

# 1 Objective

The objective of the lab is to utilize the Thevenin and Norton methods to calculate the current and voltage across any one of several resistors in a circuit and verify the calculated values by measuring the values in the circuits [1].

## 2 Equipment Used

- Digital Multimeter
- DC Power Supply
- Resistors:  $1.2k\Omega$ ,  $3.3k\Omega$ ,  $10k\Omega$

## 3 Experiment Setup

To find the calculated values complete this procedure

1. Remove the load resistor based off the model in Figure 9-1.

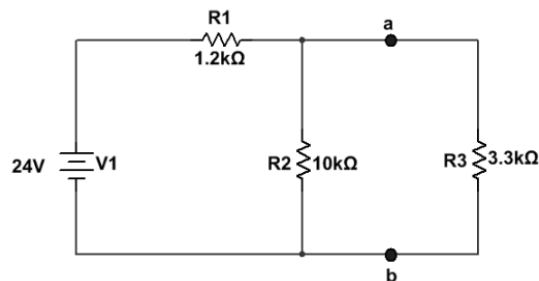


Figure 9-1: Circuit for Thevenin and Norton Analysis [1]

2. Calculate the thevenin voltage by calculating the voltage across the resistor in parallel with the open terminals.
3. Calculate the resistance by removing current and voltage sources and replacing them with open and short circuits then calculate the equivalent resistance.
4. For Norton equivalent repeat step 3 to calculate the resistance.
5. To calculate norton current short the terminals and and calculate the current in the circuit.

Lab Procedure for measurements

1. Construct the circuit in Figure 9-1 and measure the current in R3.
2. Remove R3 and measure the voltage across the terminals.
3. Reconnect R3 then measure the voltage and current in R3.
4. Build the circuit in figure 9-4 and measure the Norton Current

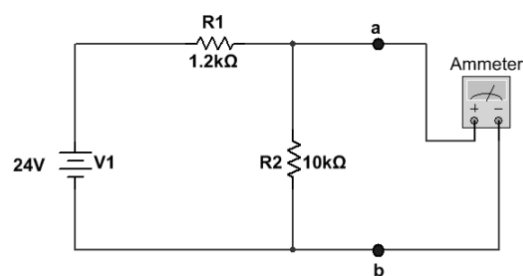


Figure 9-2: Circuit for Norton Analysis with R3 replaced by an Ammeter [1]

5. Change the Ammeter with Ohmmeter and short the voltage source to measure the Norton resistance.

## 4 Results

**Table 9-1: Calculated Voltage and Current for Resistor R3 [1]**

	Thevenin Equivalent	Norton Equivalent
$I_{R3}$	4.9 mA	4.9 mA
$V_{R3}$	16.17 V	16.17 V

**Table 9-2: Measured Thevenin and Norton Equivalents [1]**

Thevenin Equivalent		Norton Equivalent	
$v_{TH}$	21.43 V	$i_N$	18.3 mA
$R_{TH}$	$1.056k\Omega$	$R_N$	$1.056k\Omega$

**Table 9-3: Measured Voltage and Current for Resistor R3 [1]**

	Figure 9-3	Thevenin Equivalent	Norton Equivalent
$I_{R3}$	4.961 mA	4.961 mA	4.596 mA
$V_{R3}$	16.19 V	16.18 V	15 V

## 5 Conclusion

Thevenin and Norton equivalent circuits are way to reduce circuits to a simpler form that makes finding current though, voltage in, and resistance in a circuit. The Norton Current and Thevenin Voltage will be the values across the load resistor. Norton Resistance equals Thevenin Resistance and the Thevenin Voltage is equal to the Thevenin Resistance times the Norton Current.

## References

- [1] UNCC ECE Department. Thevenin and norton equivalent circuits, 2023. [Online; accessed 17 November 2023].