# **Testing**

1. This section describes the testing process we went through during our project development.

## Resistive Load Testing in Power Electronics Lab

Describe our preliminary testing using the rheostat in the power electronics lab.

Include oscilloscope shots.

Throughout our testing, we standardized on the following oscilloscope connections:

* Channel 1: Input Voltage
* Channel 2: Output Current
* Channel 3: Control Voltage (C2/diac input to ground)
* Channel 4: Output Voltage

### Day 1 of Assembly and Testing (16 December)

The first day that we assembled our circuit and began testing was 16 December. We made the connections loosely, only soldering what needed to be soldered in order to make good electrical connection and leaving some connections twisted together. As this circuit topology has not been used by teams in the past, we wanted to verify that the circuit would work before moving toward more permanent connections.

Initially we were unsuccessful in firing the triac using our control circuit. The problem was that we had not carefully noted the pin assignments of the triac and had not wired the control signal to the gate pin. Additionally, although the triac is a bipolar device, the gate is tied to one side of the triac, so it does matter which of the main triac legs is connected to ground and which is connected to the incoming line. We had reversed that connection, which also led to a failure to fire the triac. Once the triac connections were made correctly, the control circuit fired the triac as designed.

Figure 1 shows oscillography recorded from an intial test with a large resistive load intended to be gentle on the circuit but prove whether the design would work for voltage control or not.

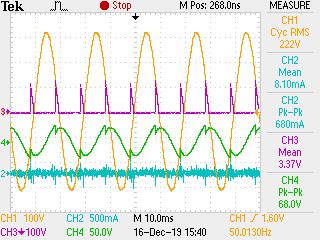


Figure 1: *Small Resistive Load Testing: Minimum Output Voltage*

In Figure 1, we can see that the triac is firing appropriately each half cycle and that a minimal output voltage was able to be obtained.

Next we increased the output voltage by adjusting the potentiometer resistance.

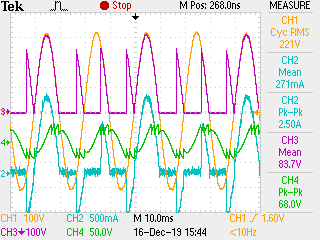
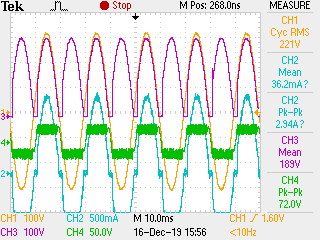


Figure 2: *Small Resistive Load Testing: Medium Output Voltage*



*Figure 3: Small Resistive Load Testing: Maximum Output Voltage*

Although it was somewhat visible in the minimum voltage control voltage waveform, it becomes more evident in the medium output voltage and maximum output voltage waveforms that there is some oscillation or ringing in the control circuit around the point of maximum voltage where the diac breaks over to fire the diac.

## Resistive Load Testing in the Machines Lab

Describe our tests using the resistive load bank in the machines lab.

Include oscilloscope and thermal camera shots.

## Motor Load Testing without Mechanical Load

Include oscillscope and thermal camera shots.

# **Demo Day**

How did demo day go for us? Was there anything we learned from our experience of demo day?

Include oscilloscope and thermal camera shots.