



**BSc (Hons) in Computer Engineering
Laboratory Practical**

**Experiment #1 Hand on Experience on
Introduction to Measuring Instruments**

Name:	
Index No	
Intake	
Date	
Instructor Name and Signature:	
Comments	Grade

Objectives:

To make an electronic circuit on a breadboard, and implement it as a complete product using a dot board

Outcomes:

After completing this experiment, students would be able to:

- a) Understand essential functions in the instruments
- b) Explain the functions in Oscilloscope and the Signal Generator

Equipment Required:

A breadboard, A Digital Multimeter, A power supply, A signal generator, An oscilloscope, Wires, Resistors, Capacitors, Diode and Transistors.

Ex 02: Identify Connections on the experimental board (Breadboard)

A breadboard is a solderless/solder device for the temporary prototype with electronics and test circuit designs. Most electronic components can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate. The breadboard has strips of metal underneath the board and connects the holes on the top of the board. The top and bottom rows of holes are connected horizontally and split in the middle while the remaining holes are connected vertically as shown in Figure 01.

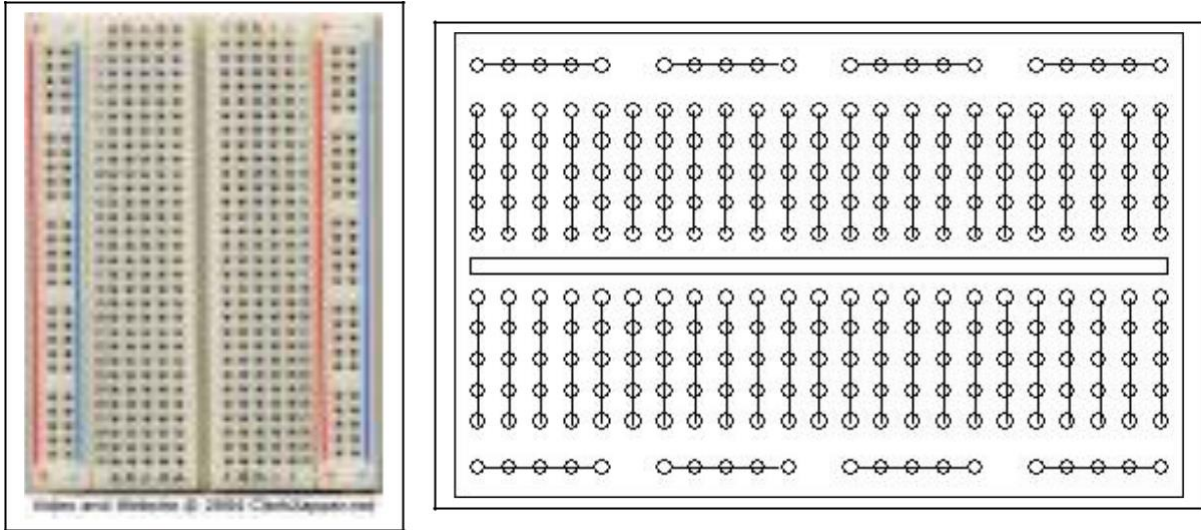


Figure 01: Internal connections of a breadboard

Use a multimeter and check your breadboard pin connections and make wires as required.

Ex 02: Measuring values with a Digital Multimeter

A multimeter is an electronic measuring instrument that combines several measurement functions in one unit. So, we can say that multimeter is a common multi-purpose instrument used to measure different electrical quantities in a circuit. A digital multimeter is shown in Figure 02.

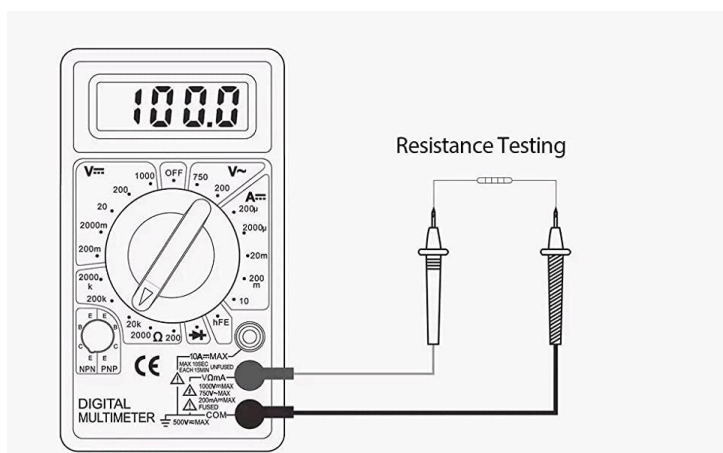


Figure 02: A Digital Multimeter

Steps

1. Check whether the multimeter is working properly by connecting the two terminals.
2. Measure the value for all given components.
3. Identify the transistor type (NPN/PNP).
4. Measure the voltage of the power supply.

Ex 03: Fix the power supply into your experimental board

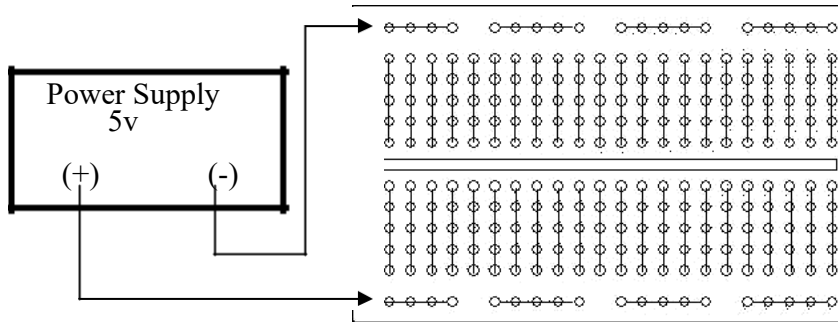


Figure 03: Connection between the power supply and breadboard

Steps

1. Connect your power source and the breadboard as shown above.
2. Measure the voltage of the power supply with the help of a multimeter.

Ex 04: Ohm's Law

Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points. Introducing the constant of proportionality, the resistance, one arrives at the usual mathematical equation that describes this relationship.

$$V = IR$$

01

I is the current through the conductor in units of amperes, V is the voltage measured across the conductor in units of volts, and R is the resistance of the conductor in units of ohms. More specifically, Ohm's law states that the R in this relation is constant, independent of the current. [1]

Case 01:

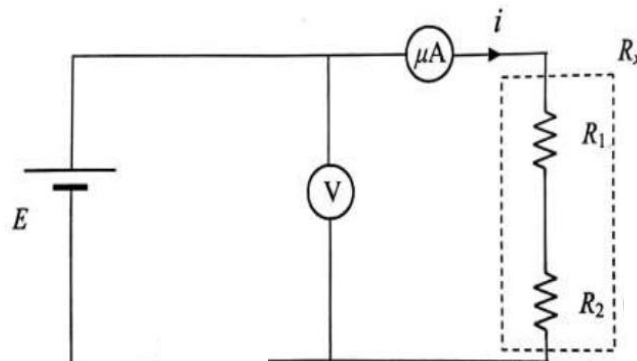


Figure 04: Resistors in Series

Case 02:

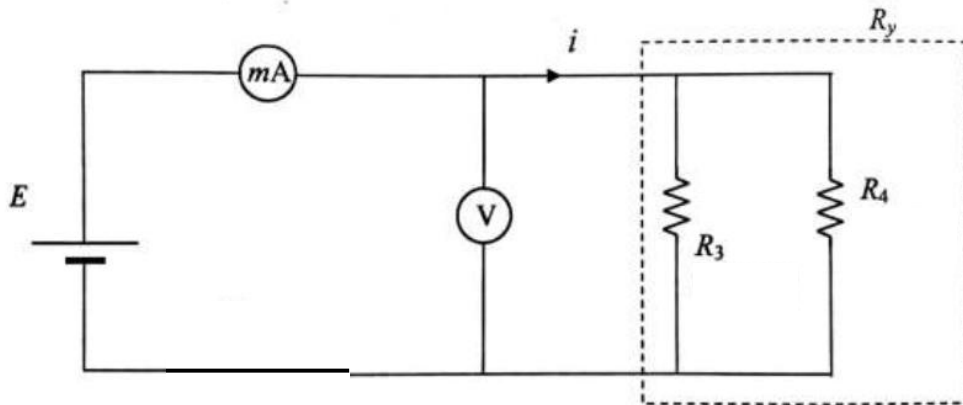


Figure 05: Resistors in Parallel

Steps

Design the circuit using the given components:

- Setup the circuit as shown in Figure 04.
- Set E is to 5V.
- Record value for R1, R2, and I.
- Verify the Ohm's Law.
- Repeat the above steps for Figure 05.
- Record values for R3, R4 and I, also verify Ohm's Law.

Ex 05: The Oscilloscope and Signal Generator

An oscilloscope is a laboratory instrument commonly used to display and analyze the waveform of electronic signals. In effect, the device draws a graph of the instantaneous signal voltage as a function of time.

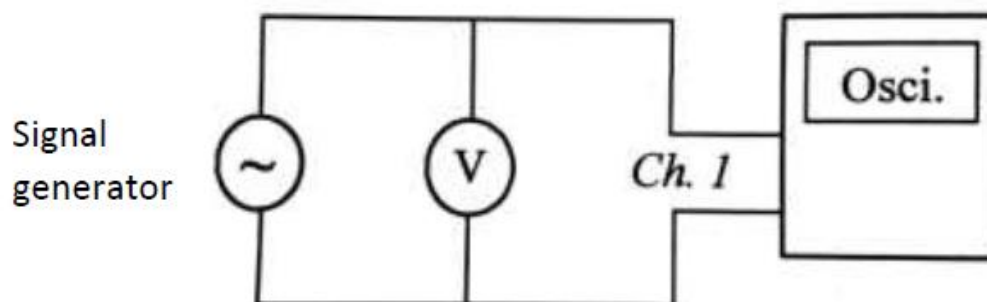


Figure 06: Connection between signal generator, voltmeter and oscilloscope

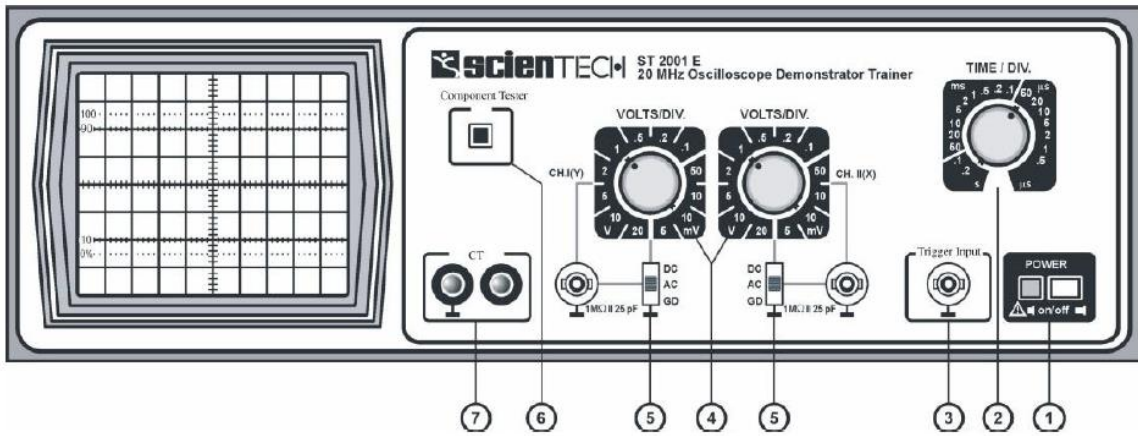


Figure 07: Front Panel of CRO

- (1) **Power ‘On/Off’:** Turns ‘On’ & ‘Off’. LED indicates power ‘On’. Use position & Int/Focus controls to get the beam. All are push buttons.
- (2) **Time / Div:** Rotary Switch for TB speed control.
- (3) **Trigger Input:** For feeding external trigger signal.
- (4) **Volts/Div:** For sensitivity selection of CH 1 & CH 2.
- (5) **DC-AC-Gnd:** Switch provided for Input coupling. BNC inputs are provided for connecting the Input signal.
- (6) **Component Tester:** Switch when pressed converts scope into Component Tester mode.
- (7) **CT:** Input & Gnd terminals to be used for CT.

Controls on PCB

- (1) **Intensity:** Controls the brightness
- (2) **Focus:** Controls the sharpness
- (3) **Trace Rotation:** Controls the horizontal alignment of the trace.
- (4) **X Pos:** Controls the horizontal position
- (5) **Y Pos I & II:** Controls vertical position of the trace.
- (6) **X Y:** When pressed cuts-off internal TB & connects external horizontal signal via. CH II
- (7) **X 5:** When pressed give 5 times magnification.
- (8) **External:** When pressed allows ext. trigger.

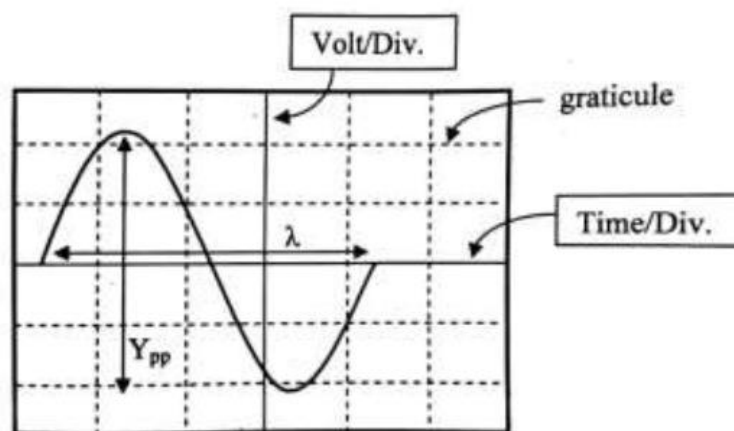


Figure 08: Figure of oscilloscope screen

A Signal generator:

A Signal generator is a device that can produce various patterns of voltage at a variety of frequencies and amplitudes.

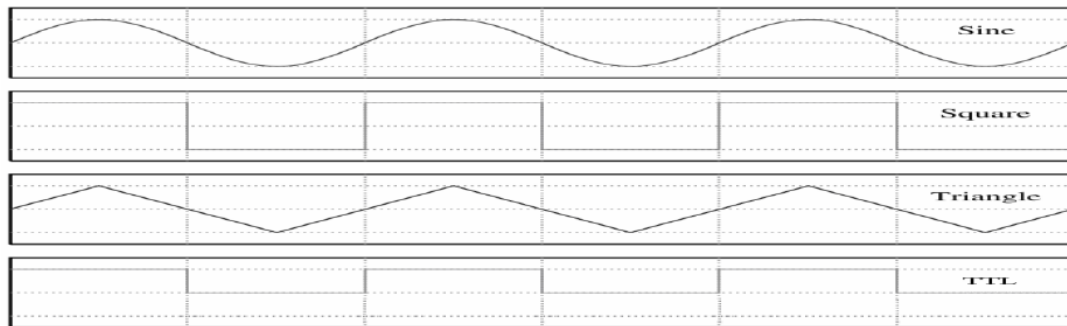


Figure 09: Waveforms of the function generator

Steps:

- Calibrated the Oscilloscope.
- Connect the output of the signal generator to Ch.1 of the oscilloscope.
- Make the Settings to obtain a stationary waveform on the oscilloscope screen.
- Set V_{pp} is to about 4 V.
- Measure the sinusoidal voltage signal in the frequencies 100 Hz, 1 kHz, and 10 kHz ranges.
- Draw the signal that you've observed from the oscilloscope.

END