EGR 333 Electronics I

Lab 4: Rectifier Circuits

Prepared for: Dr. Ni

Christopher Parisi

School of Engineering
California Baptist University

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Introduction

This lab teaches students about full wave rectifiers and their outputs. Students will see the various outputs using both a simulation of the circuit as well as the physical circuit. Students will learn how to build rectifier circuits in Multisim and then how to implement them on the NI Elvis II board. This lab also teaches more about virtual instruments that can be used to analyze circuits.

Development

The method I used in this lab was to first simulate the circuits and then to compare the results to that of the physical circuit. This data was also compared to the pre lab data to confirm accuracy.

Pre-lab Calculation

1) Vo = 16.27V
   T = 8.3ms

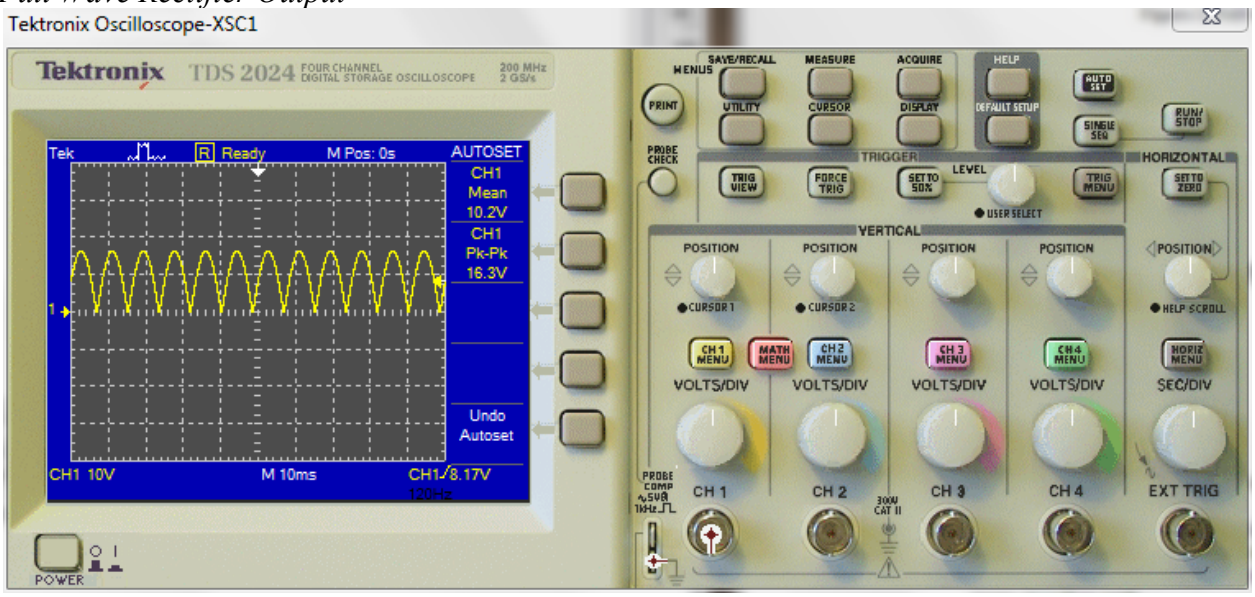
2) Vr = 1.36V

The worked out solutions can be found on the back of the lab report.

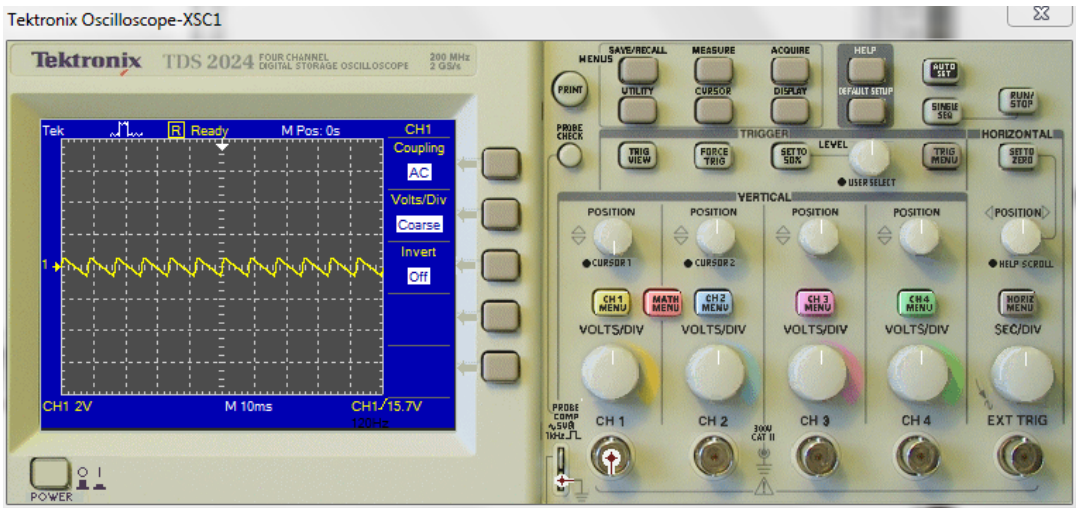
Simulation

Before constructing the actual circuits, I first simulated the design using the circuit simulation software Multisim. I measured the output using the virtual Tektronix Oscilloscope. I first tested a Full Wave Rectifier and then Full Wave Peak Rectifier using various capacitance values. The data I received is shown below.

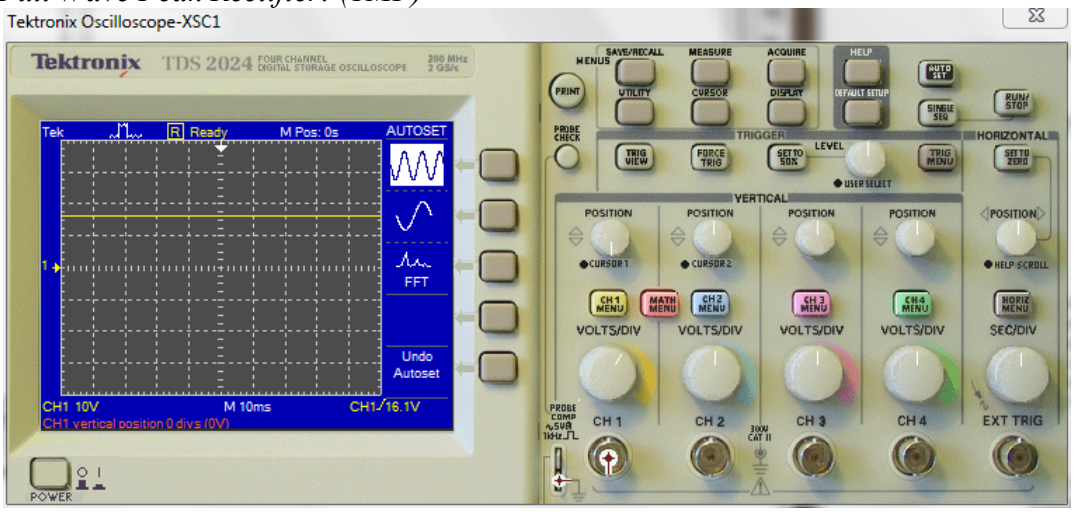
Full Wave Rectifier Output



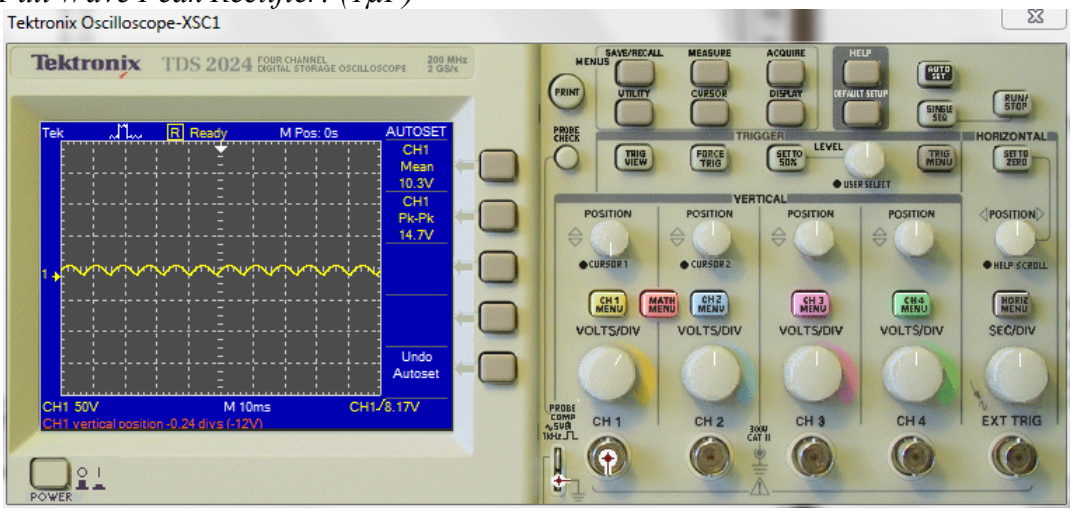
Full Wave Peak Rectifier: (100µF) AC Coupling



Full Wave Peak Rectifier: (1MF)



Full Wave Peak Rectifier: (1μF)



Equipment/Part List

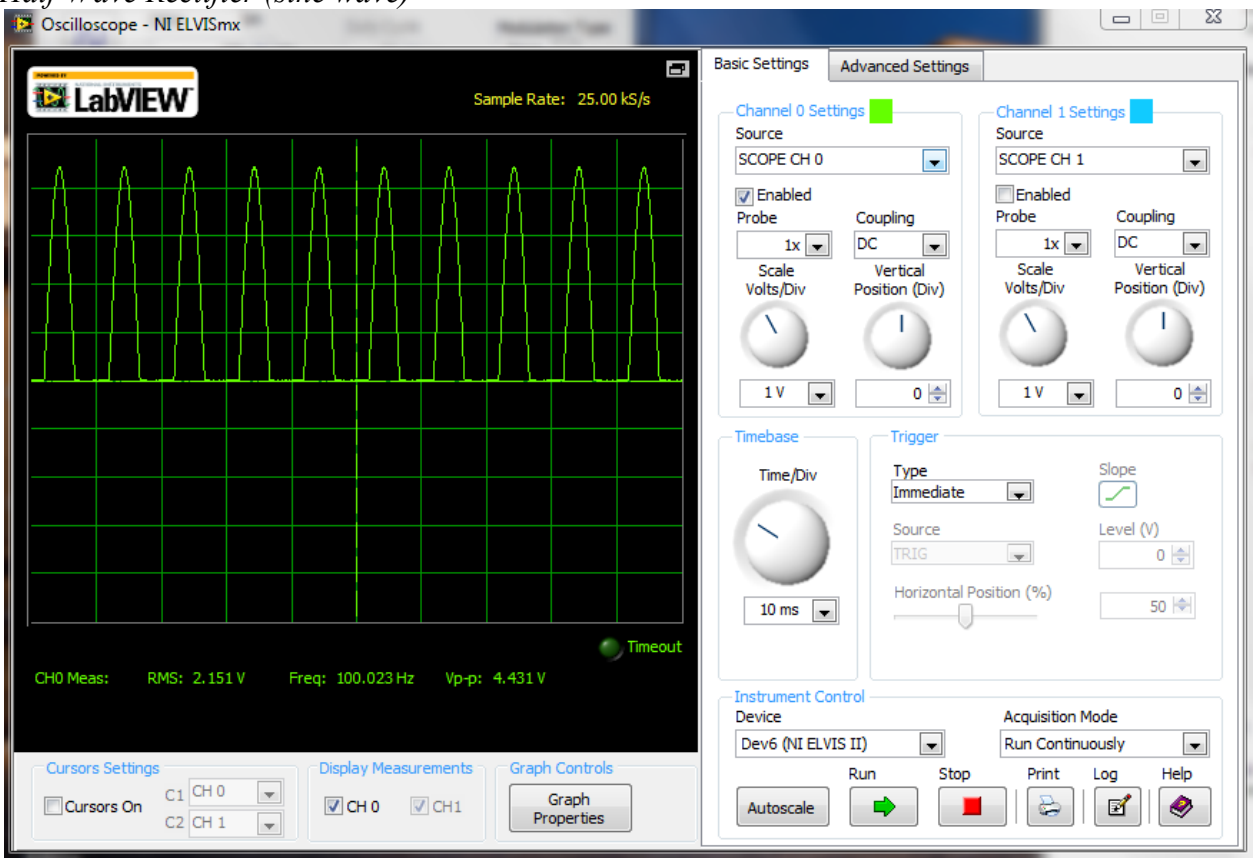
1. +10V DC power supply
2. PC with Multisim
3. NI ELVIS II
4. 1 1N4004 diode
5. 1 10KΩ resistor
6. 1 100µ F capacitor

Implementation

After simulating the circuits, I then physically constructed them on the NI Elvis II board. I first built the Half Wave Rectifier circuit and set the input to a sine wave. I then used the same circuit but gave it a triangular wave input instead. I captured the plots using the Scope tool of the NI Elvis software. The plots I obtained are shown below.

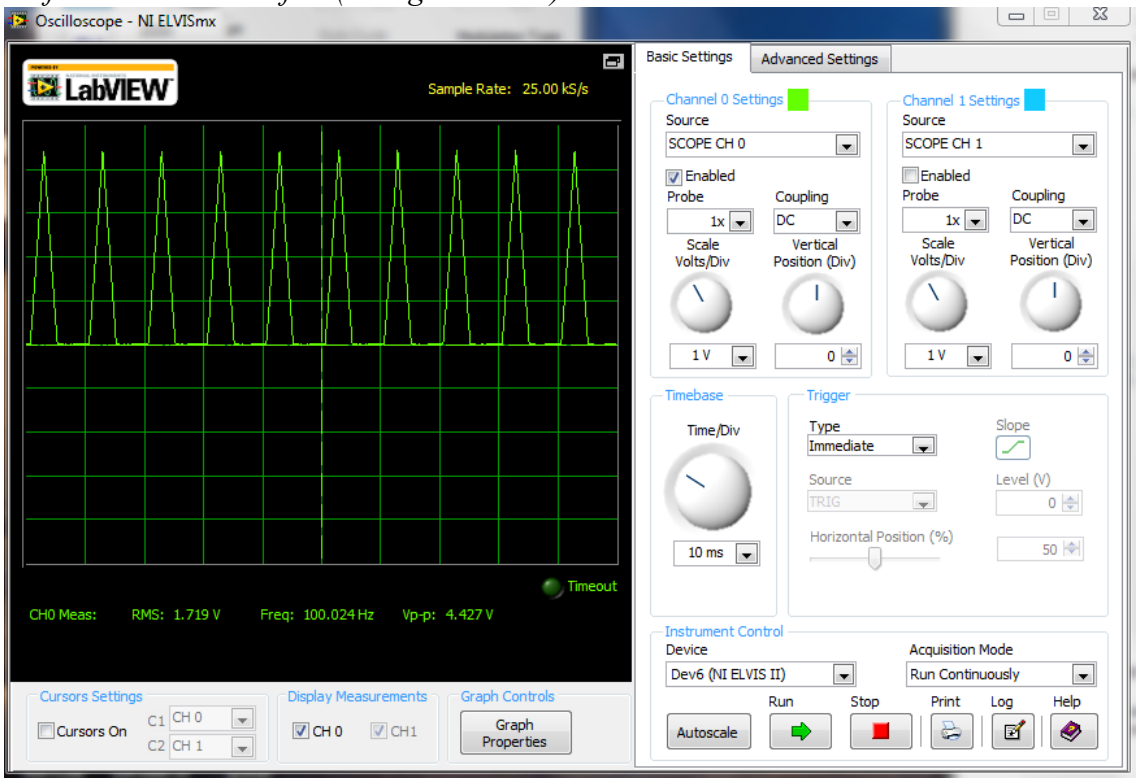
Part 1)

Half-Wave Rectifier (sine wave)



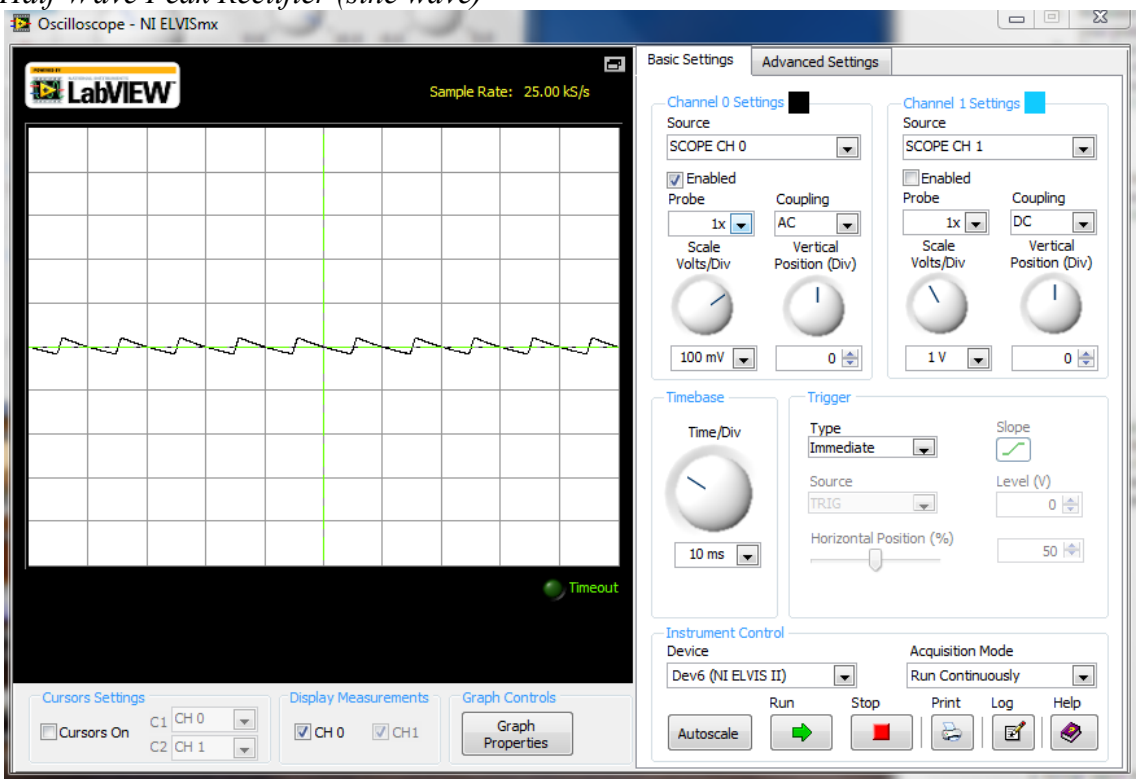
Part 2)

Half-Wave Peak Rectifier (triangular wave)



Part 3)

Half-Wave Peak Rectifier (sine wave)



Discussion

The only problem I ran into was not pushing the AC coupling button on the virtual oscilloscope. This gave a graph but did not show the data that needed to be seen.

Conclusions

This lab has given me more experience with Multisim as well as the NI Elvis II board. I have also learned a great deal about rectifiers and their functionality. I also learned about the difference between a Full-Wave Rectifier and a Full-Wave Peak Rectifier. Seeing the waveforms of the output also gave me a better understanding about what the capacitor does in these circuits.