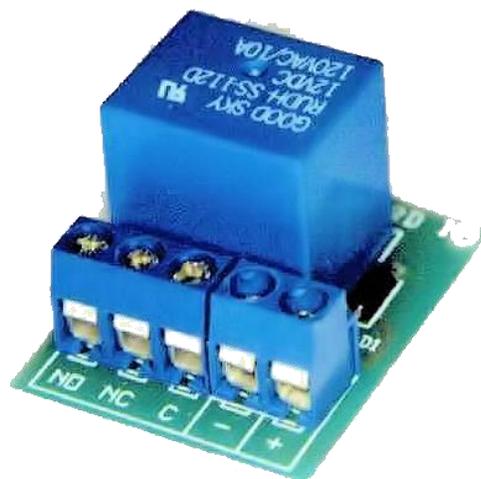




**ELVEY**  
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# Basic Electronics For Alarm Technicians



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## Basic Electronics for Alarm Technicians

### What is electricity?

There are many definitions for electricity.

- It is the movement of electrons.
- It is energy.

Electricity can be found in many forms:

- Static Electricity
- Animal Electricity
- Lightning
- Complex Signals
- DC
- AC

To understand this easier, think about water, this can also be found in many forms:

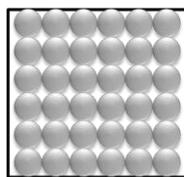
- Liquid - Water
- Gas - Steam
- Ice – Solid

Before we carry on we need to understand the following terms.

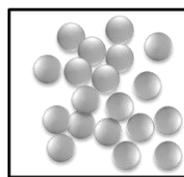
- Matter
- Element
- Atom
- Ion
- Polarity
- Molecule

### Matter

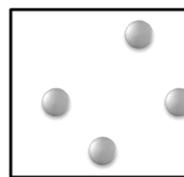
Matter is anything that has weight and occupies space whether it is a solid, liquid, or gas.



Solid



Liquid



Gas

- Solids are ordered and dense, have a definitive shape and volume, and are slightly compressible.
- Liquids are disordered, less dense than solids, take the shape of container, and are compressible.
- Gas is disordered, less dense than liquids, has no definite shape/volume, and is highly compressible

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## Basic Electronics for Alarm Technicians

### What is an Element?

An element is a form of matter

- Cannot be divided into simpler substances
- Consists of one atom
- Oxygen is an element

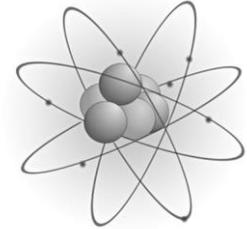
### What is an Atom?

The atom consists of the following parts; Nucleus, Proton, Electron & Neutron.

There are normally the same number of protons and electrons in an atom.

The Nucleus consists of:

- Protons
- Neutrons



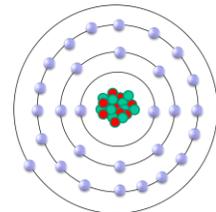
The number of Protons determine the Element

- Copper has 29 Protons
- Zinc has 30 Protons

The number of Neutrons determines the Isotope. It is not important for you to know what an isotope is!

Electrons rotate around the atom at different orbits called Rings, Orbits, or Shells  
BOUND ELECTRONS orbit the nucleus on the inner rings.

- Bound electrons have a strong magnetic attraction to the nucleus
- FREE ELECTRONS orbit on the outermost ring known as the VALANCE RING.



### What is an Ion?

An ion is an atom that has either lost or gained electrons.

- If an atom gains electrons it is called an ANION.
- If an atom loses electrons it's called a CATION.

### What is Polarity?

In electricity polarity refers to the type of charge.

- Like charges repel each other
- Unlike charges attract each other.

Charge is referred to either as a positive or a negative charge

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## Basic Electronics for Alarm Technicians

### What is Electricity?

Electricity is a form of energy involving the flow of electrons.

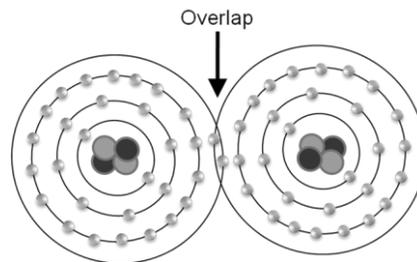
This may be:

- Controlled as in electrical appliances
- Uncontrolled as in a lightning strike

For the purpose of basic electronic knowledge this refers to the controlled movement of electrons.

### Conductors

- A conductor is an electrical material, usually a metal, that offers very little resistance to the movement of electrons
  - In good conductors the outer orbits in adjacent atoms overlap each other
  - The outer shell of an atom is called the valence shell



- When the valence electron gains sufficient energy from an outside force, it can break away from the parent atom and become a **free electron**.
- A CONDUCTOR has 1 to 3 free electrons in the outer ring
  - These electrons in the outer ring are loosely bound to the atom and they can easily move to another atom
- The copper atom's outside shell has one electron

### Insulators

- Offer a very high resistance to electron movement
- These have between 5 and 8 free valence electrons which are tightly bound to these atoms making it difficult to lose or gain electrons.
  - Examples of Insulator atoms are sulphur and oxygen
  - Plastic, air, glass are all examples of materials used as insulators.

### Semiconductors

- Semiconductors in their natural state are not good conductors or good insulators.
  - These have exactly 4 valence electrons
  - Examples include carbon, silicon, and germanium
- Semiconductors can be both an insulator and a conductor, this depends on voltage changes.
  - This allows semiconductors to operate as switches as they are able to quickly change between conducting and insulating.

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