

# Circuit & Electronics

REPORT  
BY  
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## AIM OF EXPERIMENT

The aim of the experiment is to construct an electronic circuit on a breadboard with at least five meshes and ten resistors and find the voltages and current across and through some of the resistors respectively.

## METHODOLOGY

To achieve this task, the following procedure was considered;

1. The diagram of the circuit design was drawn in the LT Spice software and ran on a laptop and the reading for the current and voltages were taken.
2. Ten resistors with known resistors were taken from the analog kit and were connected in series and parallel to form seven meshes.
3. A side of the first mesh was connected to a voltage source and that was source provided by the waveform software.
4. The circuit was also grounded to serve as a reference point in the electrical **circuit** from which voltages are measured.
5. The voltmeter was then used to measure the voltages and current across and through the resistors respectively.
6. The result obtained were then analyzed and compared to the data produced by the LT Spice software.

## APPARATUS USED

Resistors, breadboard, conducting wires, analog discovery waveform, LT Spice software, laptop and a voltmeter.

## DIAGRAM OF THE LT SPICE CIRCUIT DESIGN

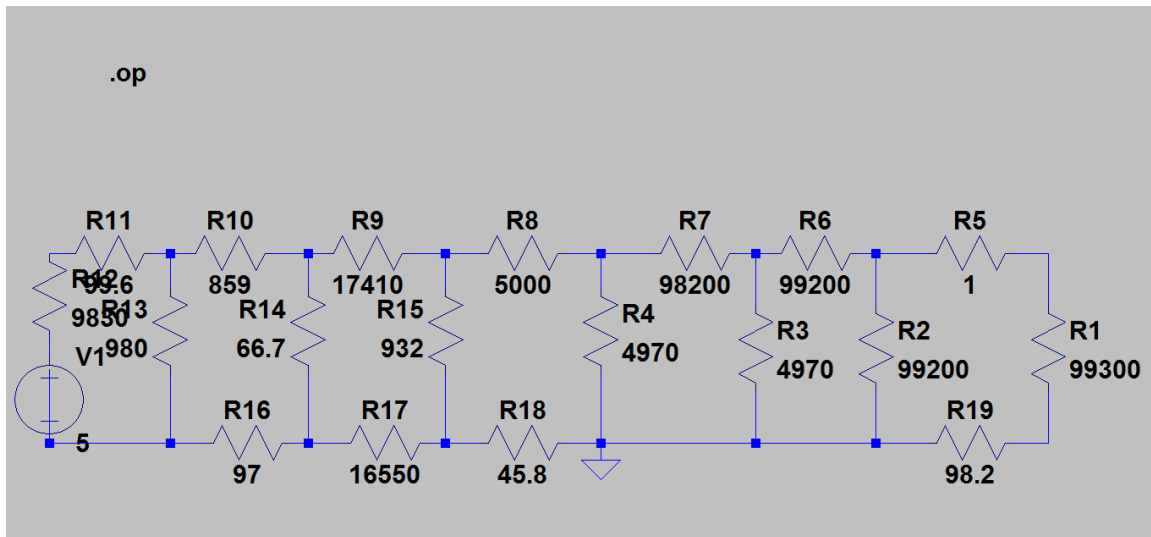


Figure 1. The diagram above shows the circuit designed using LT spice software

## RESULT AND ANALYSIS.

The following are the results obtained from the LT spice run command.

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--- Operating Point ---

V(n008):      2.88027e-006  voltage
V(n013):      2.84555e-009  voltage
V(n007):      2.8803e-006   voltage
V(n006):      8.63513e-006  voltage
V(n005):      0.00018495    voltage
V(n004):      0.000379993   voltage
V(n003):      0.00819087    voltage
V(n002):      0.20971       voltage
V(n001):      0.257457      voltage
V(n010):      -0.0301828    voltage
V(n011):      -0.00742683   voltage
V(n012):      -1.7866       voltage
V(n009):      4.96982       voltage
I(R12):      -0.000479386   device current
I(R19):      -2.89771e-011  device current
I(R18):      -3.90087e-008   device current
I(R17):      -4.48643e-007   device current
I(R16):      -0.000234597   device current
I(R15):      -4.09635e-007   device current
I(R14):      -0.000234149   device current
I(R13):      -0.000244788   device current
I(R11):      -0.000479386   device current
I(R10):      -0.000234597   device current

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I (R9) :      -4.48643e-007  device_current
I (R8) :      -3.90087e-008  device_current
I (R7) :      -1.79546e-009  device_current
I (R6) :      -5.80124e-011  device_current
I (R5) :      -2.89771e-011  device_current
I (R4) :       3.72132e-008  device_current
I (R3) :       1.73745e-009  device_current
I (R2) :       2.90353e-011  device_current
I (R1) :       2.89771e-011  device_current
I (V1) :      -0.000479386  device_current

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### COMPARISON WITH VOLTMETER

The voltage across R14 (R14 N011 N003), R15(R15 N012 N004) AND R10 (R10 N003 N002) were 0.008V, -1.78 and -0.007V respectively. The other voltages that had -0.000 and +0.000 were assumed to have had a lot of decimal places, hence the voltmeter could not display.

Finding the current with the voltmeter was very tedious because we encountered a lot of -0.000 and +0.000 so we had to use the Ohms' Law. The voltages obtained were divided by the value of the resistors.

Calculation:

$$I_{R14} = \frac{0.008V}{4970\Omega} = 1.61 \times 10^{-6}A = 1.6\mu A$$

$$I_{R15} = \frac{-1.7866V}{99200\Omega} = -1.80 \times 10^{-5}A = -18\mu A$$

$$I_{R10} = \frac{-0.007V}{5000\Omega} = 1.4 \times 10^{-6}A = 1.4\mu A$$

## CONCLUSION AND LESSON LEARNED

With regard to the information gathered and compared, the LT spice provides a convenient way to evaluate a circuit, but can also be detrimental if not experimented physically with the circuit component. I obtained similar values for the voltages and currents of some resistors. I also learned that one needs to be careful and watchful when using the voltmeter to measure current and voltage of the resistors. The tip of the voltmeter pins should touch either the holes in which the resistor enter the breadboard or touch the metal pin of the resistor connected. One should connect the red and black pin of the voltmeter to the Voltage(V) and COM respectively. For current, the Current(A) and COM are required. I think the tests did go smoothly and I had no problems, except for the fact that the voltmeter could not display all the values for the voltages and current due to its four-digit display. It was a very insightful experiment done by me and much has been learned.