



## Objectives

1. The student will learn how to use a Digital Multimeter (DMM).
2. The student will use the DMM for basic measurements like Voltage, Current, Resistance, Diode, and Continuity.

## Apparatus

- Experiments Board (Simple-2)
- 1xAA Battery Holder w/AA battery
- 2xAA Battery Holder w/AA batteries
- DMM
- Jumpers
- Resistors

## Procedure and Conclusions:

**Note:** Turn the DMM on if it has a separate power switch.

### Continuity Testing:

1. Turn the DMM selection dial to the continuity mode, touch the two test probes together, watch the change in the DMM reading, do you hear a sound?
  - When you touch the two test probes together, the DMM reading becomes ....., and

- you hear ..... from the DMM.
2. Insert the DMM probes at the points (2) and (5) on the Experiment board, watch the DMM reading.
  3. Insert a jumper at the pair (E), watch the change in the DMM reading, do you hear a beep from the DMM?
  4. Take the probe off the point (5) and insert it at the point (6) while watching the DMM reading, do you still hear the beep?
  5. Insert a jumper at the pair (F) and see what happens to the reading, now do you hear a beep from the DMM?
    - When we put a jumper at the pair (E) we ... **short / open ...** the path between the points (2) and (5).
    - The DMM will beep if there is a ... **continuity / discontinuity ...** between its two probes.

### **DMM as a Voltmeter:**

1. Turn the DMM selection dial to DCV mode (200m), in this case DMM measures the voltage between 0-200 mV (0-0.2 volt), notice that the DMM reading is almost zero.

2. Connect 1xAA Battery Holder to the pair (D).
3. Insert the DMM probes at the points (1) and (4), this will give the reading “1” on the DMM, this reading indicates that the voltage is higher than the range that you have selected.
4. Turn the DMM selection dial to the next DCV range (2000m), in this case you can measure the voltage between 0 and 2000 mV (0-2 volt), watch the DMM reading, this reading is the voltage difference between the two points (1) and (4) in mV, in this case the measurement accuracy is 1 mV (0.001 volt).
  - The voltage difference you measured between the two points (1) and (4) is ..... mV, which equals to ..... Volt, this is the voltage difference between battery terminals.
5. Turn the DMM selection dial to the next DCV range (20V), this range measures voltage between 0 and 20 volt, watch the DMM reading, this reading is the voltage difference between the two points (1) and (4) in volts, in this case the measurement accuracy is 0.01 volt.
  - In this case, the voltage difference you measured between the two points (1) and (4) (between battery terminals) is ..... volt.
6. Turn the DMM selection dial to the next DCV range (200V), this range measures

voltage between 0 and 200 volt, watch the DMM reading, this reading is the voltage difference between the two points (1) and (4) in volts, in this case the measurement accuracy is 0.1 volt.

7. Connect 3 volt using the 2xAA Battery Holder instead of 1xAA Battery Holder to the pair (D), watch the Voltmeter reading, this reading is the voltage for the two batteries placed in the battery holder.
  - The voltage you measured for two batteries is .....volt.
  - In this case, the measurement accuracy is ..... volt, you might get more accurate reading by turning the DMM selection dial to the range .....

### **DMM as an Ohmmeter:**

1. Turn the DMM selection dial to the Ohms mode (range 200) which measures resistance between 0 and 200 $\Omega$ .
2. Insert the DMM probes at the points (1) and (4) on the Experiment board.
3. Insert resistor 330 $\Omega$  at pair (D), this will give the reading “1” on the DMM, this reading indicates that the measured resistance is larger than the range you have selected.
4. Turn the DMM selection dial to the range (2000), which measures a resistance

- between 0 and  $2000\Omega$ , watch the Ohmmeter new reading, this reading is the measured value of the resistance in  $\Omega$ , in this case the reading accuracy is  $1\Omega$ .
- In this case, the measured value of the resistance is  $\dots\Omega$ .
5. Turn the DMM selection dial to the range (20K), which measures a resistance between 0 and  $20K\Omega$ , watch the Ohmmeter reading, this reading is the measured value of the resistance in  $K\Omega$ . In this case the reading accuracy is  $0.01\Omega$ .
  6. Choose another resistor and insert it at the pair (D) instead of the resistor  $330\Omega$ , turn the DMM selection dial at the maximum range (2000K), then move the dial to the lower range until you get a reading for the resistor, move again the dial to lower range to get more accurate value.
    - The resistors that you measured are:
      - Resistor 1: band colors are ....., measured value is .....  $\Omega$ .
      - Resistor 2: band colors are ....., measured value is .....  $\Omega$ .
  7. Insert the unknown resistor available in the kit at the pair (D) and try to know its value and obtain the best accuracy.
    - The measured value of the unknown resistor is .....  $\Omega$ .