1   LAB USAGE GUIDELINES

1.1   PROGRAMMING THE FPGA IN LABS

1. Please program the FPGA device, **only** in the JTAG mode and refrain from using the Active Serial mode, which is only meant to program the on board flash (eeprom) memory.

    - If the default DE2 program from the flash is overwritten, then at power-up DE2 no longer displays the flashing LEDs, rotating Hex values or the Welcome message on the LCD screen.

        This can confuse students in assuming that the board is not working.

    - This also makes it necessary, later on, to re-write the flash with the default program!

2. Please keep SW19 in the RUN position. SW19 is on board's edge, by the LCD screen.

    - If the board is powered up with the switch in PROG position, then..

        1) The default sequencing will not happen.

        2) The students will **not** be able to download their design.

        In the RUN position, even if someone has overwritten the flash, users could still load and check their own design.

1.2   BOARD HANDLING

1. Please do use the ESD mats and the wrist bands, to avoid damaging the board.

2. Kindly keep DE2 boards in their respective boxes and don't mix them up.

    - This helps to better track the boards, e.g. for faults, repairs and revision level etc.

2 QUARTUS TOOL USAGE

2.1 ANALYSIS & SYNTHESIS: WARNINGS

It is recommended you quickly go through all the warnings to make sure nothing unwanted has happened.

The tool **will** perform logic optimizations. Make sure nothing untoward has been optimized away!

To prevent this you may need to use compiler directives, attributes in your code. Refer to Quartus documentation for more info regarding this.

2.2 UNUSED PINS ON THE DEVICE

As your design likely won't use all of the hardwired pins of the FPGA chip, there would be many unused IO pins on the FPGA chip.

You are better off assigning all such unused IO pins 'As input tri-stated'.

To do this, go to

Menu Assignments -> Device, then click on 'Device and Pin Options'. In the open box, highlight category 'unused pins' and select 'as input tri-stated' from the drop down menu. Click ok to save.

2.3 IMPORTING THE PIN CONNECTIONS

Altera provides pin files in diff formats. *You can import pin connections from the 'qsf' (settings) file and save yourself time*, instead of manually inputting the pin terminal names.

The pin file is available from online at:

http://www.altera.com/education/univ/materials/boards/de2/unv-de2-board.html

Before you import the pins, make sure that 1) you have performed Analysis & Synthesis) and 2) that the pin names you are matching with those in the imported file!

To import pins, follow these steps..

1) Menu Assignments -> Import Assignments, then browse to where the file has been saved, click ok and you are done.

To verify that all your pins (of course only the top-level in your design) have indeed been assigned, open Pin Planner tool and double check. (Menu Assignment -> Pin Planner).

Note: While this will save you time, it will also generate warnings for all the other assigned pins in imported file, which are not in your design! You can just ignore these warnings, or delete those pins them from 'your' project's setting file (your_top_design_module**.**qsf)

Note: You can use Pin Planner tool, to edit other properties of your IO pins, e.g. current strength, whether it is a differential pair, the type of IO standard etc.

2.4 DOWNLOADING (PROGRAMMING) YOUR DESIGN ON THE CHIP

After your design has been compiled, program it to the chip following these steps..

1. Ensure that the board is..

   - Powered up

   - USB Blaster port is connected to your PC port.

   - SW19 (near boards' edge, by the LCD screen) is in RUN position.

2. Start the Programmer..

   Menu Tools -> Programmer

   Ensure that in the Programmer dialog box..

   - 'Hardware setup' shows *USB-Blaster[USB-0]*

     If not, then click on 'Hardware Setup'. Then in the new box, click on drop down menu, next to 'currently selected hardware' and select USB Blaster[USB-0] and the click Close.

   - Mode shows *JTAG*

   - File name shows 'top_design.sof'

   - Program/Configure box is checked off.

   Then select/highlight the file name and press 'Start'. This starts programming the chip. The 'Progress' bar should indicate 100% (Successful) message after chip configuration is complete.

3 ADDITIONAL RESOURCES

1. Altera DE2 Board, 'User Manual'.
2. DE2 Board 'Schematic'