

2.3.1: Series and Parallel Resistances and Circuit Reduction

Overview:

In this lab, we will examine resistance networks consisting of resistors in series and parallel. We will measure the equivalent resistance of the resistance network and comparing the measured results to analytical expectations. DMMs will be used to measure the voltage and current across individual resistors within series and parallel combinations of resistors; the experimental measurements will be compared to analytical expectations based on the governing equations for voltage and current dividers.

Before beginning this lab, you should be able to:

- State Ohm's law
- Determine the equivalent resistance of series and parallel resistive networks
- State the voltage divider and current divider formulae
- Use a digital multimeter to measure resistance, voltage, and current
- Use the Analog Discovery's waveform generator to apply constant voltages
- Use the Analog Discovery voltmeter to measure a constant voltage
- Use color codes on resistors to determine the resistor's nominal resistance

After completing this lab, you should be able to:

- Measure the equivalent resistance of a resistive network
- Measure the voltage and/or current in a resistor in a series or parallel resistance combination

This lab exercise requires:

- Analog Discovery module
- Diligent Analog Parts Kit
- Digital multimeter (optional)

Symbol Key:

DEMO	Demonstrate circuit operation to teaching assistant; teaching assistant should initial lab notebook and grade sheet, indicating that circuit operation is acceptable.
ANALYSIS	Analysis; include principle results of analysis in laboratory report.
SIM	Numerical simulation (using PSPICE or MATLAB as indicated); include results of MATLAB numerical analysis and/or simulation in laboratory report.
DATA	Record data in your lab notebook.

General Discussion:

This portion of the lab assignment concerns the circuit shown in Figure 1 below. A power supply is used to apply the 5V voltage difference. We wish to determine the power dissipated by the 1K Ω resistor.

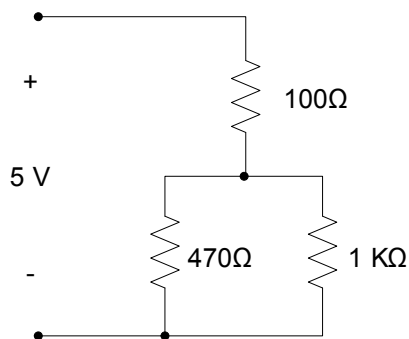


Figure 1. Circuit schematic.

Pre-lab:

ANALYSIS	Analyze the circuit of Figure 1 to estimate the power dissipated by the 1K Ω resistor.
-----------------	---

Lab Procedures:

- | | |
|-------------|--|
| DATA | 1. Construct the circuit of Figure 1; measure and record all actual resistance values. Measure the parameters necessary to determine the power dissipated by the 1K Ω resistor. Determine the power dissipated by the 1K Ω resistor. Compare the measured power with your estimate from the pre-lab. Comment on any differences between the estimated and measured values. |
| DEMO | 2. Demonstrate operation of your circuit to the Teaching Assistant. Have the TA initial the appropriate page(s) of your lab notebook and the lab checklist. |