

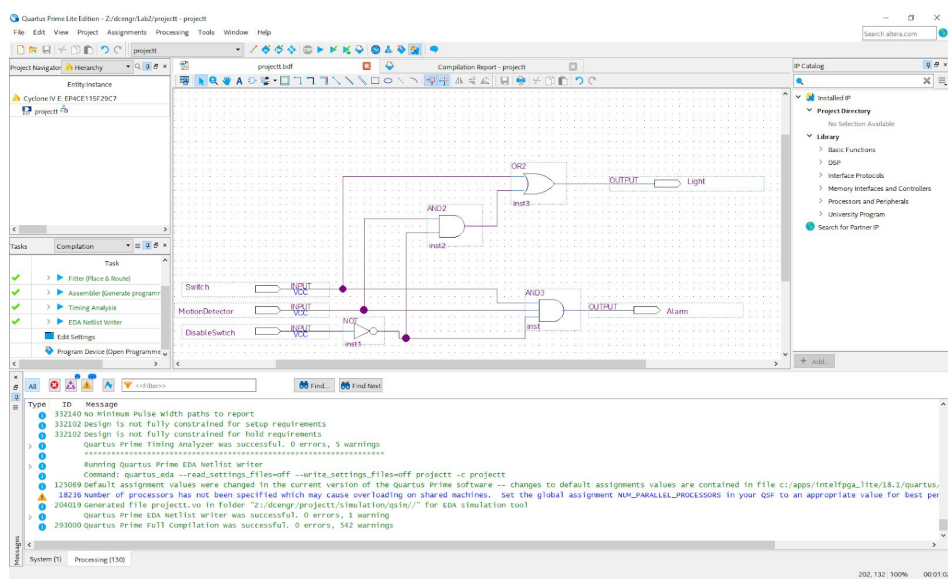
ELEN 21 Lab 2

Introduction

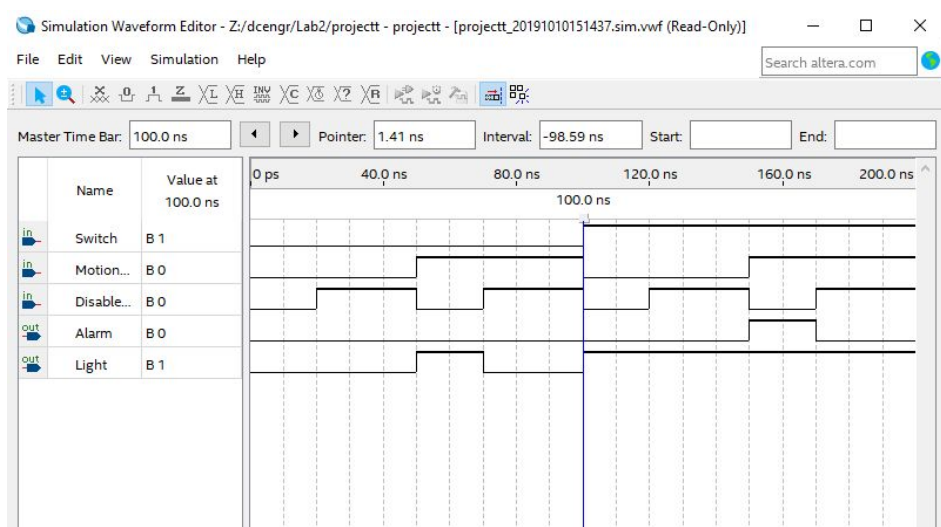
In this lab, we created a new circuit that involved a switch, a disable switch that will disable the motion detector activated light but still allows the switch to turn on the light. We will be creating this circuit on the computer program, Quartus, and a DE2-115 board to demonstrate what this circuit would look like in real life. First, we made the circuits on Quartus. Here are our results:

Dillon Kanai's Results

Circuit

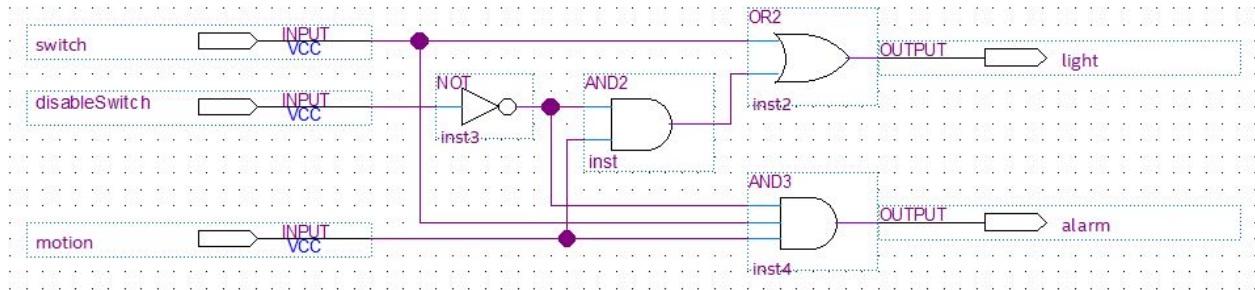


Waveform/"Truth Table"

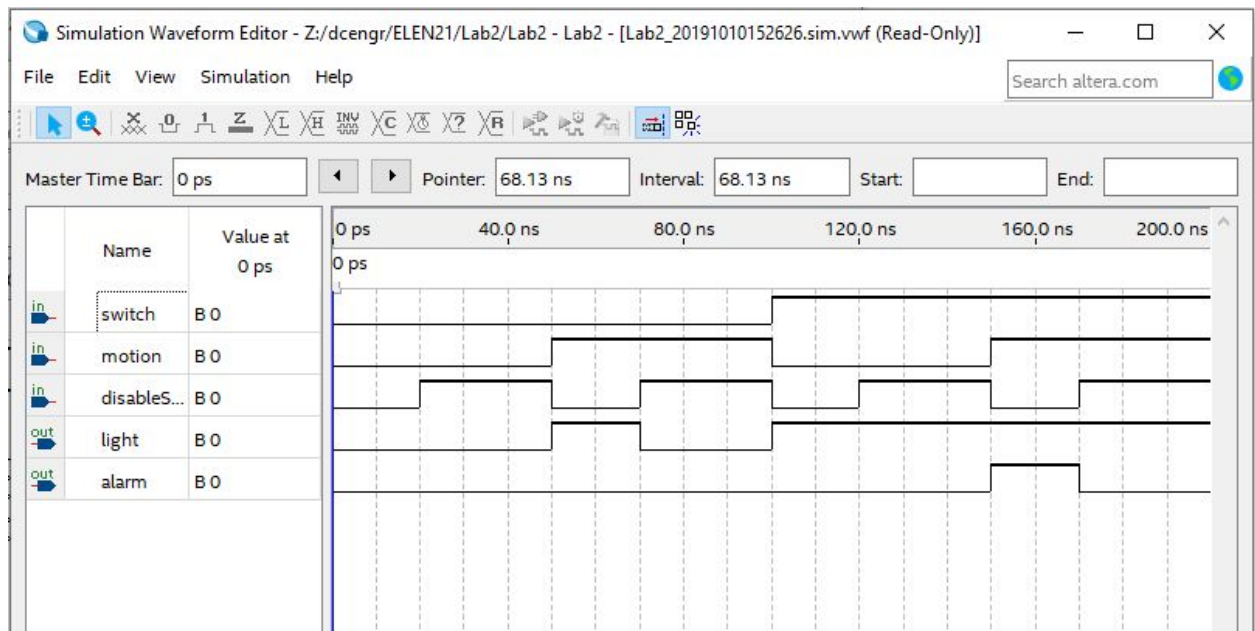


Conrad Park's Results

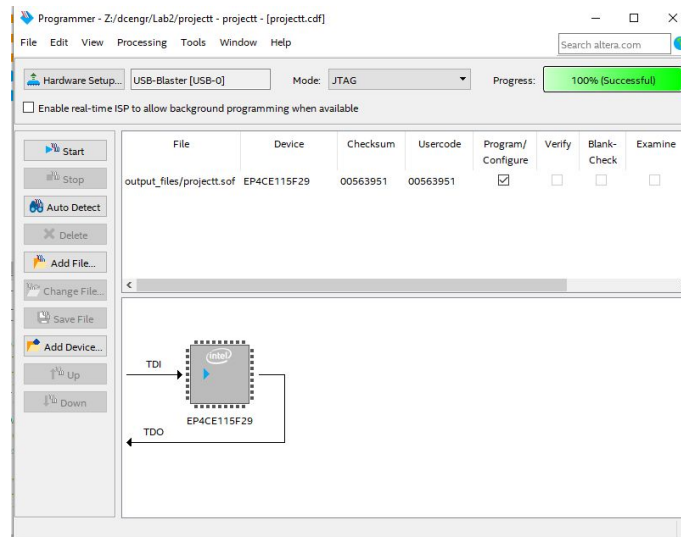
Circuit



Waveform/"Truth Table"



We were able to successfully implement this on the DE2-115 board as well. The light switch and the motion detector both individually turn on the light. When both are turned on, they trigger the alarm LED. When the Disable switch is on, the alarm is off when the switch and the motion detector are on. However, the switch can still turn off and turn on the light. Here is proof that the circuit was downloaded onto the board.



Procedure

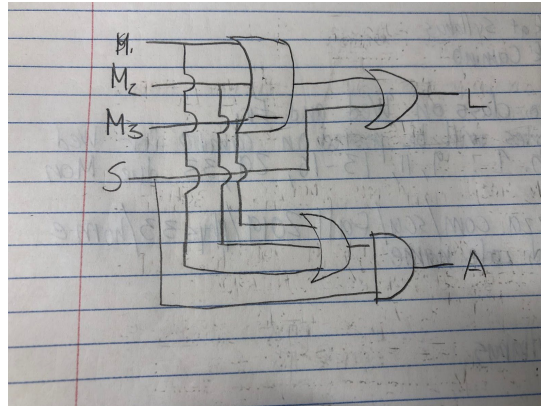
1. To start the project, create a new project and project folder in Quartus II.
2. Create a new Block Diagram/ Schematic File.
3. Replicate the logic gate schematic from the Pre-Lab using the necessary symbols and connecting nodes.
 - a. This circuit requires three inputs and two outputs, as well as a 2 input AND gate, 3 input AND gate, a 2 input OR gate, and a NOT gate.
4. Compile the program to verify everything is placed correctly in the schematic.
5. Create a new University Program VWF to test the circuit.
 - a. Insert all of the inputs and outputs and set each at varying ON OFF states to test all 8 input combinations.
 - b. Run a Functional Simulation to generate the outputs of the logic gate schematic.
6. Label the inputs and outputs corresponding to the DE2-115 switches and LEDs, or assign each of the inputs and outputs manually in the Assignment Editor.
7. Upload the program to the DE2-115 using Programmer and verify its functionality.

Questions

Q1) In Laboratory 1, what would you have had to change to use three motion detectors such that any of three different motion detectors could turn on the light and could also turn on the buzzer if the light were already on because the manual switch S was on? Specifically consider the component changes or additions, the wiring changes, and the testing.

A1) First, we need to have a triple input OR gate that uses the inputs of the three motion detectors. Then, this new OR gate would be the input for a double input OR gate that uses the inputs of the previous triple input OR gate and the switch. Additionally, the three motion detectors need to provide input to a new OR gate. This new OR gate will provide input to an

AND gate that also receives input from the switch. This outputs to the Alarm. For clarification, this is what this would look like:



Q2) Compare that to the changes you would need to make for the Altera FPGA implementation of a logic circuit using three buzzer inputs.

A2) Were we to use three motion sensor inputs in a similar fashion using the Altera FPGA implementation, we would need to modify our Block Diagram/ Schematic file to correspond with the new functionality. The motion sensors would be connected to a 3 input OR gate which would simply take the place of the currently labeled Motion Sensor input pin. Thus should any of the three motion sensors be triggered, one or all of them, they would act as the current motion sensor does and turn on the light or alarm depending upon the state of the power switch and the disable switch. Assigning the motion sensors to the correct inputs and uploading it to the DE2-115 board would complete the changes to the schematic.