This document describes the scope of Altera's DE3 Development and Education Board and the supporting materials provided by the Altera Corporation. It also explains the installation process needed to use a DE3 board connected to a computer that has the Quartus II CAD system installed on it.

Contents：

Altera's DE3 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 DE3 Board

The DE3 is the next generation of development and education board, equipped with Altera Stratix III 3SL340 (DE3-340) or 3SL150 (DE3-150), which offers nearly 340,000 or 150,000 LEs, respectively. The board provides 240 differential pairs of user-defined 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 DE3 Board and Supporting Material

The DE3 board has powerful features that allow users to implement a wide range of designed circuits. The Stratix III device is capable of dealing with resource consuming projects and complex algorithm verification, and the HSTC interface is provided for high-speed inter-connection. The DDR2 SO-DIMM socket offers the opportunity of faster memory access experience, while the SD card socket provides the extension of data storage.

Finally, it is possible to connect other user-designed boards to the DE3 board by means of eight High Speed Terasic Connectors (HSTC) or two GPIO expansion headers. Software provided with the DE3 board features the Quartus II web edition design tools. There are also several applications that demonstrate the utility of the DE3 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 or from the Altera web page: **www.altera.com/download**

Install ALL of the following:
   • Quartus II software version 8.0 or later
   • Nios II EDS, version 8.0 or later

4. Installing the Path File for Quartus II 8.0

Some software issues when using Quartus II 8.0 compiling a design that is using DDR2 or DDR3 and has the memory interface wrapped around the corner of a chip using location constrain. To solve these issues, users need to install a path file named "*PC-Quartus_II-8.0-0.01.exe*" which is located in the directory "*QII_80_Path*" of the DE3 System CD.

5. Obtaining a License File From Altera

Before using the Quartus II software, you must request a license file from the Altera. The Quartus II web edition does not support any of the Stratix III devices on DE3. In another words, a subscription of Quartus II is required, and users must apply a license file for it from Altera's website.

6. Setting up the License File for Terasic Power Controller IP

After the license file for Quartus II is installed, there is one more license file needed. The license is for Terasic Power Controller IP. Error messages will be popped for users if the license file is not added before the projects generated by the DE3 System Builder are submitted to compile. The procedures are listed below：

Step 1. Use Notepad or other text edit software to open the file *license_de3_regulator.dat*, which is located in the directory *Terasic IP License* of the DE3 System CD.

Step 2. The license contains the FEATURE lines required to license the IP Cores as shown below.

FEATURE 535C_000C alterad 2008.02 permanent uncounted 308F50115C98 \
    VENDOR_STRING="99999999h29ahVVVVVVVVUpSriqqqqqqqq1ow88ooooooooperGcrrrrrr
rrtL9UG88888888bypL0pppppppppgqUvizzzzzzzzbtMQV88888888BSMRk88888888Dl0zRCCCCCCC
CCWslN4" \
    HOSTID=ANY SIGN="0BE4 4F79 1DC8 A4AE 8B30 C3C0 B070 DE00 E0F8 \
    5F61 6E46 FB77 569E CB2A B7CA 0115 90DC 5AFC CC7C D11E 21BE \
    A654 145A 8DD9 447A 067C EF04 B42F B4EE D13F"

Step 3. Open your Quartus II license.dat file in a text editor.

Step 4. Copy the all the contents of the Terasic_license.dat and paste it at the end of your Quartus II license file. (Note: Do not delete any FEATURE lines from the Quartus II license file. Doing so will result in a non-usable license file.) .

Step 5. Save the Quartus II license file.

7. Installing the USB Blaster

The DE3 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 DE3 board is shipped in a package that includes all parts necessary for its operation. The only essential parts are 250Watts ATX power supply, power cable and the USB cable. Plug in the power cable which connects to ATX power supply to provide power to the board. Use the USB cable to connect the USB connector (the one closest to the power switch) on the DE3 board to a USB port on a computer that runs the Quartus II software. Turn on the power switch on the DE3 board.

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 DE3 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**.
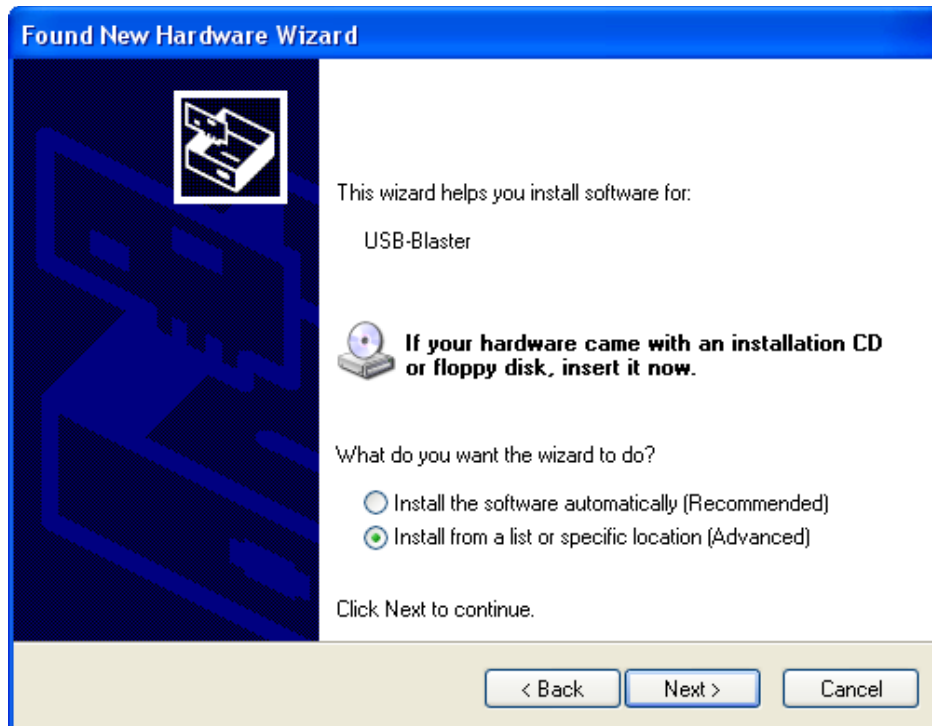
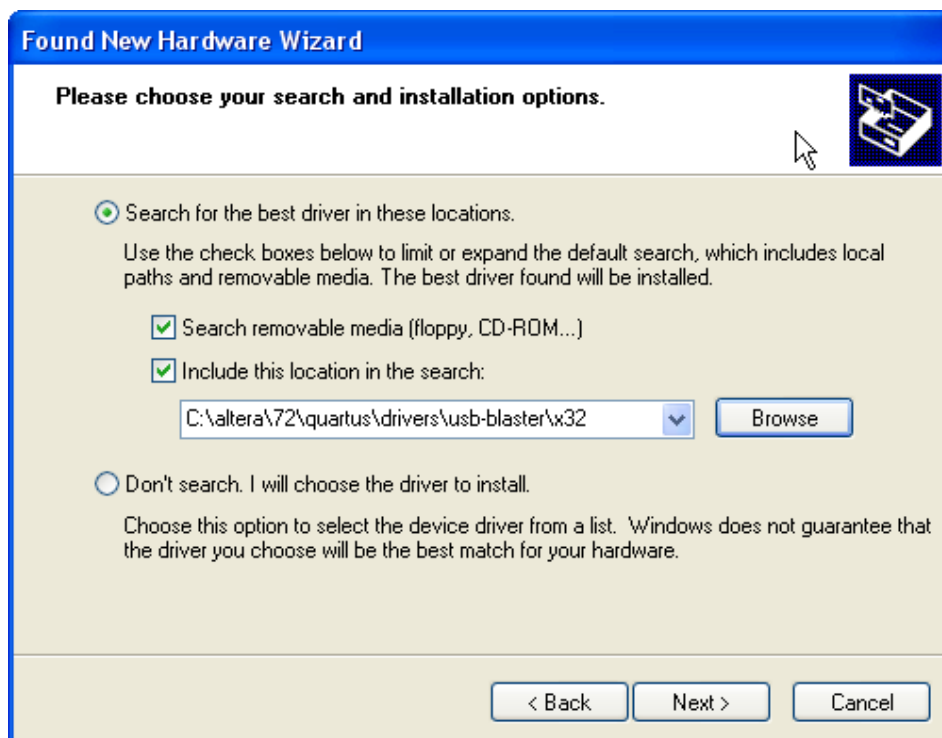Figure 2. The driver is found in a specific location.

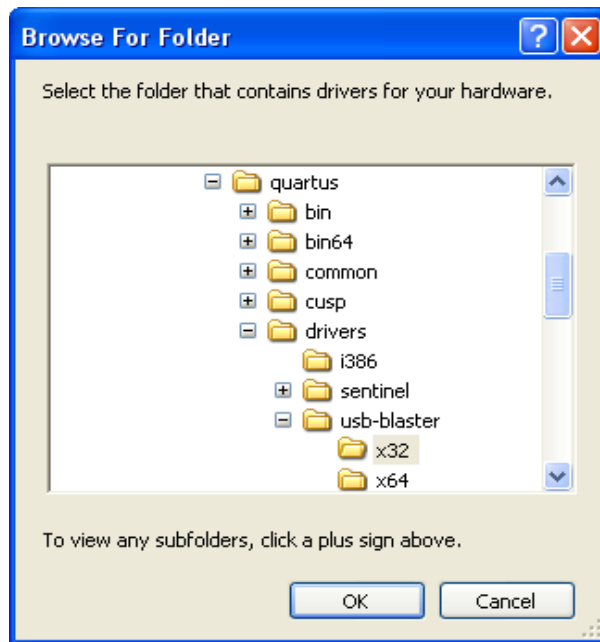Figure 3. Specify the location of the driver.

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.
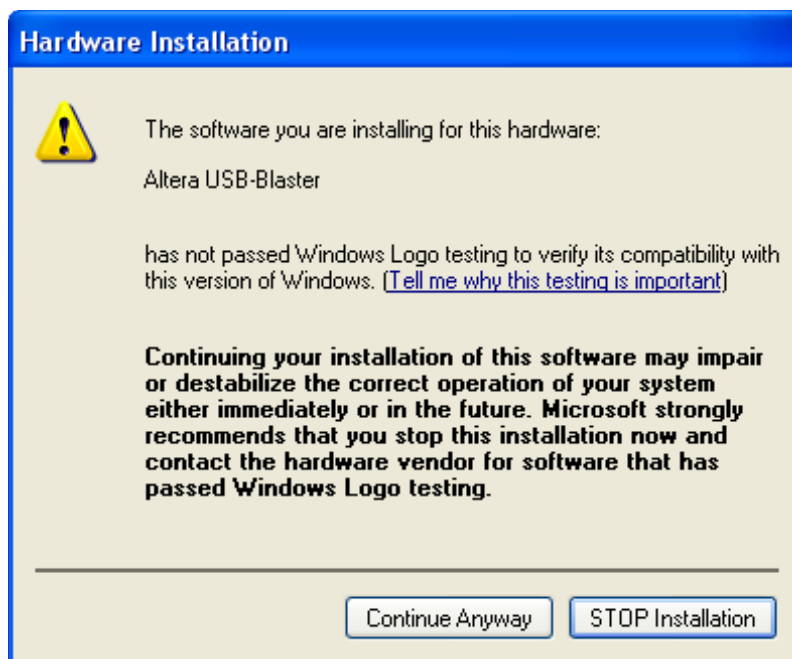

Figure 5. There is no need to test the driver.

Figure 6. The driver is installed.

8. Powering up the DE3 Board

The DE3 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 jack of ATX power supply 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 DE3 power cable from the connector of ATX power supply to the power connector (J18) on the DE3 board.

Step 3. Turn on the power by pressing the ON/OFF switch (SW5) on the DE3 board.
At this point you should observe the following:
- All user LEDs(LED0~LED7) are flashing
- All 7-segment displays(HEX0 and HEX1) are cycling through the numbers 0 to F

Figure 7. The connection setup for DE3 board and power supply

9. Programming the FPGA Device on the DE3 Board

If users would like to program their own SRAM Object File(.sof) into the FPGA device on the DE3 board, please perform the following steps:

Step 1. Connect the power supply cable to the power connector (J18) on the DE3 board to a power outlet.

Step 2. Connect the USB cable to your host computer and the USB blaster port (J19) on the DE3 board.

Step 3. Turn on the power by pressing the ON/OFF switch (SW5).

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.

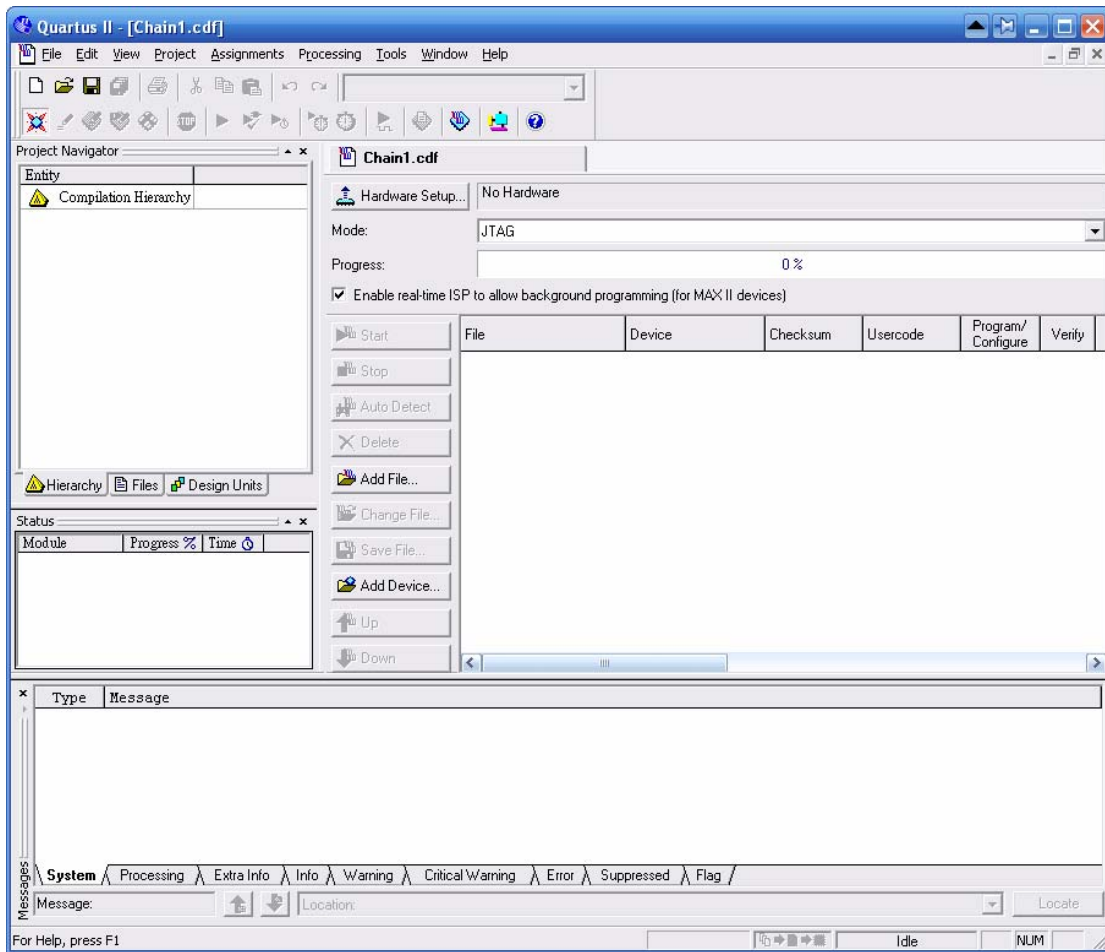**Step 11.** Click **Start**. The file downloads to the development board as shown in Figure 10.
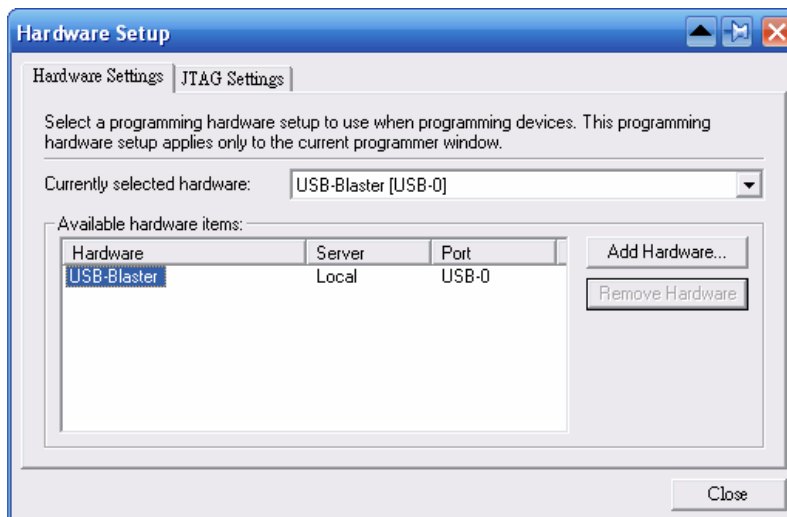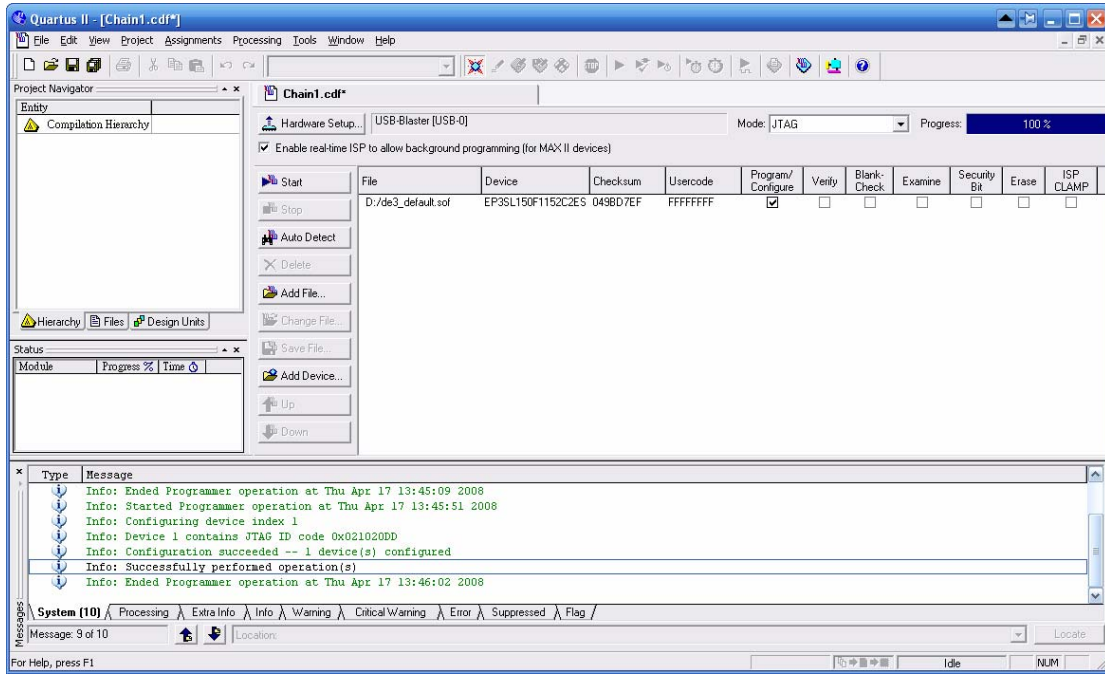
Figure 8. Programmer window

Figure 9. Hardware settings

Figure 10. Download complete

Revision History

Date	Version	Changes
2008.6	First publication	
2009.1	1.1	Modify section "Obtain a License File"
2009.2	1.2	