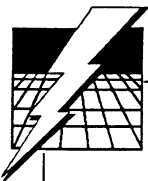


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The symbols used in this book are those in British Standards 3939, part 5. Where there is a choice, the most popular symbol has been chosen.



Introduction

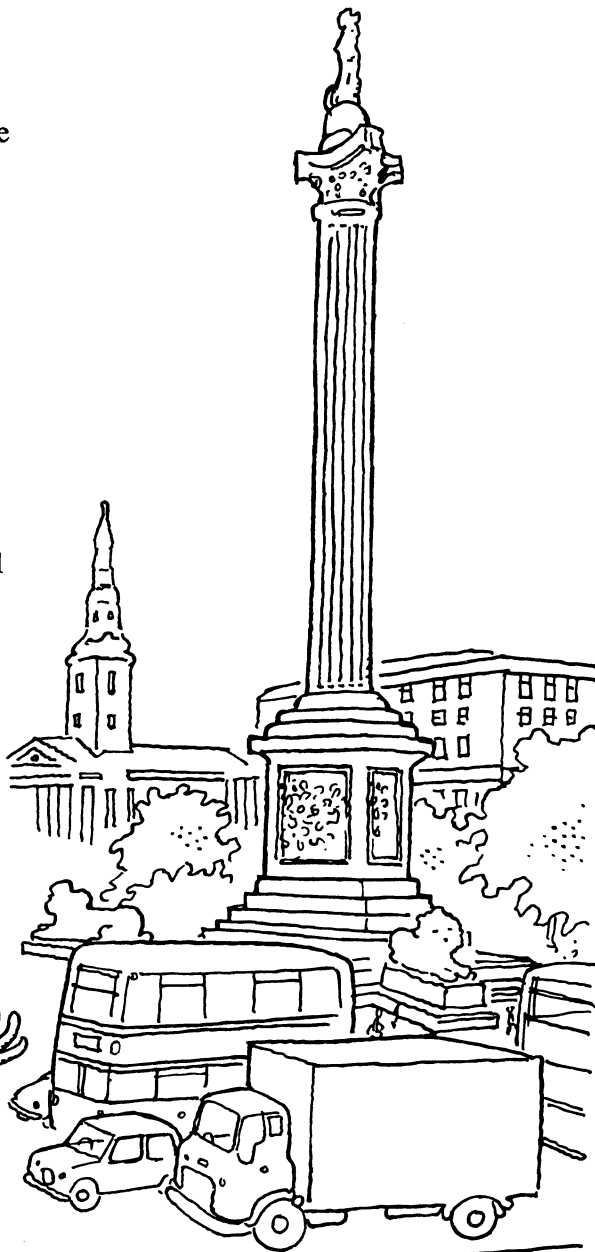
This book invites you into the fascinating world of electronics. Many people think this subject is hard and a bit mysterious, but if you read on you will find yourself doing electronics – and enjoying it.

To get the most from this book, try not to skip pages, and have a go at all the activities. All the words that will be new to you are printed in **bold** to start with and are listed in a mini-dictionary at the back. This will give you more information and help you to answer any questions. There are also sections on fault finding, product model making and, if you want, some simple mathematics.

One of the best ways of learning electronics is by designing and making things, and this book will guide you step by step through many different projects. All the materials and parts needed are cheap and if you cannot get them all from school, they are readily available from electronics supply shops.

Fact File

If we were able to shrink Nelson's Column (37 metres high) as much as computers have shrunk during the last 30 years, it would now slip into your pocket!



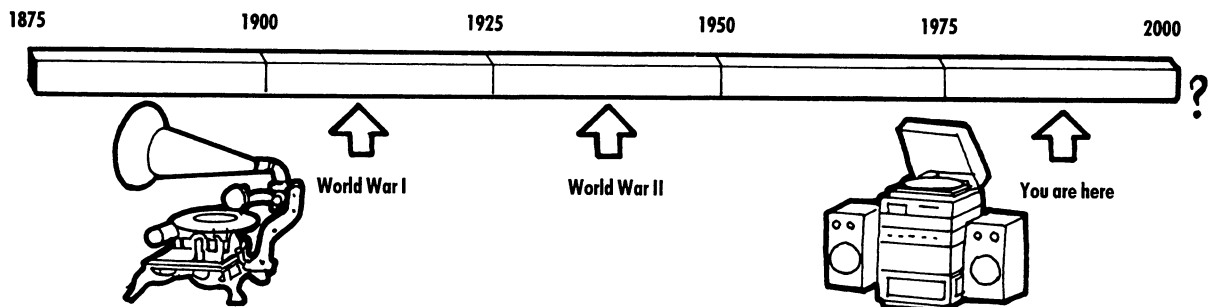
Introduction

The Electronics Revolution

Why Is Electronics Important?

You have probably heard the term 'electronics revolution'. We talk about a revolution when changes happen very quickly – and it may surprise you to know that only in your own lifetime have computers become household items.

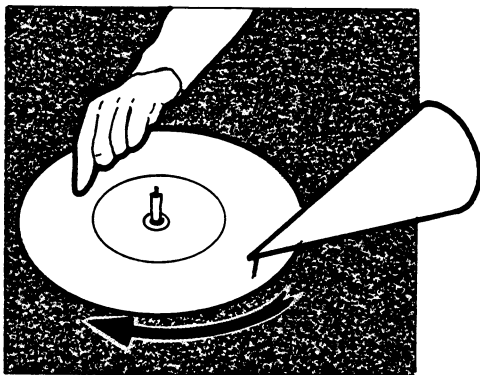
Looking back even further, the best machine for playing back recorded music 60 years ago used a large horn to **amplify**, or make louder, the sound when a needle vibrated its way through the grooves of a record. Modern records still have sound locked up in the form of wavy grooves, but we now have electronic amplifiers.



Experiment 1

If you want an idea of what records sounded like before electronics, take any *old* record and spin it around a pen with a finger while a friend lowers on to it a pin stuck through the end of a paper cone.

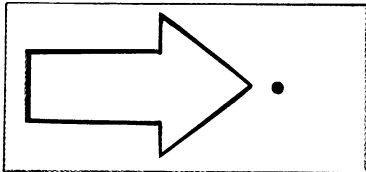
With a modern stereo system, we now hear sound with few of the hisses and scratches you may have just heard. This is just one example of the way electronics has changed our world.



Electronic Components

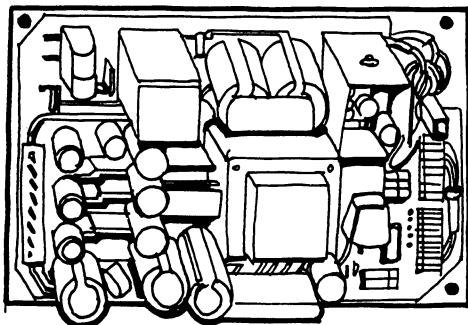
What Is Electronics?

All materials are made up of countless numbers of atoms, each of which is made up of smaller particles. One of these is the **electron**, and when large numbers of these are made to move through certain materials, we talk about an electric current flowing.



There are billions of electrons in the ink of this full stop.

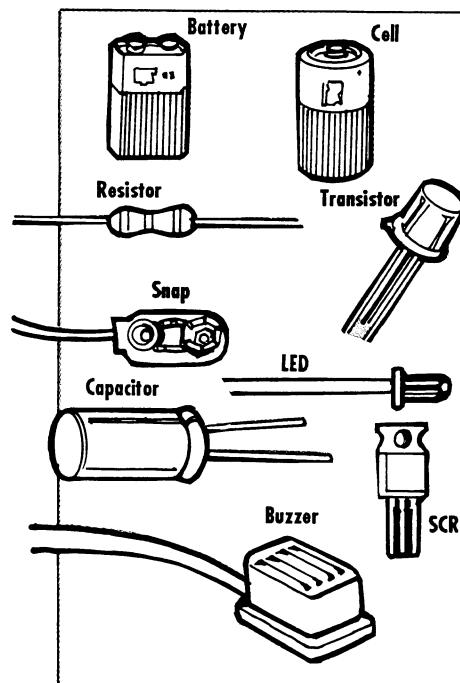
Electronics is to do with managing and controlling these electrons in a **circuit**, which consists of different parts, or **components**, connected together. Making a television, radio or computer involves putting the right components together in the correct way.

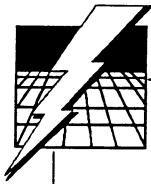


A modern electronic circuit.

As in all subjects, you have to walk before you can run, and this book will show you, in turn, just a handful of the most important components in electronics. Even so, you will be amazed at how many things you can design and make with them.

These are the components you will be working with:

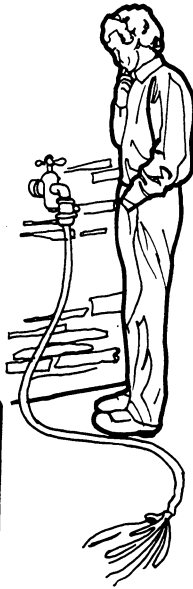
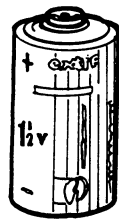




1 Batteries

Because current cannot be seen, many people find it helpful to think of it as something like water flowing in a pipe.

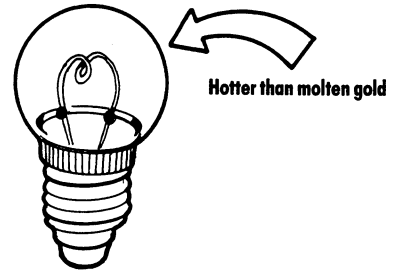
The **dry cell** is one way of producing current. We think of it as a kind of pump that uses chemicals rather than a mechanism. The chemicals inside are not doing much until something that passes, or **conducts**, current is connected between the (+) and (-) terminals.



Although we know that electrons flow from (-) to (+), many years ago it was thought that current was a kind of fluid and flowed from (+) to (-). This is known as **conventional current flow**, and it is common to speak of electricity flowing in this direction.

Fact File

Did you know that any torch bulb filament gets hotter than molten gold or silver?



If a small bulb is connected in that way, the cell pumps electrons out from (-) to flow through the wire and the very fine bulb filament and back to (+). The electrons *must return* to the cell, so there must be a complete wire loop.

In this very simple circuit (most torches use it), the filament of the bulb is designed to obstruct, or **resist**, the flow of current. When this happens, it gets hot – so hot, in fact, that it glows white.

