Tutorial for EEL4712 Lab LSA

Starting Note: Assume that the 8-bit counter you designed in part 1 of the prelab is programmed on your BT-U board.

1) The first thing you need to do is connect a probe of the LSA to each of the pins you assigned your outputs to on the BT-U board. For this tutorial, you only need to connect the 4 least significant bits of the counter and the least significant RCO output. Remember that the pins on the INSIDE of each of the headers are the ones connected to the FPGA. **Also, you will need to connect one of the LSA probes labeled "gnd" to a ground pin your BT-U board.** This is common thing students forget, so if things aren't working as you expect make sure the grounds are connected.

2) Start the "LA Viewer" program on the computer. On the left side of the screen, you should see the default labels for each of the channels (CH-00, CH-01, etc…) You can change the label of a channel to be more descriptive by right clicking on it and choosing "Modify Label Name". If a previous user has already modified the labels, you can reset them to the default by right clicking on one of the labels and choosing "Delete All Labels". Then right click again and choose "Add all labels". This will reset all the labels to their default state. To capture data, click on the icon with the running man (5th from left). You should now see the captured data on the screen. To switch between a graphical waveform view and a text view, click the "Timing State Analysis Switch" button (12th from left).

3) Multiple signals can be combined into a group so they can be displayed together. This is useful for displaying count values or busses. To view the count value of the 74163, right-click on one of the labels and choose "Combine Labels" from the menu. Enter a name for the group in the top text box. To add pins to the group, select a pin from the source list and click the right arrow to move it to the destination list.

4) You can change the radix the group is displayed in by double-clicking the label name and choosing the radix you want it to be displayed in from the window that pops up.

5) To get a copy of the data for your lab report, you will need to take a screenshot. You can do this by pressing the "PrintScreen" button on your keyboard, opening an imaging program such as MS Paint, and choosing Paste from the edit menu. You can then save the screenshot as an image file.

Take a screenshot of the data you captured. Use the graphical waveform view.

Clock Settings

The LSA works by sampling the value of all the pins at fixed intervals. This interval can be based either off the internal clock of the LSA, or a pin on your BT-U board.

6) To capture data based on the internal clock of the LSA, make sure that "Int Clk" is selected in the upper right hand part of the screen. To the left of this selection box you can choose what speed the internal clock should run at. Capture the data several times with different clockspeed settings to observe the results.

Take a screenshot of data captured with the internal clock at a different clockspeed than you used in part 5. Use the graphical waveform view.

7) The LSA can also sample the pins based on a clock signal provided from your board. This is useful to keep the LSA in sync with your design and is the most useful mode for this class. To use this mode, connect probe 31 of the logic analyzer to the pin on your BT-U board where you routed your clock signal. Then in the upper left hand drop down box, choose "CH31" instead of "Int Clk".

Take a screenshot of data captured using the board clock. Use the text view.

Trigger Settings

8) You can configure the LSA to begin capturing data at an arbitrary point. To do this, click on the Trig button in the top menu, select single mode, and click ok. In the screen that pops up, the "<<" button toggles between direct mode and label mode. Change to label mode. To trigger starting at a specific count value, select your count label in the drop down box and enter a value in the text box below. Click "add" to add the trigger and then click ok. Now when you run a data acquisition, the data capture will begin at when the count reaches the value you specified.

Capture data starting with a count value of 5 and take a screenshot. Use the text view.