

Experiment No. (4) Digital Multimeter (DMM)



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:

- | | | |
|------------------------------|--------------------|-----------|
| • Basics Board | • Connection Wires | • DMM |
| • Voltage Source (PSB Board) | • Fixed Resistors | • Jumpers |

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 (1) and (12) on the Basics board, watch the DMM reading.
3. Insert a jumper at the pair (J), watch the change in the DMM reading, do

you hear a beep from the DMM?

4. Take the probe off the point (12) and insert it at the point (11) while watching the DMM reading, do you still hear the beep?
5. Insert another jumper at the pair (I) and see what happens to the reading, now do you hear a beep from the DMM?
 - When we put a jumper at the pairs (J) & (I) we ... short / open ... the path between the points (1) and (11).
 - 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 (2000m), in this case DMM measures the voltage between 0-2000 mV (0-2 volt), notice that the DMM reading is almost zero.
2. Connect (3 volt) from PSB board to the pair (J) using a connection wire.
3. Insert the DMM probes at the points (1) and (12), 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 (20) - in this case you can measure the voltage between 0 and 20V (0-20 volt) – and watch the DMM reading, this reading is the voltage difference between the two points (1) and (12) 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 (12) (battery terminals) is mV which equals to Volt.
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 (12) 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 (12) (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 (12) in volts, in this case the measurement accuracy is 0.1 volt.
 7. Take the connection wire off the outlet socket 1.5V on the PSB and insert it at the outlet socket 3 Volt, watch the Voltmeter reading; this reading is the voltage for this outlet.
 - The voltage you measured for the second outlet isvolt.
 - 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. Take the connection wire off the pair (J).
2. Turn the DMM selection dial to the Ohms mode (range 200) which measures resistance between 0 and 200Ω . Insert its probes at points (1) & (12).
3. Insert resistor 330Ω at pair (J), 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 2000Ω - watch the Ohmmeter new reading, this reading is the measured value of the resistance in Ω , in this case the reading accuracy is 1Ω .
 - In this case, the measured value of the resistance is ... Ω .
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 0.01Ω .

6. Insert another resistor at the pair (J) instead of the resistor 330Ω , 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 Ω .

Resistor 2: band colors are, measured value is Ω .

8. Insert the unknown resistor available in the kit at the pair (J) and try to know its value and obtain the best accuracy.

- The measured value of the unknown resistor is Ω .