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| UI- Evaluation | April 26  2014 | |
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# Contents

# Description of the test object:

My device of choice is a standard Multimeter. Multimeter is an electronic measurement device that combines several measurement functions in one unit. A typical multimeter would include basic features such as the ability to measure voltage, current resistance and continuity of circuits.  They are used to troubleshoot electrical problems in a wide array of industrial and household appliances.

Multimeter comes in two types i.e. Analog and Digital ones. Analog multimeters comes with pointer which moves over a scale calibrated for all the different measurements that can be made.  Digital multimeters display the measured value in numerals. Digital multimeters are now far more common than analog ones.

Every multimeter comes with a display (digital display in case of digital or analog pointer for analog multimeter), a red probe and a black probe. Red probe can be considered as positive and black probe to be negative.

Multimeter has a selector switch or a knob though which users can adjust the settings depending on what they intend to do.

# Typical usage scenarios

Typical usage scenarios of Multimeter are voltmeter, ohmmeter, ammeter as describe below.

## Multimeter as voltmeter

Multimeter can be used as a voltmeter for measuring potential difference between two electrical points. Device can measure either the AC or DC voltage flowing through a circuit. Voltage is a difference in potential energy between the two points. To test any appliances, the users must initially have to choose either AC or DC.

## Multimeter as Ohmmeter

Multimeter can be used as ohmmeter. Device finds the resistance in a circuit, which is given in ohms. A user can find the resistance at any point in a live circuit or battery source then putting in an approximate range he or she expects to contain the number of ohms.

## Multimeter as Ammeter:

Multimeter can be used as ammeter. Device measures current flowing through a closed circuit by interrupting that circuit. Device needs to be connected in series, which means that all the circuit's current will flow through the multimeters circuit. The user will still need to select the range in which he or she expects the current to fall. This feature is used less often than the others, so some multimeters do not measure current at all.

## Multimeter to test continuty

# Test procedure description

I have considered two use cases for the UI evaluation.

1. Measuring potential difference across two points using multimeter.
2. Measuring resistance across two points using multimeter.

## Use case 1: DC Voltage measurement using multimeter

Test case demands measuring voltage difference between two terminals in a standard battery with multimeter and equipment to be used are multimeter, black and red probe and a battery.

Multimeter needs to be switched on by moving the jack by operating the round knob present in the center of the multimeter. Black probe needs to be fixed to COM port. Black probe in the COM port is needed for all the test scenarios. Red probe shall be plugged into volts slot. This slot can be seen as clearly marked as “ V/” and is generally seen in the lower part of multimeter. It is often that red probe needs to be switched slots depending on the use case . Position of red probe differs when multimeter takes the role of voltmeter or ohmmeter and ampmeter. So a special attention needs to be paid while plugging in the red probe. Plugging into wrong slot can blow up fuses in multimeter.

Most important step in the test case is to adjust the knob to point to DC voltage setting .

DC voltage is marked as “V “ followed by horizontal line and three dashed line below it as shown in below picture. It is worth to note that certain multimeters come manual range settings in which case relevant range setting has to be set , usually of a AA battery it can be under 2 V.

Now we have two probes plugged in and multimeter ready for measuring volts and a working battery. Make a contact between the red probe to positive terminal of battery and black probe to negative end of battery. Display in the multimeter shows the potential difference between the terminals in volts.



Black probe slot

Red probe slot

Knob setting for measuring DC voltage.

Knob setting for measuring AC voltage.

## Use case 2: Resistance measurement using multimeter across the leads

Test case demands measuring resistance across two points in a circuit of arbitrary points .In general resistance is measured across any circuit components , resistors etc.

Terminals needed for measuring resistance across two points are a resistor or any other circuit for which the resistance has to be measured , multimeter and, black and red leads.

Multimeter needs to be switched on by moving the jack by operating the round knob present in the center of the multimeter. Black probe needs to be fixed to COM port. Black probe in the COM port is needed for all the test scenarios. Red probe shall be plugged into resistance slot. This slot can be seen as clearly marked as “ V/” and is generally seen in the lower part of multimeter. It is often that red probe needs to be switched slots depending on the use case . Position of red probe differs when multimeter takes the role of voltmeter or ohmmeter and ampmeter. So a special attention needs to be paid while plugging in the red probe. Plugging into wrong slot can blow up fuses in multimeter.

As discussed in precious test case , . It is worth to note that certain multimeters come manual range settings in which case relevant range setting has to be set. These values depend on the range of resistance for the circuit under test. If we are measuring resistance across the leads smallest available range should be good enough. Multimeter used in our case is manufavured by Fluke which is quite good and has auto range functionality.

The differentiating and most important step compared to previous test case is that knob has to be set to measure resistance. The two probes plugged in their relevant slots and multimeter ready for measuring resistance across a resistor.

Make a contact between the red probe to one end of the resistor and black lead to other end. Display in the multimeter shows the resistance across two points in the resistor whose valued depends on the resistance offered by resistor.



## Observations of the executions of the test case.

My choose my wife to use for this test and I kept taking notes on while she executes the test cases. Fortunately she claimed to have some idea on resistance , volts and current from her study days but not a vivid user of electrical measurement devices by any means. This does not mater for us as our target is just to execute the above discussed test cases and not to arrive at the best possible accuracy. It should be noted that I asked to speak loud what she thinks while operating the device which would help me to do less guess work for noting the observations. I here onwards would refer her as tester for our discussion .

Equipment offered : Fluke multimeter , a set of AA battery , a resistor with one kilo ohms and a pair of leads.

**Observation 1**: Initially tester spent time at turning the knob ruffling it too many times in an effort to get familiarity of the device and was keenly noticing the changes in the display. My guess is that the tester is trying to understand and read settings presented by the knob. It looked like tester is trying to gain familiarity with the device.

**Observation 2** : Tester tried recollecting her past knowledge of Volts/Ohms/AC/DC. Tester said that there are too many other options like Hold, preset, continuity etc. I guess tester is correct to an extent .It was the same feeling with me as well when I first time used the multimeter , too many buttons and choices are presented with out any clear markings.

**Observation 3:** Tester made sure that knob is set to off position before she started experiments. My guess was that tester is far too apprehensive with the device and making sure not to blow up or short circuit.

**Obesrvation 4:** Tester had the probes connected to correct slots with the red and black markings . Tester had no trouble at plugging in the black lead but for the red one tester tried to check other three

## Recommendation on how these problesms can be solved

## Learned from evaluation.

From the observation 2 , I guess she is correct to an extent as even first time I used multimeter I also have the same feeling that too many buttons and choices are presented with out any clear markings. This reminded me of the same feeling I had when I first time operated a similar multimeter device. I felt this during first time operation of the device and there after I was at ease and hadn’t looked twice or refered any manuals.

I feel this is one of the concepts that Don Norman had emphasized as a good design is one any user would not need help using the device second time.