

Design Objective

This lab was designed to teach the students what happens to resistors when too much power is put through them. It was also designed for the students to learn about why resistors can only handle so much power and what the result of ruining a resistor is.

Equipment

- Resistors
 - 1500 Ω
 - 620 Ω
 - 300 Ω
 - 82 Ω
 - 75 Ω
 - 62 Ω
 - 51 Ω
 - 47 Ω
 - 33 Ω
 - 27 Ω
 - 15 Ω
- Power source
- Digital Multi-Meter (DMM)

Procedure

- Tested Resistor for actual value of R
- Setup circuit
- Turned on power source at highest possible current setting
- Timed how long the resistor burned for
- Recorded data
- Repeated for each resistor

Data

Table 1. Values Recorded and Calculated from the experiment.

VALUES							% err			
T R	real R	Burn Time	T A	Real A	T power	Real power	R	power	I	V
1500	1488	0	0.02	0.02	0.6	0.6	80.00%	0.00%	0.00%	0.00%
620	616	0	0.05	0.05	1.45	1.45	64.52%	0.00%	0.00%	0.00%
300	297.4	1:08 AM	0.1	0.1	3	3	86.67%	0.00%	0.00%	0.00%
82	80.77	12:06 AM	0.37	0.37	10.98	11.1	150.00%	109.29%	0.00%	0.00%
75	74.6	00:04.500	0.4	0.44	12	13.2	53.33%	1,000.00%	1,000.00%	0.00%
62	62.12	00:04.400	0.48	0.52	14.52	15.6	19.35%	743.80%	833.33%	0.00%
51	51	00:08.100	0.59	0.6	17.65	18	0.00%	198.30%	169.49%	0.00%
47	46.28	12:02 AM	0.64	0.74	19.158	22	153.19%	1,483.45%	1,562.50%	0.00%
33	32.88	00:03.700	0.91	1	27.27	30	36.36%	1,001.10%	989.01%	0.00%
27	26.91	00:01.900	1.11	1.2	33.33	36	33.33%	801.08%	810.81%	0.00%
15	15.01	00:08.100	2	2.18	60	65.4	6.67%	900.00%	900.00%	0.00%

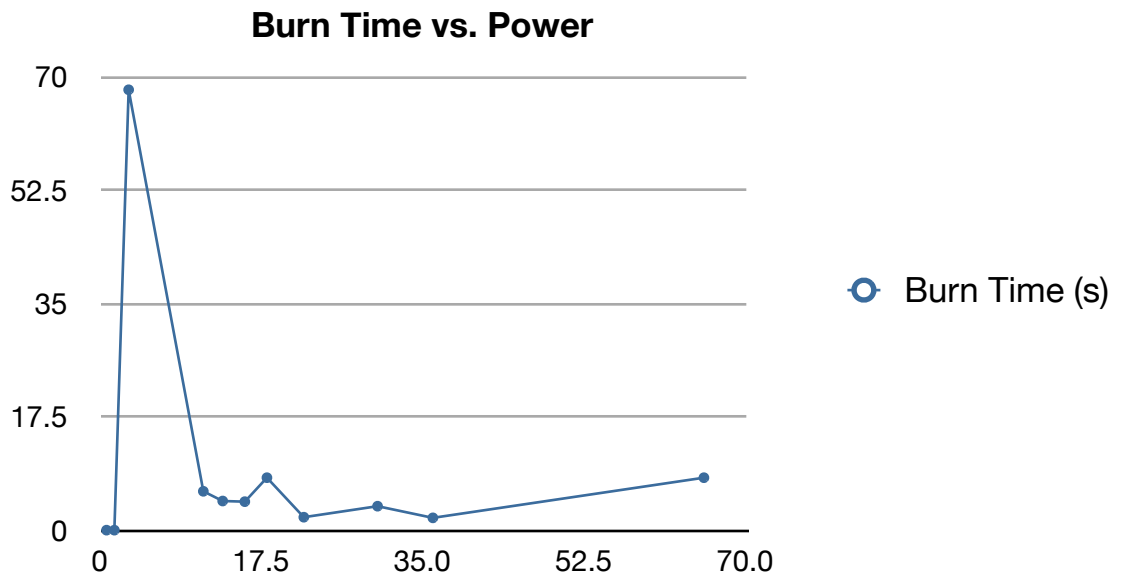


Figure 1. Scatter plot showing the Burn time of the resistor compared to the power delivered to the resistor

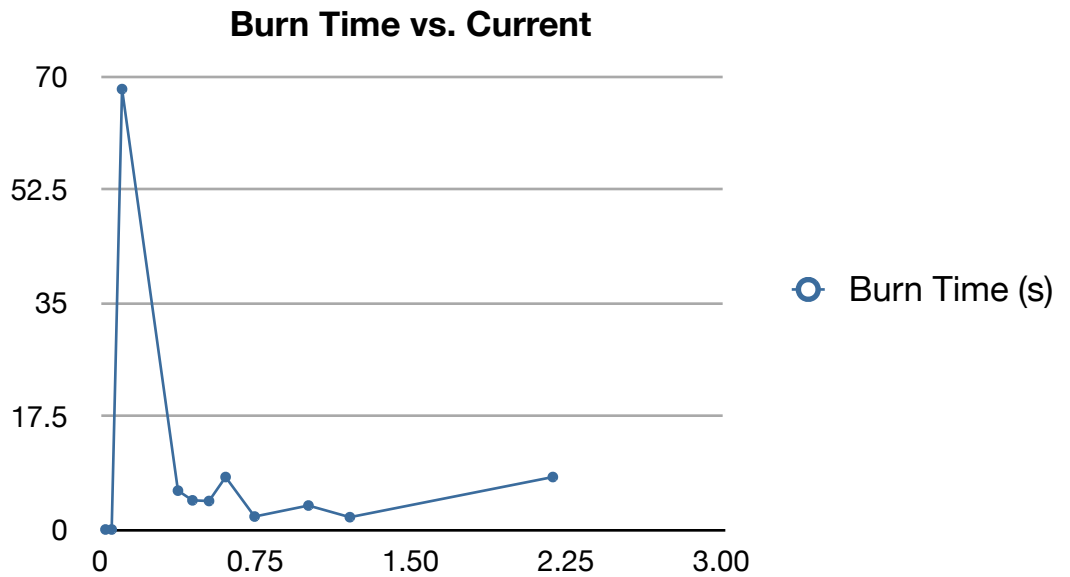


Figure 2. Scatter plot showing the Burn time of the resistor compared to the current across the resistor.

Discussion

The way that the resistors behaved when they were being tested was not initially expected. The general thought going into the experiment was that the lower the R value the longer the burn time. However both plots show that the R values and their burn times tended to follow a general bell curve. This is due to Ohms law, $V=IR$, As one of the variables increase the other two should remain constant, however due to the limited resources of the power supply, they do not. So as R increases, V and I both end up decreasing which makes the time go down. But as R decreases after a certain point there is not enough resistance to keep I from growing, which makes the burn time go down because the resistor cannot handle that much current through it, and the current is actually higher than what would be expected.

Conclusion

Overall this lab was very intriguing and informative. It was really easy to follow, the instructions were very straight forward. If in the future you can get your hands on a larger power supply I think that it would be interesting to see how much current it takes to ruin one of the really small resistors, after you've hooked it up to a power source that ruined other small resistors, but did not ruin that one. It would be really interesting to show the Ω value before and after it is hooked up to each power supply. Other than that this was a great lab.

Lab 6
Ruining Resistors
October 8th, 2012
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EE 222-010