Getting Started with Altera's DE-Series Boards

For Quartus II 13.0

1 Introduction

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

Altera's DE-series Development and Education Boards have been developed to provide an ideal vehicle for learning about digital logic and computer organization in a laboratory setting. 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. In addition to the DE-series board and the associated software, Altera provides supporting materials that include tutorials, laboratory exercises, and interesting demonstrations.

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- Scope of a DE-Series Board and Supporting Material
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- Using a DE-Series Board

2 Purpose of a DE-Series Board

University and college courses on the design of logic circuits and computer organization usually include a laboratory component. In a modern curriculum, the laboratory equipment should ideally exemplify state-of-the-art technology and design tools, but be suitable for exercises that range from the simple tasks that illustrate the most basic concepts to challenging designs that require knowledge of advanced topics. From the logistic point of view, it is ideal if the same equipment can be used in all cases. The DE-series board has been designed to provide the desired platform.

3 Scope of a DE-Series Board and Supporting Material

A DE-series board features a powerful Cyclone® series FPGA chip. All important components on a DE-series board are connected to the pins of this chip, allowing the user to configure the connection between the various components as desired. For simple experiments, a DE-series board includes a sufficient number of switches (of both toggle and pushbutton variety), LEDs, and 7-segment displays. For more advanced experiments, there are SDRAM and Flash memory chips on DE-series boards. SRAM is included on the DE1, DE2 and DE2-115 boards and SSRAM is included on the DE2-70 board. For experiments that require a processor and simple I/O interfaces, it is easy to instantiate Altera's Nios II processor and use interface standards such as PS/2 and RS232 (Please note that DE0 boards do not have an RS232 port). For experiments that involve sound or video signals, there are standard connectors provided on the DE1 and DE2-series boards. Finally, it is possible to connect other user-designed boards to a DE-series board by means of two expansion headers.

Software provided with the DE-series board features the Quartus II Web Edition design tools. It also includes a simple monitor program that allows the student to control various parts of the board in an easily understandable manner. There are also several applications that demonstrate the utility of a DE-series board.

Traditionally, manufacturers of educational FPGA boards have provided a variety of boards and the CAD tools needed to implement designs on these boards. However, there has been a paucity of supporting materials that could be used directly for teaching purposes. Altera's DE-series boards are a significant departure from this trend. In addition to the DE-series board, Altera Corporation provides a full set of associated exercises that can be performed in a laboratory setting for typical courses on logic design and computer organization. In effect, the DE-series board and the available exercises can be used as a ready-to-teach platform for such laboratories. Of course, the DE-series board is also likely to be suitable for exercises that have been developed for other hardware platforms and can be ported to the DE-series platform.

4 Installation and USB-Blaster Driver

The DE-series board is shipped in a package that includes all parts necessary for its operation. The only essential parts are the power adapter and the USB cable. There is also a protective plexiglass cover that may be used in the laboratory environment to protect the board from accidental physical damage.

Plug in the appropriate power adapter to provide power to the board. Refer to Table 1 for the power adaptor voltage specification for different DE-series boards. Use the USB cable to connect the USB connector on the DE-series board to a USB port on a computer that runs the Quartus II software. Turn on the power switch on the DE-series

board.

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 DE-series board is programmed by using Altera's USB-Blaster mechanism. If the USB-Blaster driver is not already installed, follow the steps in section 4.1 or 4.2, depending on your operating system.

4.1 Windows XP

After using the USB cable to connect the board to a computer the New Hardware Wizard in Figure 1 will appear.

Board	Power Adaptor Voltage (V)
DE0	7.5
DE1	7.5
DE2	9
DE2-70	12
DE2-115	12

Table 1. DE-series power adaptor voltages.

Figure 1. Found New Hardware Wizard.

Since the desired driver is not available on the Windows Update Web site, select No, not this time in response to the question asked and click Next. This leads to the window in Figure 2.

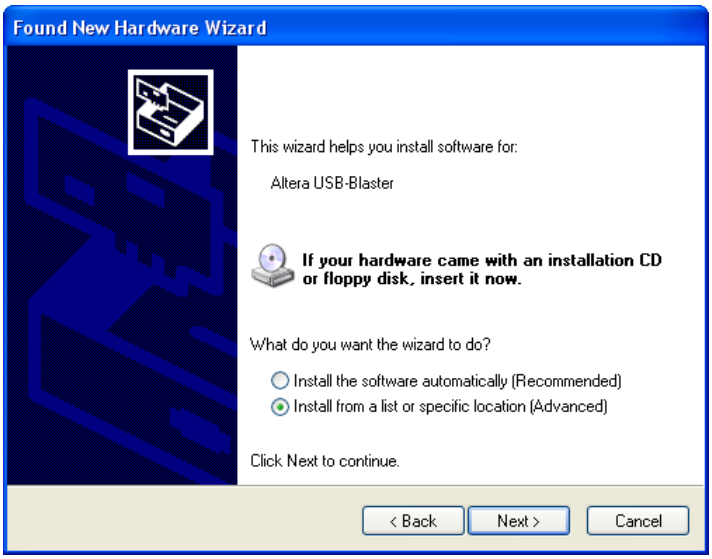

Figure 2. The driver is found in a specific location.

The driver is available within the Quartus II software. Hence, select Install from a specific location and click Next to get to Figure 3.

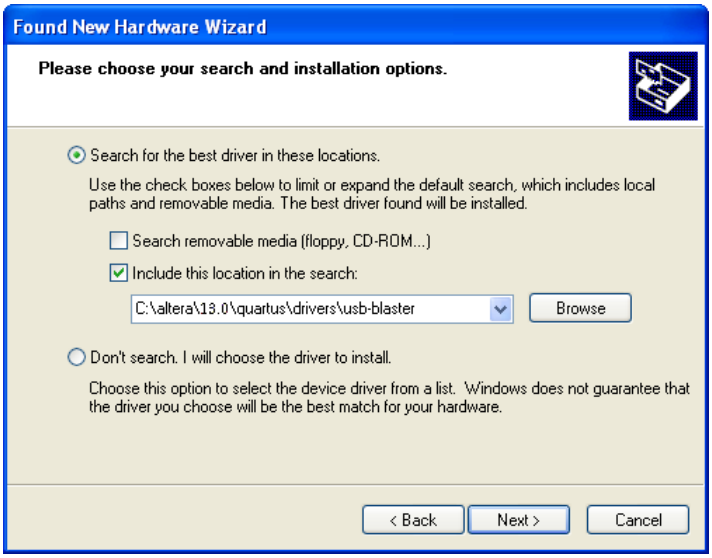

Figure 3. Specify the location of the driver.

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 can be found in your Quartus installation folder: ⟨*QUARTUS_ROOTDIR*⟩*drivers**usb−blaster*. Click OK and then upon returning to Figure 3 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 4. Browse to find the location.

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

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

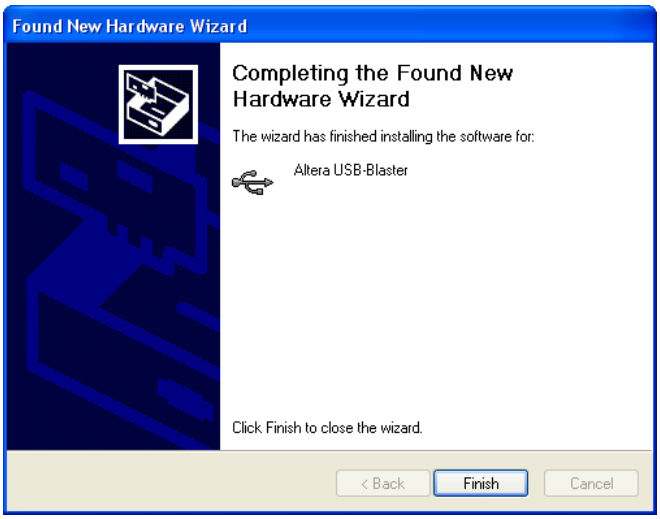

Figure 6. The driver is installed.

4.2 Windows 7

After using the USB cable to connect the board to a computer the notification in Figure 7 will appear. Ignore or close this notification.

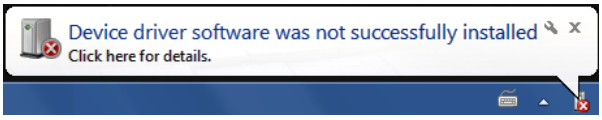

Figure 7. Notification for unsuccessful device driver installation.

If a different notification appears indicating that the driver is being searched for in the Windows Update Web site, click the notification to open a window. Since the desired driver is not available on the Windows Update Web site, select the option to stop the search.

Then select Start > Control Panel > Hardware and Sound and click Device Manager under Devices and Printers to get the window in Figure 8. Expand the Other devices option and double-click USB-Blaster to get the window in Figure 9.

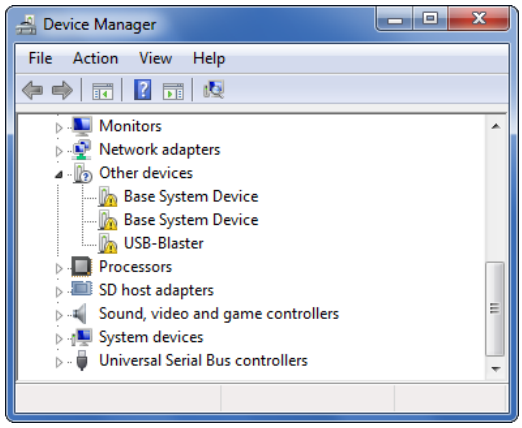

Figure 8. Click USB-Blaster in the Device Manager.

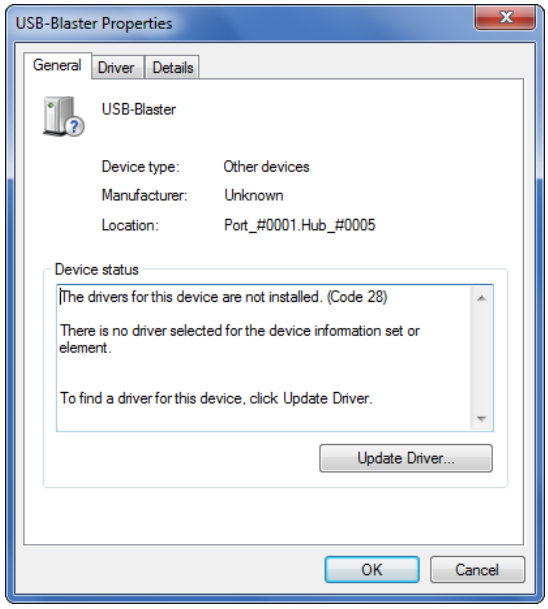

Figure 9. Click the Update Driver button.

In the General tab select Update Driver, which opens the window in Figure 10. The driver is available within the Quartus II software. Hence, select Browse my computer for driver software. In the window in Figure 11 check Include subfolders and click Browse to get the pop-up box in Figure 12.

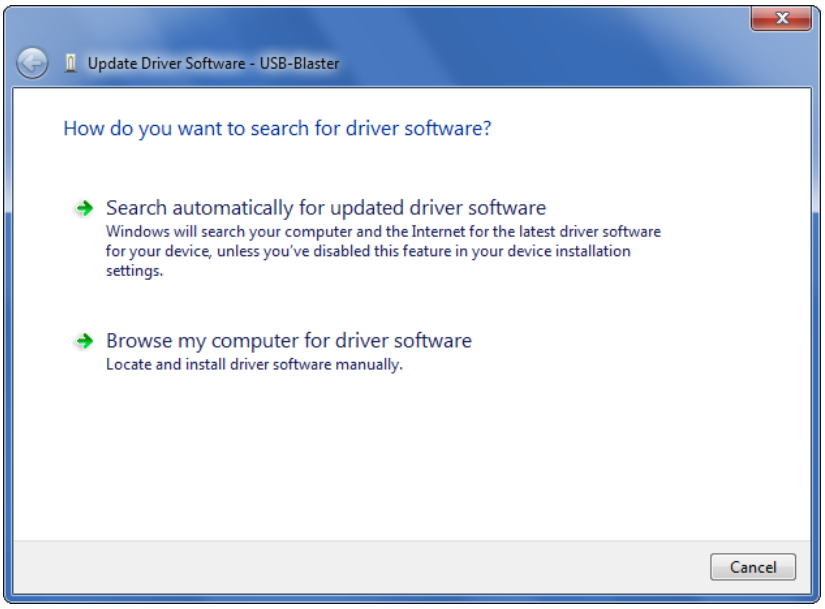

Figure 10. Browse your computer for the driver software.

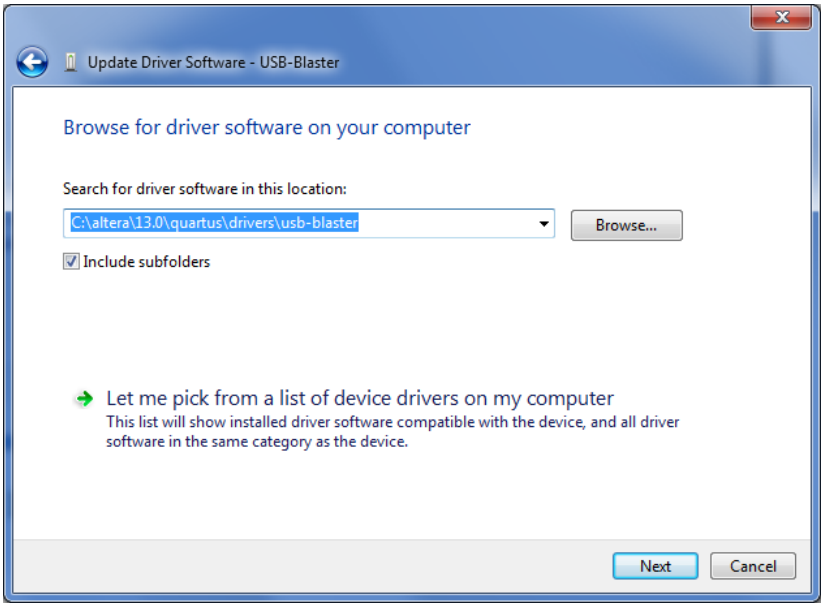

Figure 11. Specify the location of the driver.

Find the desired driver in your Quartus installation folder: ⟨*QUARTUS_ROOTDIR*⟩*drivers**usb−blaster*. Click OK and then upon returning to Figure 11 click Next.

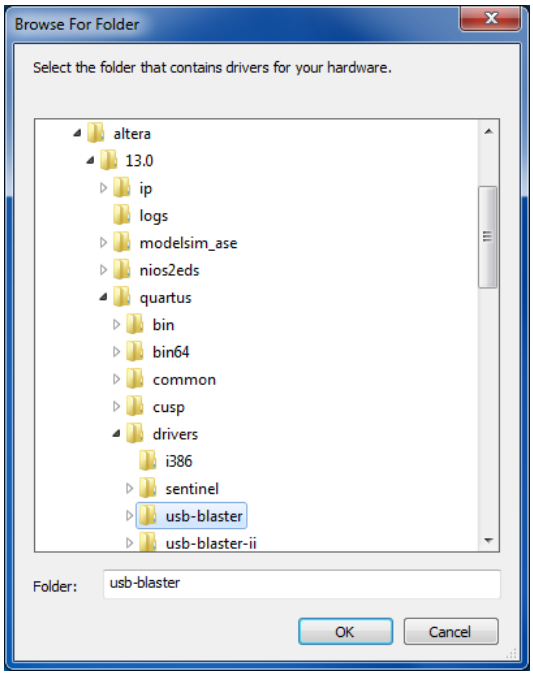

Figure 12. Browse to find the location.

At this point the installation will commence, but a dialog box in Figure 13 will appear indicating that Windows cannot verify the publisher of the driver software. Click Install this driver software anyway. The driver will now be installed as indicated in Figure 14. Click Close and you can start using the DE-series board.

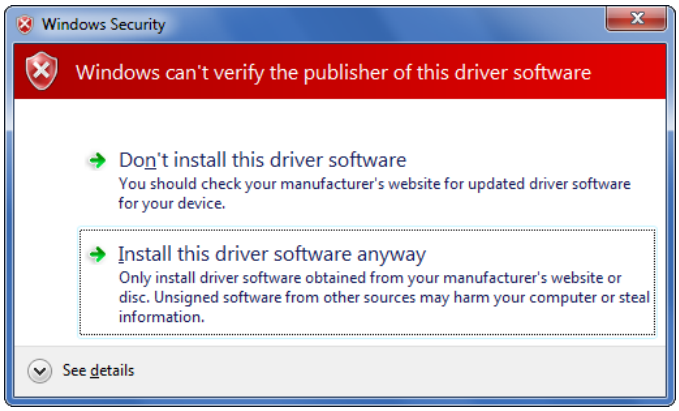

Figure 13. There is no need to verify the publisher of the driver.

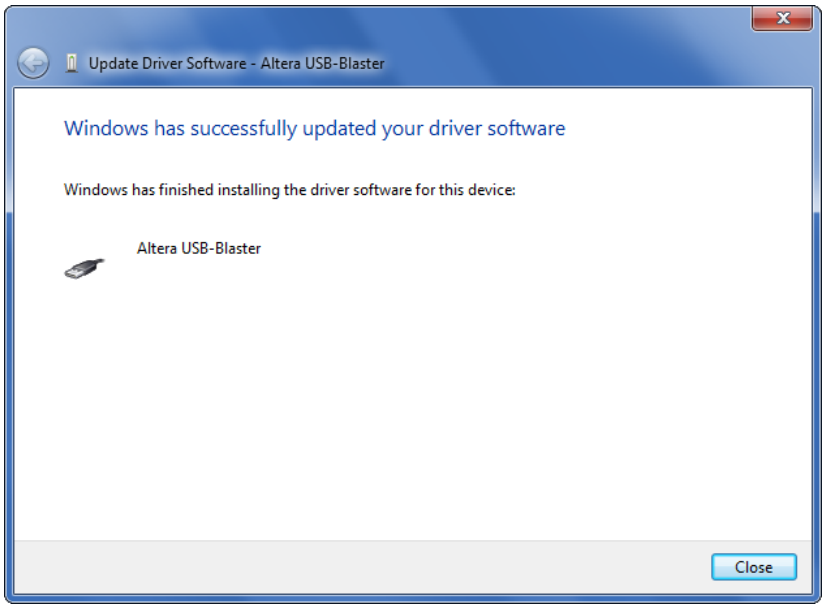

Figure 14. The driver is installed.

5 Using a DE-series Board

A DE-series board is used in conjuction with the Quartus II software. A reader who is not familiar with this software should read an introductory tutorial. There are three versions of the tutorial:

- *Quartus II Introduction Using Verilog Designs*
- *Quartus II Introduction Using VHDL Designs*
- *Quartus II Introduction Using Schematic Designs*

These tutorials cover the same aspects of the Quartus II software; they differ only in the design entry method that is used. They illustrate the entire process of implementing a design targeted for a DE-series board.

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