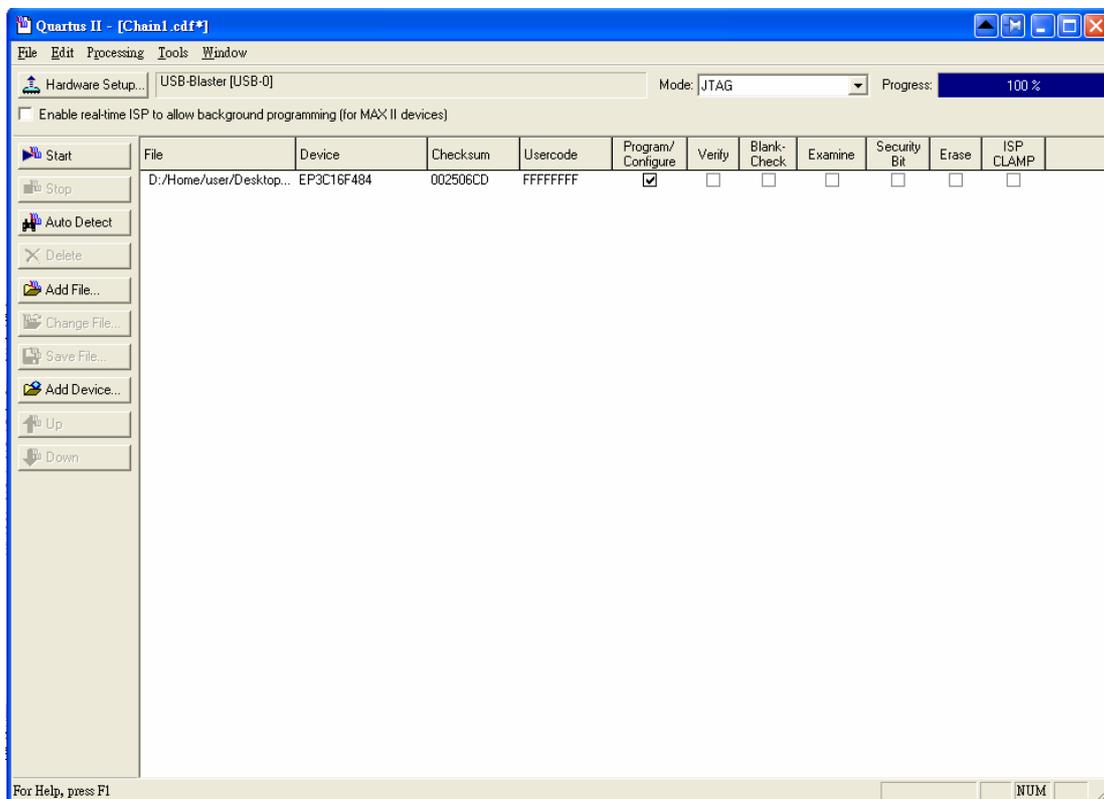
Figure 10. Download complete

Revision History

Date	Version	Changes
2009.7	First publication	