1 Objective

The goal of this lab is to gain more experience using a multimeter while exploring some of the properties of a linear voltage regulator. In it we use a multimeter to measure node and differential voltage. Then we break the circuit to measure current. Finally simulate the circuit using OrCad and compare our measured results to the simulation.

2 Equipment

- Agilent 34410A Multimeter
- Agilent E354xA Dual Output Power Supply
- 78L05 Linear Voltage Regulator
- 1k Resistor
- 1u Capacitor
- Prototyping Board

3 Setup

The circuit used in this lab is shown in figure 1.

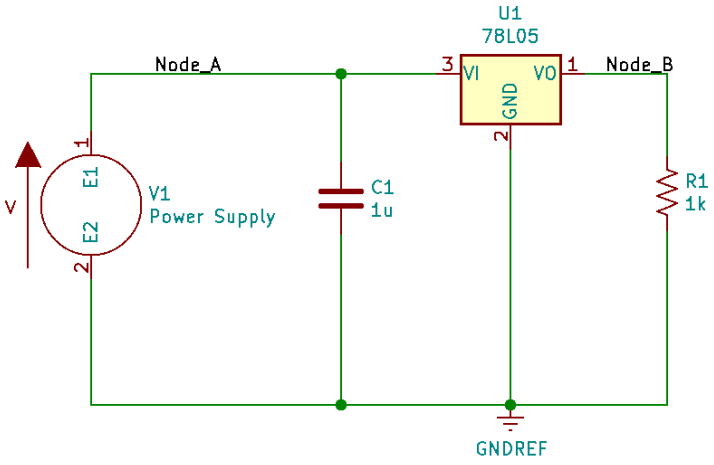

Figure 1: Schematic

4 Observations and Results

Measured Node Voltage V_A (V)	**Measured Node Voltage V_B** (V)	**Measured Differential Voltage V_{AB}** (V)	**Measured Current Through 1 kΩ** (mA)	**Calculated Differential Voltage $V_A - V_B$** (V)	**Calculated Resistance** (Ω)
1.5	0.00020238	1.474	0.0015	1.5	134.92
2.0	0.669	1.329	0.661	1.331	1012.103
2.5	1.189	1.396	1.028	1.311	1156.615
3.0	1.611	1.380	1.589	1.389	1013.845
3.5	2.096	1.433	2.065	1.404	1015.012
4.0	2.583	1.439	2.545	1.417	1014.931
4.5	3.072	1.455	3.026	1.428	1015.202
5.0	3.563	1.470	3.510	1.437	1015.1
5.5	4.0563	1.531	3.993	1.444	1015.853
6.0	4.53	1.466	4.470	1.47	1013.423
6.5	4.924	1.574	4.860	1.576	1013.169
7.0	5.067	1.917	5.000	1.933	1013.4
7.5	5.069	2.435	5.014	2.431	1010.969
8.0	5.07	2.981	5.037	2.93	1006.552
8.5	5.066	3.316	5.058	3.434	1001.582
9.0	5.069	3.914	5.060	3.931	1001.778

Table 1: Displays the measured node and differential voltages, and current, as well as calculated differential voltage and resistance.

To calculate the differential voltage we use the following equation.

$$V_{AB} = V_A - V_B \tag{1}$$

To calculate the expected resistance we use Ohm's Law, equation (2).

$$R = \frac{V_B}{I} \tag{2}$$

Note that current is measured in mA so first we must convert it to amps to get our result in ohms.

5 Conclusion

5.1 Sources of Error

- Temperature is not controlled for.

6 References

[1] Denise Thorsen, Maher Al-Badri, INTRODUCTION TO ELECTRICAL AND COMPUTER ENGINEERING, University of Alaska Fairbanks, 2022.