Lab#1 General DC Circuits

This lab covers the general DC circuits. In addition to KCL, KVL and absorption power, this lab also covers the concepts of a reference node and using voltage division to design the circuit in Figs (2.2 and 2.4)

Multisim

Please follow the steps below to setup the simulation environment and build your circuits

1. Setting up simulation environment
   - Simulate -> Analyses and simulation
   - Select “Interactive Simulation”, then “Save”
2. Place component on the circuit board to build your circuit
   - Place -> Components
   - Change Database to Master Database
   - Change Group to <All Groups>
   - Change Family to <All families>
   - Type RESISTOR_RATED under Component, then click OK to place it on the board

   Repeat the steps above to place all components for your circuits

Circuit	Resistor	Power	GROUND (Reference Node)
Fig (2.1) Use **Agilent multimeter** to measure **voltage** across the 10 kΩ	4 RESISTOR_RATED	DC_INTERACTIVE_VOLTAGE Set: - Maximum Value: 50 V - Increment: 1 % DC_POWER	1
Fig. (2.3)	4 RESISTOR_RATED	DC_POWER	0
Fig. (2.4) Use **Agilent multimeter** to measure the **current**	1 RESISTOR_RATED 1 Variable Resistor (decade resistance box) Set: - (R): 100 kΩ - Increment: 0.1%	DC_POWER	1 (optional)

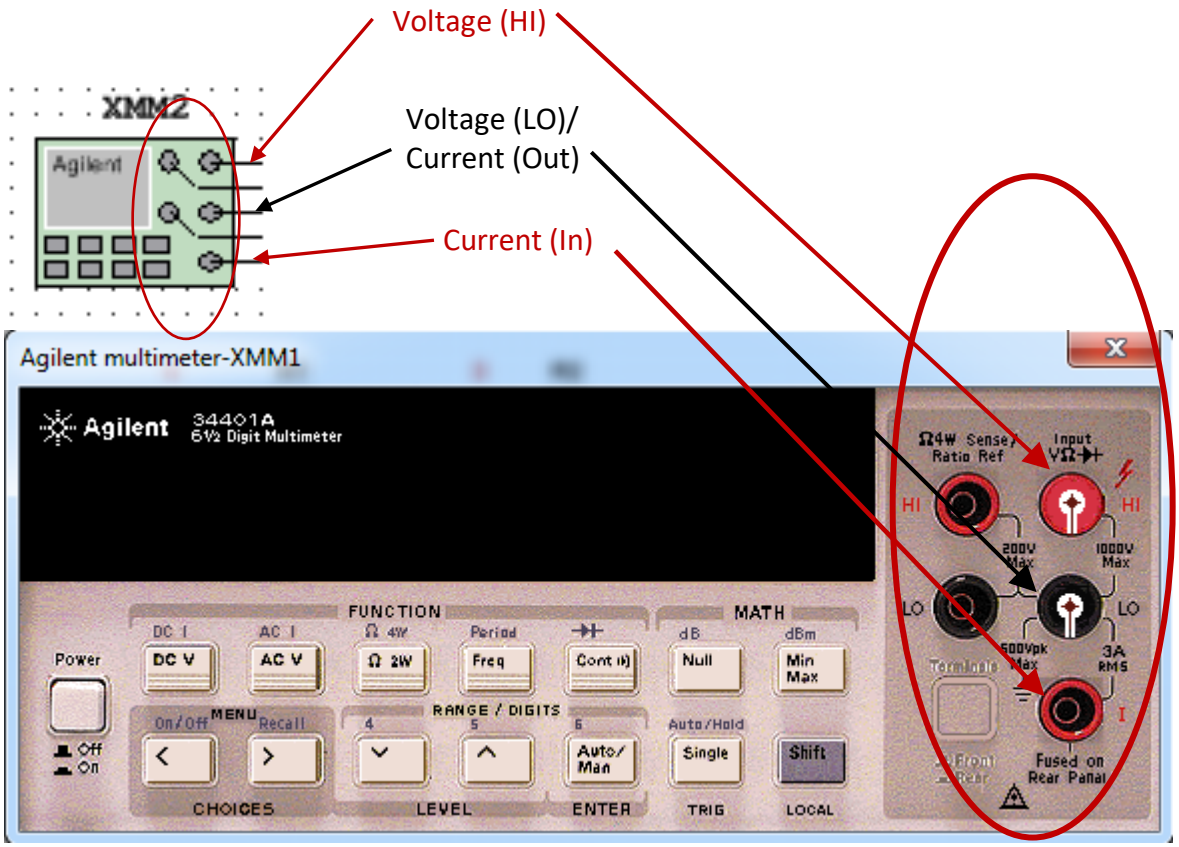
NOTE: Double click the component to change it value.

3. Placing
   a. Multimeters (First instrument icon on the top right)
   - Alternatively,

- Simulate -> Instruments -> Multimeter

b. Agilent multimeter (Fourth instrument icon from the bottom right)

- Alternatively,
  - Simulate -> Instruments -> Agilent multimeter



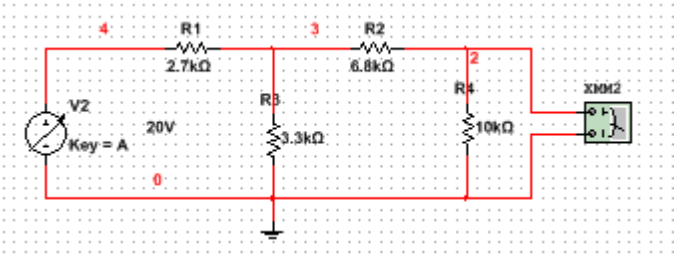
To do the measurement:

- Press the Power button to turn of the Agilent Multimeter
- Press DC V to measure DC Voltage
- Or, press Shift + DC V to measure DC Current (DC I)

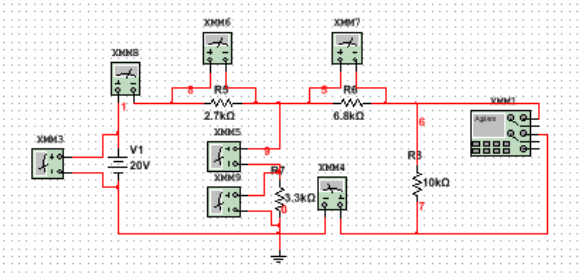
Lab Procedure

Part I - Fig (2.1)

Use a DC_INTERACTIVE_VOLTAGE and a multimeter to determine the value of the DC voltage source to be use in your circuit



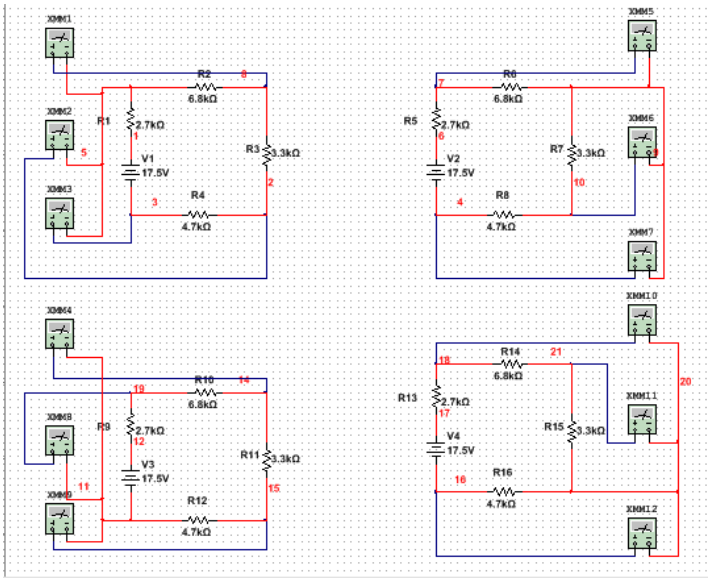
Once you have found the DC voltage value, use Agilent multimeter to measure the voltage across the 10 kΩ resistor. The rest of the current and voltage measurement can be done with a multimeter as shown below.



Part II - Fig (2.3)

Instead of using ground, use one of the nodes (a), (b), (c), or (d) as your reference node. You are going to measure the voltage with respect to your reference node. If node (a) if your reference node, you will measure V_b voltage difference between (b)-(a). This means connect the -ve pin of the multimeter is at your reference point and measure the voltage at the other nodes

Ref. Node = (a)



Ref. Node = (b)

Ref. Node = (d)

Ref. Node = (c)

Part III – Fig (2.4)
The circuit is designed to allow current to flow in the range of 0-5mA with V_{R2} = 5V for the 15V source. This means V_{R1} =10V and R1=2xR2. The maximum current is limited to 5mA and is only possible is R2 is shorted by 0Ω, then R1 = 15V/5mA = 3 kΩ and R2 = 1/2xR1 = 1.5 kΩ.

You will learn to use Agilent multimeter to measure the current as below: