












## Electronics Made Easy – 1

### Experimental Kit

		
BATTERY	BATTERY CONNECTORS	LED
		
RESISTOR	EXPERIMENTAL BREAD BOARD	DC MOTOR
		
BUZZER	LAMP / GLOBE	PUSH BUTTON SWITCH



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## **1. Introduction**

Electronic circuitry can be experimented with using very few, basic electronic components. Essentially, most circuits or experiments, can be divided into five areas :

1. The power or energy source ( a battery )
2. The control components ( a switch )
3. The protection components ( a resistor or diode )
4. The load ( a motor or led or buzzer )
5. The connecting components ( wires, experimental boards, etc. )

The desired function of a circuit is normally determined by the load. For example, to produce light, the load of the circuit would be a lamp or an LED.

This Kit provides components to experiment, with at least three circuits and possible combinations of them :

1. Circuit to convert electric current or electron flow to light ( using a lamp or led )
2. Circuit to convert electric current or electron flow to motion ( using a motor )
3. Circuit to convert electric current or electron flow to sound ( using a buzzer )



## 2. THEORY

Electronics is the science that studies the flow of electrons ( current) and its effects.

When electrons ( current ) flows through a component, there always is some sort of secondary effect. For example :

- Current flow through an incandescent lamp, causes heat and light to be emitted
- Current flow through an LED causes light to be emitted
- Current through a motor, causes it to spin / rotate ( electromagnetism )
- Pulsating current through a coil or buzzer, emits sound ( vibration )

Current ( electrons ) can only flow through a completed or closed circuit, and only if the power or energy source (battery) has a terminal at a higher potential than the other terminal.

In some circuits (Direct Current / DC), current flow and correct function can only be achieved if current flows in a given direction. While in other circuits (Alternating Current / AC), correct function is realized regardless of direction of current flow.


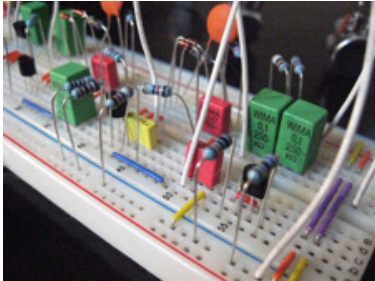
Voltage and current are terms used to measure levels of energy or power in a circuit. Voltage can be likened to pressure in a water tank, while current flowing in a wire, can be likened to water flowing in a pipe.

Circuits or components can be wired in series or parallel. Current in a series circuit is the same throughout, while the voltage may differ according to components characteristics.

In parallel circuits the voltage is the same throughout while the current in each parallel leg may differ according to the component characteristics.

## 3. COMPONENTS EXPLAINED

### 3.1 Experimental boards.

	
Plain / Empty experimental board	Loaded / Populated experimental board



This board is sometimes also called a breadboard. This is a board with many interconnected holes, where components can be placed and interconnected to form the desired circuit.

Each row of holes from a to f, is interconnected. In other words, holes 1a, 1b, 1c, 1d, 1e and 1f are already connected in the board.

The same applies to row g to l. In other words, holes 1g, 1h, 1i, 1j, 1k and 1l are already connected in the board.

In this board no columns are connected at all. For vertical connections use given wire links.

### **3.1 Motors.**

If the positive of a battery is connected to one terminal of a DC motor and the negative to the other, the motor will rotate in a given direction. Reversal of the terminals will cause the motor to also reverse rotational direction.



### **3.2 Batteries**

Batteries are sources of energy ( voltage & current ). To function, all circuits must have a source of energy. Batteries are electrochemical sources of energy.







### 3.3 Switches and Push Buttons

These are very simple devices used to control current flow or power to a circuit. They either complete / close the circuit or open it.



### 3.4 Lamps and LEDs

Lamps and LEDs are devices normally intended to generate light when a current flows through them. Unlike lamps, LEDs are polarity sensitive and only work when connected correctly and also in series with a resistor. The idea of the resistor is to limit the current to levels below that which will damage the LED.

	
Red LED	Resistor for current limiting

LEDs are classified as semiconductors. They only conduct under specific circumstances ( right voltage, right current and correct polarity ).

LED's will become permanently damaged ( and very hot ) if connected incorrectly or if too much current flows through them.



### 3.5 Resistors

Resistors are perhaps the simplest components in electronics. They are used mostly to reduce voltage or current in a circuit. Resistors are available in many sizes and values.



### 3.6 Diodes

Like LEDs, diodes are also classified as semiconductors. They only conduct or allow current flow in a given direction and voltage.



### 3.7 Buzzers

Buzzers are very interesting. They produce an audible sound (vibration), when current flows through them. Some buzzers are made with semiconductors, while some are not. Hence they may be polarity sensitive. Should the latter be the case, the positive pin or wire, will be marked with a plus, or be red in color.





## 4. CAUTION

While working with electronics may seem less dangerous than working with electricity. That is not the case !!!

Some electronic circuits may cause electrocution, fire, poisoning, burning, blinding, etc...

The circuits and components proposed here operate at 9V or less. There is no danger of electrocution.

But if incorrectly used, may cause burns or other injury.

- **Do not swallow any part or component.**
- **Do not allow very young children or babies to handle components.**
- **Never connect any battery or power source, until you are certain that your circuit and load are all connected correctly and the right way around.**
- **Always disconnect the battery or power source when not experimenting.**
- **Some parts are polarity sensitive ( LEDs, Buzzers, etc.). Connecting them the wrong way, may cause permanent damage to the parts and the board and also may cause a fire.**
- **Never experiment near flammable liquids or gases.**